

S20MT14P02**INVESTIGATING PLANT TRANSCRIPTIONAL RESPONSES TO ALLELOCHEMICAL AND HERBICIDE EXPOSURE USING DNA MICROARRAYS**

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DNA microarray technology is a powerful tool for monitoring gene expression on a genomic scale, allowing simultaneous measurement of changes in the expression of tens of thousands of genes. In recent years, this technology has been used to discover gene function, understand biochemical pathways and regulatory mechanisms, classify disease specimens, and discover drug target sites. Although not an invasive weed, the model plant *Arabidopsis thaliana* is an excellent organism for the study of responses to chemical inhibitors, as its genome has been fully sequenced and well characterized. With the development of a nearly full-genome GeneChip® array for *Arabidopsis*, it is now possible to monitor global changes in gene expression profiles in response to various chemical inhibitors. Benzoxazolin-2(3H)-one (BOA) is a phytotoxic allelochemical resulting from the degradation of DIBOA glucoside. As a first step in our investigations, we have analyzed transcriptional responses for approximately 23,000 *Arabidopsis* genes following exposure to sublethal concentrations of BOA. The largest functional category of BOA-responsive genes represented protein families known to participate in pathways for chemical detoxification, cell rescue, and defense, including some novel plant protein families with potential detoxification roles. The data significantly expand upon previous studies examining transcriptional responses to environmental toxins, and potentially provide novel insights into plant detoxification pathways.

S20MT18P01**REGULATORY PROGRESS, TOXICOLOGY, AND PUBLIC CONCERN WITH 2,4-D: WHERE DO WE STAND AFTER TWO DECADES?**

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2,4-Dichlorophenoxyacetic acid (2,4-D) is member of the phenoxy family of herbicides and has major uses in agriculture, non-crop, forestry, turf, and aquatic weeds. First registered in 1946, 2,4-D is one of the most extensively studied herbicides. Beginning in 1980, regulatory agencies in North America and Europe initiated re-registration/re-evaluation activities for 2,4-D. These activities assure state-of-art testing for health and environmental evaluations of pesticides, and resulted in submission of >80 toxicology studies conducted to GLP standards using 2,4-D acid and its dimethylamine salt and 2-ethylhexyl ester forms. 2,4-D has low to moderate acute oral toxicity (rat LD₅₀ 699-896 mg/kg) and is not well absorbed through skin. In subchronic and chronic rat and mouse studies, overall dietary No-Observed-Effect-Levels (NOEL) were 15 and 5 mg/kg/day, respectively. 2,4-D was not carcinogenic in either rodent species, consistent with a lack of genotoxicity in *in vitro* and *in vivo* test systems. Mild kidney toxicity was the primary toxic effect in these studies. 2,4-D was not a developmental toxicant in rat (overall NOEL 25 mg/kg/day) and rabbit (overall NOEL 75 mg/kg/day) studies, had a low potential for multi-generation reproductive toxicity and neurotoxicity (NOELs 5 mg/kg/day, respectively), and is not regarded as an endocrine disruptor. The various forms of 2,4-D were toxicologically equivalent. The overall toxicology NOEL of 5 mg/kg/day represents a margin of exposure (MOE) of 833 for commercial applicators and 50,000 for home and garden users, indicating 2,4-D meets safety standards for today and beyond. Additional 2,4-D information is available on the 2,4-D Industry Task Force II website www.24d.org.

S20MT18P02**ECOTOXICOLOGICAL EFFECTS CHARACTERIZATION OF ATRAZINE IN AMPHIBIANS**

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Although some studies have reported effects of atrazine in amphibians, there is a paucity of data on its potential effects, especially for endpoints related to development and reproduction. Laboratory and field studies were conducted in the USA and South Africa to assess whether atrazine caused adverse effects in frogs through endocrine-mediated mechanisms. Hypotheses tested related to effects mediated through estrogenic and androgenic mechanisms and how these may interact with gonadal development. Atrazine had no effects on plasma estradiol titres in frogs (*Xenopus laevis*) in laboratory exposures and in frogs from maize-growing sites where atrazine was present in the environment. Neither did it increase the activity of gonadal or brain aromatase in frogs exposed to atrazine. Laboratory and field studies showed no changes in plasma testosterone concentrations. No effects on larynx dilator muscle size, an androgen-dependent developmental process, were observed in male *X. laevis* exposed in the laboratory or collected from maize-growing areas. Results from microcosm and field studies showed a low incidence of gonadal anomalies with no consistent concentration-response to atrazine exposures. There was no evidence of effects at the population level that were linked to atrazine exposures. Assessment of a causal link between atrazine exposure and effects in amphibians showed no temporal correlation, weak strength of association, and equivocal concentration-responses with respect to endocrine and gonadal effects. The authors wish to acknowledge Ecorisk Inc. and Syngenta Crop Protection, Inc. for their support of this research.

S20MT20BP01**HYBRIDIZATION BETWEEN RED RICE AND RICE IN THE U.S.: IMPLICATIONS FOR GENE FLOW AND FERALITY**

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Imidazolinone-resistant rice cultivars have been increasingly adopted in the southern U.S. since their initial introduction in 2002, largely due to the improved control of red rice in these systems. Although promising, herbicide-resistance technology has raised concerns about potential hybridization and gene flow between rice (*Oryza sativa* L.) and its weedy relative, red rice (*Oryza sativa* L.), and the potential development of herbicide-resistant or feral red rice populations. SSR marker analysis and phenotypic analysis of segregating populations are being employed in Arkansas to quantify, identify, and track red rice hybrids in grower and research fields. Outcrossing rates between red rice and herbicide-resistant or non-resistant rice have been variable, but nearly always less than 0.5%. Outcrossing depends on a number of factors, including red rice ecotype, rice cultivar, vertical and/or horizontal distances between panicles, synchronization of flowering periods, and seed production, as well as environment. Subsequent introgression of hybrid traits into the red rice population can be mitigated by additional factors including delayed flowering periods and/or low seed set in hybrids. Although gene flow between rice and red rice in U.S. rice fields is likely to remain a significant issue, establishment of feral populations of hybrid, weedy rice in non-rice or non-agricultural areas appears to be of relatively low risk due to the minimal availability of desirable *O. sativa* habitat outside of rice fields. Integrated strategies that address short- and long-term challenges of red rice control and resistance management will be necessary to optimize sustainability of rice production in the U.S.

S20MT20BP02

WEED DIVERSITY ON WEED FLORA AND VEGETATION IN THE SUMMER CROP FIELDS OF ANHUI PROVINCE CHINA

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Two surveys were conducted to investigate weed flora and vegetation in 155 sampling sites accounting to a total area of 153hm² of summer crop fields in Anhui Province, China through visual scoring the level of weed infestation to crops in seven-scale. Data on weed communities and environmental factors collected were analyzed through the principal component analysis (PCA) and canonical correspondence analysis(CCA). 96 species of weeds subjected to 19 families were recorded, . Results of multivariate analysis showed that the main factors influencing the structure and distribution of weed communities were the duration of soil submersion period, latitude, and soil type and pH. Based on the result of PCA, the 155 sampling sites could be divided into the southern, northern dry-land group and the paddy soil group three groups in geographic and floristic composition, and weed abundance. Both southern and northern dry-land groups with continuous summer crop and autumn dry-land crop double cropping system, distributed in the southern and northern parts respectively, had dominant species *Galium aparine* var. *tenerum*, which were regarded as *Galium* weed vegetation type. However, the former had main weeds *Avena futua* and *Veronica persica*, whereas the latter had *Galium tricorne*, *Descurainia sophia*, and *Lithospermum arvense*. The paddy soil group, characterized by continuous summer crop and rice double or triple cropping systems prevailed in the south and central areas, had dominant weed *Alopecurus aequalis* and other main weeds: *Malachium aquaticum*, *Stellaria alsine*, *Alopecurus japonicus*, *Lapsana apogonoides* so that it might be called as *Alopecurus* weed vegetation type.

Key words: weed diversity; weed vegetation; weed communities; weed flora; principal component analysis (PCA); canonical correspondence analysis(CCA); summer crop; ecological interpretation

S20MT26P01

MANAGING AGRICULTURAL INTENSIFICATION: THE ROLE OF INTERNATIONAL AGRICULTURAL RESEARCH

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Over the next 20 to 25 years, global food demand is expected to increase by around 50%, largely coming from developing countries. The challenge is to increase production without damaging the natural resource base. Various options for Integrated Natural Resource Management (INRM) have been developed, but adoption has been poor, for various reasons – technical, socio-economic, and institutional. To date a great deal of past work has focused at the plot and farm level. It needs to be extrapolated to more sites in order to answer the key question: '*Under what conditions will rural households be encouraged to reinvest in their agroecosystems?*' Encouraging such investment involves several challenges: improving returns from such investments, creating market access for smallholder farmers, improving research-extension-farmer linkages, specific policies on soil, water and biodiversity, integration of livestock-wildlife-crop systems, development of drought mitigation strategies, capacity building, better information flow; and a clearer gender perspective in research and training. Although a large body of successful INRM research is available from many countries, little work has reached sub Saharan Africa. This meeting must aim to share experiences, discuss case studies of specific technologies, identify "best options" and adapt them to environmental and socio-economic conditions in Africa. It must also aim to build and expand partnerships among institutions with a common interest in INRM targeted at small-scale farmers.

S20MT20BP03

PATCH DYNAMICS AND SPATIAL DISTRIBUTION PATTERNS OF INVASIVE WEEDY RICE (*ORYZA SATIVA* L.) IN MALAYSIA

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Weedy rice has been a successful invasive in the Malaysian rice granaries since the late 1980's. Field surveys were conducted in 1999 to 2002 to assess the extent of spread and infestation, and patch sizes of weedy rice in selected farm blocks in the rice granaries of Tanjung Karang, MADA, and Besut. These were augmented by field studies to assess patch dynamics of weedy rices in direct-seeded rice plots where standard control measures were used. These comprised pre-plant paraquat application at 3 kg a.i./ha prior to two rounds of tillage operations followed by incorporation of molinate at 4.5 kg a.i./ha one day before sowing. Control plots were devoid of herbicide treatment. Both granary- and season-mediated differences prevailed in weedy rice infestations in the granaries surveyed, although the extent of infestation ranged from 1% to 100%. Patch sizes ranged from 0.56 m to 4.83 m in diameter in the control plots *vis-à-vis* 0.15 m to 0.62 m in plots subjected to standard agronomic practices, water regimes and control measures. Lloyd's patchiness index (*Ip*) ranged from 1 to 68, denoting over-dispersed distribution patterns, and the occurrence of patterns were not repetitive within the period of study. The absence of seed dormancy, short maturation period, and the production of abundant seeds are some of the growth traits of weedy rice that enable it to establish and spread quickly. Differences in agronomic practices and control measures, and water availability are some of the attributes contributing to very apparent differences in degree of infestations of weedy rices in the granaries surveyed.

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BIOTECHNOLOGY, BIOSAFETY AND AGRICULTURAL DEVELOPMENT- VIEW FROM THE WORLD BANK

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New techniques of biotechnology can stabilize yields and improve rural incomes, reduce negative environmental impacts, provide nutrient-enhanced and better quality food, and deliver vaccines and antibodies to improve health. While most benefits have occurred in industrial countries, the techniques have considerable potential for sustainable small-farm systems in developing countries. However, due to the potential environmental and health effects and socioeconomic implications, some of the new technologies are controversial. Biotechnology strategies must be country-specific, depending on needs and scientific capabilities. All countries, however, will need the capacity for developing technology policies and strategies, a strong regulatory framework, and scientific skills to make use of appropriate technologies. Activities, experiences, lessons learnt and challenges for the World Bank in supporting agricultural biotechnology will be presented.

<p>S22MT05P01 DEGRADATION OF METOLACHLOR IN SIMULATED WATER/SEDIMENT system</p> <p>w. MERSIE¹ AND c. MCNAMEE¹</p> <p>¹VIRGINIA STATE UNIVERSITY, P. O. BOX 9061, PETERSBURG, VA 23806, USA, WMERSIE@VSU.EDU</p> <p>A study was conducted to determine the half-life, degradation rate and metabolic formation pattern of metolachlor in a water/sediment system. Metolachlor degradation in a laboratory (water/sediment) was examined in Bojac sandy loam sediment that was incubated at 24°C. Samples were collected at day 0, 7, 14, 28, 42, 56, and 112 and analyzed for metolachlor and its major metabolites. The water/sediment oxidation-reduction potential took 28 d to reach -371 mV and the pH increased from 5.6 to 6.5 by the last sampling day (112 d). The half-life of metolachlor was 34 d in sediment and 8 d in the water phase. Metolachlor metabolites, ethanesulfonic acid (ESA) and oxanilic acid (OA) were detected in the water/sediment system. In sediment the two metabolites peaked by the 56th d of incubation and declined after that indicating transformation to other products. Greater quantities of OA and ESA were detected in sediment than in the aqueous phase. The production of OA and ESA in the water/sediment system occurred in the first 28 d when the system was at an aerobic redox state. Metolachlor can degrade under reducing conditions but its metabolites, ESA and OA are not significantly formed under anaerobic conditions.</p>	<p>S22MT05P02 THE PAST, PRESENT AND FUTURE OF TRIAZINE HERBICIDES</p> <p>Homer M. LeBaron¹ and Janis E. McFarland²</p> <p>¹Illinois Nauvoo Mission, Church of Jesus Christ of Latter-day Saints, P.O. Box 215, Nauvoo, IL 62354, USA, halebaron@navvoo.net; ²Syngenta Crop Protection, P.O. Box 18300, Greensboro, NC 27419, USA, janis.mcfarland@syngenta.com</p> <p>The first synthesis of s-triazine chemicals for herbicidal screening took place 52 years ago, and first triazine was registered in 1956. There are 15 triazine herbicides currently in use as critical weed control tools in crops around the world. Atrazine is the most important herbicide for yield and cost benefits in North America for corn, sorghum and sugarcane production, and is essential for soil conservation programs. Atrazine and other triazine herbicides are vital tools in no-till, ecofallow and other soil conservation programs that have greatly reduced soil erosion. Farmers are making great progress with best management practices, which are preventing or reducing herbicide and nutrient levels in our water supplies. Data confirm that atrazine levels in water are decreasing significantly. In 2003, the US EPA completed a 9-year review of hundreds of new studies on the safety and benefits of atrazine. Their conclusions are that atrazine can be used safely and is not likely to cause cancer in humans. Additional monitoring for atrazine in water, site-specific management plans and new studies in emerging areas of amphibian research are required as part of the reregistration of atrazine. The results of this comprehensive review support the safety and long-term availability of atrazine for farmers and serves as a case study for scientific reviews of chloro-triazine herbicides. This paper will cover environmental fate and effects, toxicology, benefits and risks, analysis, biology, history and other aspects of triazine herbicides, which are documented in a soon to be published book on The Triazine Herbicides.</p>
<p>S22MT05P03 WATERSHED ASSESSMENTS OF CONSERVATION MANAGEMENT PRACTICES AND HERBICIDE FATE</p> <p>M A Locke¹, R M Zablotowicz², S S Knight¹, S Smith¹</p> <p>¹USDA-ARS, WQEPRU, 598 McElroy, Oxford, MS 38655, USA, mlocke@ars.usda.gov; ²USDA-ARS, SWSRU, Stoneville, MS</p> <p>A regional watershed scale project (Mississippi Delta Management Systems Evaluation Area) was established to assess effects of conservation land management practices on environmental quality. The focus was on three watersheds that drain into oxbow lakes (Thighman, Beasley, and Deep Hollow). Of the three watersheds, the greatest intensity of conservation practices was implemented at Deep Hollow (1996 to 2000), and the least at Thighman. Only edge-of-field practices (e.g., buffer strips, erosion control pipes) were used in Beasley watershed until 2000. All watersheds were primarily planted to cotton and soybean in 1996, but by 2002, land use patterns shifted to include more corn, soybean, and in Beasley watershed, trees. Lake water was evaluated for herbicides (fluometuron, atrazine, cyanazine, and metolachlor), total solids, phytoplankton, and nutrients from 1996 to 2002. Water quality of the three watersheds was dynamic and was affected by land management practices and hydrology. Prior to initiation of improved practices, lake ecology was impaired in all lakes due to sedimentation. After management practices were implemented, primary productivity of lakes was restored. Overall, highest sediment levels, algal and bacterial populations, enzyme activities and herbicide levels (atrazine and metolachlor for corn production) were observed in Thighman Lake. Implementation of reduced tillage and glyphosate resistant crops (cotton / soybeans) (after 2000) in Beasley watershed resulted in lower levels of suspended sediments and herbicide concentrations in lake water. Conversion of Deep Hollow watershed from conservation practices back to conventional tillage after 2000 increased fluometuron levels in lake water with little effect on suspended sediment.</p>	<p>S22MT05P04 NARCOTIC PLANT CONTROL BY HERBICIDES: ENVIRONMENTAL ISSUES</p> <p>Charles S Helling</p> <p>Agricultural Research Service, United States Department of Agriculture, Beltsville Agricultural Research Center, Beltsville, Maryland 20705, USA E-mail: Hellingc@ba.ars.usda.gov</p> <p>The world-wide problem of narcotic drugs stems largely from the illicit cultivation of <i>Cannabis sativa</i> (marijuana), <i>Erythroxylum</i> spp. (coca), and <i>Papaver somniferum</i> (opium poppy). The solution can be approached as a specialized weed control problem, albeit where the target is a crop. Among the weed control methods, herbicide use is most effective for cultivation that is large-scale, difficultly accessible, or grown in dangerous locations. Environmental stewardship and government policy mandate understanding the impacts of herbicides used, or considered, for narcotic plant control. The overarching objective of a long series of USDA experiments was to determine how such herbicides behave in (especially) tropical sites associated with coca and poppy cultivation in Latin America. This was done by (a) determining herbicide persistence and leaching in test plots or actual coca fields in Peru, Panama, and the U.S.; (b) isolating soil bacteria capable of utilizing test herbicides; (c) conducting algal toxicity studies; and (d) observing environmental impacts from large-scale application of glyphosate on Colombian coca. The behavior of two potential coca control herbicides was notably consistent over three tropical locations, with distinctly shorter half-lives than typically reported for temperate areas. Due to unique risks (hostile ground-fire, physical hazards) associated with aerial application, especially for coca and poppy eradication, herbicides are applied at higher altitude and speed than done for conventional weed or brush control. Despite this, off-target collateral damage has been remarkably low, and environmental risks seem minimal.</p>

<p>S22MT11P01 AFTER THE GORSE HAS BOLTED—SEVEN HABITS OF HIGHLY EFFECTIVE WEED PROGRAMMES</p> <p>A I Popay¹ and S M Timmins²</p> <p>¹Department of Conservation, Private Bag 112, Hamilton, New Zealand, ipopay@doc.govt.nz; ²Department of Conservation, PO Box 10420 Wellington, stimmins@doc.govt.nz</p> <p>Proactive management is essential for handling invasive plants that have escaped border controls or garden boundaries, and have become established in and threaten ecosystems. Establishing plans and structures allows us (country, industry or agency) to deal quickly with new weeds, and effectively with widespread weeds. In New Zealand, over 2000 invasive plant species threaten ecosystems.</p> <p>Such procedures, developed for New Zealand's conservation sites, apply equally well to weed management by other agencies and in other countries.</p> <p>The seven essential ingredients are:</p> <ol style="list-style-type: none"> 1) Get ready - have plans in place before the next batch of weeds turns up. 2) Objectives ensure we know where we are going—what we want to do to the weed and what we want to achieve in the affected environment. 3) We need to prioritise which weeds are worth controlling and at which sites weed control is most beneficial. 4) Going beyond demonising weeds, we must seek to understand the way weeds spread and their impact on ecosystems. 5) Getting everyone involved requires co-ordination between organisations. The public also plays its part in weed spotting, weed pulling and behaving well. 6) To put this into practice, we need to actively control weeds. We can eradicate or contain weeds, control them to protect precious sites or, occasionally, give up. The management practice we choose depends on the weed and the location. It's important to get it right. 7) Having set the objectives, we must sharpen the saw—assess our progress using scientifically robust monitoring, evaluate, and if necessary re-jig our future management. 	<p>S22MT11P02 INVASIVE WEEDS – INVOLVING THE COMMUNITY IN EFFECTIVE MANAGEMENT</p> <p>B J Wilson¹, S Vitelli¹ and G W Fisher¹</p> <p>¹Queensland Department of Natural Resources, Mines and Energy, Land Protection, GPO Box 2454, Brisbane, Australia 4001, Bruce.Wilson@nrm.qld.gov.au</p> <p>Invasive weeds affect the whole community through economic, environmental and social impacts. Their management involves many variables such as land use (eg national park, farm), size of land parcels, type of land owner (eg individual, State government) and weed status - potential threats (not yet in the area), early invaders and widely established.</p> <p>Resources for weed management come from land owners, and also volunteer groups, sponsors and government. The resources are usually insufficient for complete control. Priorities must be set. An ongoing project is providing support to the development of local government area pest management plans as the means to set local priorities. The objective is to ensure planning that involves the local community, as well as representatives of government lands, to arrive at priorities. Planning results in participants having an understanding and commitment to achieving the preferred future, and thus a greater chance of success.</p> <p>The requirement for local governments to sponsor the development of a pest management plan for their area has been incorporated in new Queensland government legislation, to ensure this planning occurs. Each local government must establish a working group to assist, the plan must consider the interests of the community and a draft plan must be made available for public comment.</p> <p>Consistency across Queensland is provided by a set of principles, the Queensland Weeds Strategy and Guidelines for major weed species. A resource kit provides a means to develop a local plan that links to the principles and the Strategy.</p>
<p>S22MT11P03 OPERATION RAPID RESPONSE – DEALING WITH THE POTENTIAL INCURSION OF BRANCHED BROOMRAPE (<i>OROBANCHE RAMOSA LINNAEUS</i>) INTO VICTORIA, AUSTRALIA.</p> <p>David A. McLaren^{1,4}, Kate Blood² and Brian Dowley³</p> <p>¹Primary Industries Research Victoria (PIRVic), Department of Primary Industries, Frankston Centre, PO Box 48, Frankston 3199, Australia, david.mclaren@dpi.vic.gov.au</p> <p>²Catchment and Agriculture Services, Department of Primary Industries, PO Box 7, Beaufort 3373, Australia, kate.blood@dpi.vic.gov.au</p> <p>³Catchment and Agriculture Services, Department of Primary Industries, PO Box 120, St Arnaud 3478, Australia, brian.dowley@dpi.vic.gov.au</p> <p>⁴CRC for Australian Weed Management</p> <p>The Victorian Government in Australia is placing a high priority on potential new and emerging weeds. Preventing the establishment of serious weeds is a worthwhile government investment. It saves money, protects the environment and can reduce the impact on human health. The Department of Primary Industries, and the Department of Sustainability and Environment have developed the Weed Alert Rapid Response program to target potential, new and emerging weeds in the State of Victoria. The main focus is on surveillance, collection, identification, assessment and response. A network of Weed Spotters has been established to look for new weeds and report them when found. More intensive surveillance programs are being conducted for serious potential weeds. An outbreak of the parasitic weed, branched broomrape (<i>Orobanche ramosa</i>) in the Murray Bridge region of South Australia is threatening agricultural production in Victoria, Australia. Trace-back operations in South Australia identified 27 Victorian properties linked to the infestation in South Australia. To stop this potential weed incursion, the Victorian Government has set up an "Operation Rapid Response – Branched Broomrape Team" in much the same way as a team is put together to deal with natural disasters. This team has overseen the surveillance for this weed in Victoria and raised its awareness with key stakeholders and the Victorian community.</p>	<p>S22MT11P04 NATURALISED LEGUMES IN AUSTRALIAN TEMPERATE NATURAL ECOSYSTEMS</p> <p>J Emms^{1,2}, J G Virtue^{1,3}, C Preston^{1,2} and W D Bellotti^{4,5}</p> <p>¹CRC for Australian Weed Management, PMB1, Waite Campus, Glen Osmond, SA 5064, Australia, Email, jason.emms@adelaide.edu.au</p> <p>²School of Agriculture and Wine, University of Adelaide, PMB1, Waite Campus, Glen Osmond, SA 5064, Australia</p> <p>³Animal and Plant Control Commission, GPO Box 2834, Adelaide, SA 5001, Australia</p> <p>⁴School of Agriculture and Wine, University of Adelaide, Roseworthy Campus, Roseworthy, SA 5371, Australia,</p> <p>⁵CRC for Plant Based Management of Dryland Salinity, University of Western Australia, 35 Stirling Highway, Crawley, WA 6009, Australia</p> <p>Exotic legumes are common invaders of natural ecosystems in temperate Australia but it is thought that species might differ in their capability to invade and also impact in these systems. The object of this study was to examine legumes with similar residence times in Australia to find which species have been able to naturalise and invade natural ecosystems, what degree of impact they are having upon these systems and collate information on their life form, growth habit and origin. Nursery catalogues from the period 1905-1933 were located and thoroughly searched for all legumes listed. Recent floras and plant censuses were searched and all alien legumes noted. Finally a questionnaire was created and distributed to those involved with environmental weeds and natural ecosystems in temperate Australia to determine what introduced legumes are present and what level of impact they are having. Exotic legumes are present in the natural ecosystems of temperate Australia and a number are considered to be having significant impacts on biodiversity and ecosystem function. The majority of naturalised legumes are from a European origin. Annual species have a much higher naturalisation rate (59.3%) than perennial species (26%) but perennial legumes were considered to have higher impacts in natural ecosystems. Despite their ability to readily naturalise in temperate Australia, non-climbing herbaceous legumes would appear to present lower risks to Australian temperate natural ecosystems than woody perennial legumes.</p>

<p>S22MT11P05</p> <p>THE DISTRIBUTION AND SPREAD OF <i>NASSELLA TRICHOTOMA</i> (SERRATED TUSSOCK) WITH A VIEW TO IMPROVING DETECTABILITY, CONTAINMENT AND ERADICATION</p> <p>T F Cowan¹, B M Sindel¹, R S Jessop¹ and J E Browning²</p> <p>¹School of Rural Science and Agriculture, The CRC for Australian Weed Management, The University of New England, Armidale, NSW 2351 Australia. tcowan2@pobox.une.edu.au</p> <p>²New England Weeds Authority, 129 Rusden St Armidale NSW 2350 Australia.</p> <p>Originating in South America, <i>Nassella trichotoma</i> (serrated tussock) infests a considerable area of valuable grazing land in New Zealand, South Africa and Australia. <i>N. trichotoma</i> has been the cause of severe losses to farmers as it reduces the productivity of grazing land and livestock, and increases weed control costs. When introduced into a new area which provides a suitable growing environment it can rapidly dominate the landscape as it produces large amounts of wind-dispersed seed and is highly unpalatable to stock. <i>N. trichotoma</i> has recently colonised the Northern Tablelands of New South Wales, Australia though most infestations are currently scattered and consists of a small number of individual plants. In 1999/2000 the <i>N. trichotoma</i> infestations in a 20 km by 30 km area of the Northern Tablelands were located and recorded using a Global Positioning System (GPS). The number and maturity of plants were recorded at each GPS site. The process was repeated in 2003/2004. Initial results from the mapping of infestations show a reduction in the maturity and size of infestations but an increase in the number of infestations. These changes may be attributed to the development of improved detection and control of existing infestations as farmers become more aware of <i>N. trichotoma</i>, as well as to the continued spread of the weed. Further work is continuing with the aim of being able to better describe the ecological adaptation of <i>N. trichotoma</i> to this area and its localized distribution, and to improve the ability to detect and manage the weed.</p>	<p>S22MT11P06</p> <p>MANAGEMENT OF A NEW INVASIVE WEED IN NEW SOUTH WALES, AUSTRALIA – <i>ASYSTASIA GANGETICA</i> SSP. <i>MICRANTHA</i> – A CASE STUDY</p> <p>A M Storrie¹, G Prichard² and J R Hosking¹</p> <p>¹NSW Agriculture & CRC for Australian Weed Management, Tamworth Agricultural Institute, RMB 944, Tamworth, NSW 2340, Australia, andrew.storrie@agric.nsw.gov.au; john.hosking@agric.nsw.gov.au</p> <p>²Port Stephens Council, 116 Pacific Highway, Raymond Terrace, NSW 2324, Australia, graham.prichard@portstephens.nsw.gov.au.</p> <p><i>Asystasia gangetica</i> ssp. <i>micrantha</i> is the subspecies of <i>A. gangetica</i> causing problems in Australia. It is thought to have been cultivated as a garden plant prior to naturalising. It is a perennial mat-forming creeper that smothers other vegetation. <i>Asystasia gangetica</i> ssp. <i>micrantha</i> is the subspecies causing major problems in SE Asia. The first record of naturalised plants of this subspecies in Australia was from Boat Harbour, NSW, in July 1999. A program has been implemented to determine the extent of the problem, how to manage existing infestations and to determine impact of the subspecies. An awareness program was implemented to determine the extent of the problem. Colour brochures were distributed to nurseries and at field days. Live specimens were shown at field days and articles published in the print media. No herbicides were registered for control so replicated small plot trials were conducted with a range of commonly-used herbicides. Volunteers and community groups have been encouraged to conduct control on public lands. The program is successful with the original site now being controlled by occasional hand-weeding of seedlings, reports of new infestations from the public and 'permits' for two herbicides.</p>
<p>S22MT13P01</p> <p>PROMOTIVE ALLELOPATHIC EFFECTS OF RICE (<i>ORYZA SATIVA</i> L.) ON SEED GERMINATION OF <i>MONOCHORIA VAGINALIS</i> VAR. <i>PLANTAGINEA</i> AND <i>HETERENTHERA LIMOSA</i> (SW.) WILLD.</p> <p>Y Takeuchi¹, SH Chae², D Sato¹, K Yoneyama¹ and KU Kim³</p> <p>¹Center for Research on Wild Plants, Utsunomiya University, Utsunomiya 321-8505, Japan, takeuchi@cc.utsunomiya-u.ac.jp; ²Cheonan Yonam College, Cheonan, 330-802, Korea, shchae@yonam.ac.kr; ³College of Agriculture & Life Sciences, Kyungpook National University, Taegu, 702-701, Korea, kukimkim@knu.ac.kr</p> <p><i>Monochoria vaginalis</i> var. <i>plantaginea</i> and <i>Heterenthera limosa</i> (Sw.) Willd. are very serious aquatic weeds in paddy fields, growing vigorously and causing a reduction of rice yield. In recent years, they become more serious problem in Japan and Korea where the number of the weeds was increased by direct-seeding and infant seedling culture as a method of transplanting. This study was conducted to determine the effects of rice seeds, seedlings, hulls and straw on the germination of these weeds.</p> <p><i>H. limosa</i> seeds germinated in the light under flooded conditions, but the seeds also germinated in the dark under flooded conditions when they were grown with rice cultivars such as Drew, Rexmont, Sathi, PI 312777, Kouketsumochi and Koshihikari. The results suggested that seeds, hulls, seedlings and straw of rice regardless of cultivars contained stimulatory substance(s) that promote seed germination of <i>M. vaginalis</i> and <i>H. limosa</i>. Seed germination of these two weeds was stimulated by ethylene, carbon dioxide, and low oxygen conditions. In paddy fields, rice seeds and seedlings release ethylene and carbon dioxide, and consume oxygen under irrigated water and soil. In particular, more ethylene is released from germinating rice seeds and seedlings than from older rice plants. Rice straw promoted also the seed germination of these weeds in the paddy fields. Therefore it is concluded that rice regardless of cultivars may play an important role in inducing germination of these weeds.</p>	<p>S22MT13P02</p> <p>ALLELOPATHIC POTENTIAL OF <i>PARTHENIUM HYSTEROPHORUS</i> IN SOUTH AFRICA</p> <p>C F Reinhardt¹, S Kraus², F Walker², L Foxcroft³ and K Hurle²</p> <p>¹Department of Plant Production and Soil Science, University of Pretoria, Pretoria 0002, South Africa, E-mail: creinhardt@biograc.up.ac.za</p> <p>²Institute for Phytomedicine, Department of Weed Science, University of Hohenheim, 70593 Stuttgart, Germany, E-Mail: khurle@uni-hohenheim.de</p> <p>³Alien Plant Division, Kruger National Park, Skukuza 1350, South Africa, E-Mail: Llewellyn@parks-sa.co.za</p> <p>Allelopathic effects from the nonindigenous invasive plant <i>Parthenium hysterophorus</i> on native species have been linked to its marked ability to displace desirable plants. In bioassays the early growth and development of test species, including monocots and dicots, were significantly impeded by aqueous infusions of <i>P. hysterophorus</i>. Infusions prepared from leaves were particularly potent. Test species' responses included germination inhibition/retardation, and inhibition of both shoot and root growth, with the latter growth parameter proving especially sensitive. Through dipping of <i>P. hysterophorus</i> leaves in organic solvents (methylene chloride or <i>tert</i>-butyl methyl ether [TBME]), biological activity could essentially be transferred from leaves to solvent. This finding prompted an electron-microscopy study of leaf surfaces. Five trichome types were identified on leaf surfaces, and the only glandular type (capitate-sessile trichome) was selectively sampled and analyzed for the presence of the sesquiterpene lactone, parthenin, whose occurrence and bioactivity have been reported by others. Less well known is the exact location of parthenin in <i>P. hysterophorus</i>. Leaves had the highest levels of parthenin. Leaf washings (dips) with TBME yielded up to 13.4 mg g⁻¹, homogenized leaf material had 14.5 mg g⁻¹, and the aqueous extract of leaves only 1.3 mg g⁻¹ parthenin. Glandular capitate-sessile trichomes collected from the leaf surface contained the highest concentration of parthenin (24.3 mg g⁻¹) of all plant parts studied. This gland/trichome type contained virtually 100 % parthenin. On a per unit basis, they held 0.3 µg parthenin. Through extrapolation to field-scale production of numbers of these glands on leaves, and parthenin amounts produced by them, it becomes plausible that a <i>P. hysterophorus</i> population could effectively displace other plants, and hence, severely affect biodiversity in infested areas.</p>

S22MT13P03**ALLELOPATHIC EFFECTS OF PARTHENIUM HYSTEROPHORUS RESIDUES: INTERFERENCE OF ALLELOCHEMICALS WITH SOIL NUTRIENTS****H P Singh¹, D R Batish¹, J K Pandher¹, R K Kohli^{1,2} and V Arora**

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Parthenium hysterophorus L., an exotic weed from tropical America, has established itself throughout India due to its strong invasive potential. Though allelopathic nature of the weed is well known, little has been done regarding its interference and possible interaction of its allelochemicals with soil chemistry. For this the soil previously not infested with the weed was amended with different amounts of *Parthenium* residues with a view to determine phytotoxic effects on other plants vis-à-vis changes in soil chemistry and phenolic content. Growth studies conducted in the laboratory as well as under green house conditions indicate inhibitory effect of the residues amended in soil on the growth and establishment of native species *Cassia occidentalis* and *Bidens pilosa*. Furthermore, the growth and establishment of the test plants was greatly reduced in the soil amended with residue extracts. All amended soils were analyzed for pH, conductivity, organic carbon, organic matter, total phenolics, available nitrogen, phosphorus, potassium and some micronutrients. The pH of all the amended soils decreased whereas the conductivity, organic carbon and organic matter increased compared to the unamended soils. Presence of significantly higher amount of phenolics in all amended soils indicates their possible involvement in the growth inhibitory effects and their interactions with soil chemical properties. This further gets confirmed from strong correlation between phenolics and various soil properties. The study, therefore, concludes that *P. hysterophorus* affects the growth and establishment of other plants through the release of phenolics, which also interfere with soil chemistry.

S22MT13P05**ALLELOPATHIC INFLUENCE OF SOIL PLANTED TO AMARANTHUS CRUENTUS L. ON TWO TOMATO (LYCOPERSICON ESCULENTUM MILL.) CULTIVARS****J Allemann¹ and F Denner²**

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Amaranthus cruentus L. is being evaluated as a potential high value niche market crop for small-scale farmers in South Africa. This is largely due to the demand for organically produced seed for the European health food market where it is used in a variety of products. During the 2001/02 season a pilot planting took place on a farmer's field at Rust de Winter, near Pretoria, South Africa. A year later, during the 2002/03 season, the farmer planted tomatoes on this field. Problems with the growth and development of the tomato plants were noticed within a fairly short period of time. Investigations revealed no nutritional or pest and disease problems and it was decided to see if soil problems were the cause of the trouble. Soil was collected from the problem field, as well as from an adjacent field with similar soil. Two tomato cultivars (Rodade and Floradade) were grown in pots containing these soils in an air-conditioned glasshouse under natural light conditions. Plants grown in soil containing soil from the amaranth field exhibited signs of significantly inhibited growth (reduced height, leaf area, leaf number and shoot mass) when compared with those grown in soil from the adjacent field. No differences were noted between the two cultivars tested, and growth of both was significantly reduced when grown in soil from the amaranth field. It was concluded that *A. cruentus* residues were probably allelopathic to these two varieties of tomato.

S22MT13P04**WEED SUPPRESSING ABILITY OF PARTHENIN - AN ALLELOCHEMICAL FROM PARTHENIUM HYSTEROPHORUS****D R Batish¹, H P Singh¹, R K Kohli^{1,2} and D B Saxena³**

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In order to overcome the adverse effects of synthetic herbicides on environment and human health, efforts are being made to discover alternatives. In this direction, natural plant products / allelochemicals offer one of the most promising source. These are not only eco-friendly but also provide novel target sites of action for exploitation for weed management. Parthenin, a sesquiterpene lactone, is a natural constituent of ragweed parthenium (*Parthenium hysterophorus* L.) and imparts the weed a number of properties such as allelopathy, autotoxicity, and allergenicity. A study was conducted to explore the allelopathic effect of parthenin towards some weed species with a view to determine its herbicidal activity. The weeds used in the study were barnyard grass (*Echinochloa crus-galli*), coffee weed (*Cassia occidentalis*), and wild oat (*Avena fatua*). Germination and early growth of these weed species was significantly reduced in response to different concentrations of parthenin ranging from 500 to 2000 µM. At 1000 and 2000 µM parthenin, a drastic reduction in growth of weed species was observed. When the one-month-old plants were spray treated with parthenin, a significant reduction in chlorophyll content and respiratory ability was found compared to control indicating thereby the effect of parthenin on photosynthetic and respiratory ability. Even the rate of transpiration was significantly reduced. These results indicate that parthenin possesses a weed suppressing ability and can be exploited as a natural herbicide.

S22MT13P06**ALLELOPATHIC POTENTIAL OF TRIFOLIUM RESUPINATUM AND T. ALEXANDRIUM ON SEED GERMINATION OF FOUR WEED SPECIES****F Maighany¹, M Najafpour², and J Khalghani¹**

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An experiment was conducted to determine if berseem and persian clovers contained water- and methanol-soluble allelochemicals that affect seed germination of *Amaranthus retroflexus*, *Convolvulus arvensis*, *Secale cereale*, and *Sinapis arvensis*. Aboveground tissue of the clovers was collected and dried. 5 gr of dried tissue added to 150 ml of distilled water or methanol, and agitated for 12 hr. 3 concentrations of aqueous and methanolic extracts were used: full-strength (33.3 g/L), half-strength (16.7 g/L), and quarter-strength (8.3 g/L). The weed seeds were placed in petri dishes contained 10 ml of the legume extract, or distilled water. Seed germination declined progressively with increasing concentration of the extracts. In persian clover: full-strength aqueous extract suppressed field bindweed, amaranth, rye, and mustard germination by 53, 58, 24, and 0 %, respectively. Full-strength methanolic extract inhibited their germination by 78, 23, 39, and 0%, respectively. In berseem clover: full-strength aqueous extract suppressed field bindweed, amaranth, rye, and mustard germination by 63, 69, 0, and 0 %, respectively. Full-strength methanolic extract suppressed their germination by 33, 24, 26, and 0%, respectively. Mustard exhibited the greatest sensitivity to both the extracts. Methanolic extract caused more inhibition in seed germination. Berseem clover was stronger inhibitor of seed germination. Therefore, the quantities of allelochemicals in these clovers are different. Field bindweed had more tolerance to these allelochemicals.

<p>S22MT13P07 NATURE OF RICE STRAW PHYTOTOXICITY <u>Inderjit</u>¹ and C L Foy²</p>	<p>S22MT14P01 VERY-LONG-CHAIN FATTY ACID ELONGASES AS HERBICIDE TARGETS <u>Klaus Tietjen</u> and Sandra Trenkamp</p>
<p>¹Department of Botany, University of Delhi, Delhi 110007, India, Email: allelopathy@satyam.net.in; ²Department of Plant Pathology, Physiology and Weed Science, Virginia Polytechnic and State University, Blacksburg, Virginia 24061, USA, Email: cfoy@vt.edu</p> <p>Unharvested stalks of rice (<i>Oryza sativa</i> L.) left in the field generally interfere with the growth of the next season crop. Incorporation of burned rice straw may cause nutrient depletion, particularly for nitrogen. Once rice straw (burned and unburned) is incorporated into the field, water-soluble compounds become available in the soil. A series of studies was carried out with the following objectives: (a) to study the effect of rice straw (burned and unburned) leachate- incorporated soil on seedling growth and physiological parameters of mustard, (b) to study modification in rice straw phytotoxicity with N-fertilization, activated charcoal, and abiotic soil, and (c) to study selected soil characteristics of rice straw-incorporated soil. Rice straw (burned and unburned) leachate was prepared using water as a medium. Soils were amended with rice straw leachate and also modified with N-fertilization or charcoal. Mustard (<i>Brassica napus</i> var. <i>toria</i> L.) was used as an assay species to assess the phytotoxic effects, if any, of various amended soils. In addition, data on soil chemistry of amended soils, and physiological parameters of mustard when grown in amended soil, were also collected. In general, root growth of mustard was suppressed in the presence of rice straw leachate added to soil. The observed growth inhibition, however, was not eliminated when mustard was grown in soil treated with burned rice straw leachate. The present study showed that rice straw leachate interferes with seedling growth of mustard and water-soluble phenolics play an important role in mustard seedling growth inhibition.</p>	<p>Bayer CropScience AG, Target Research, Geb. 6240, 51368 Leverkusen, Germany; E-mail: Klaus.Tietjen@bayercropscience.com</p> <p>To study the mode of action of flufenacet, benfuresate and related herbicides we analyzed phenotype and gene expression of herbicide-treated <i>Arabidopsis thaliana</i> plants. Treatments caused phenocopies of the known <i>Arabidopsis</i> mutant <i>fiddlehead</i>, displaying fused organs and the typical fiddlehead-like inflorescence. Herbicide treatments of other plant species, including monocots, also gave rise to analogous organ fusions. The <i>FIDDLEHEAD</i> gene encodes a putative very-long-chain fatty acid elongase (VLCFAE), which corroborates earlier biochemical results pointing to the inhibition of VLCFA synthesis as mode of action of flufenacet. Gene expression profiles of herbicide-treated <i>Arabidopsis</i> plants provided additional clues in support of inhibition of VLCFA synthesis. Of the 21 genes encoding VLCFAEs from <i>Arabidopsis</i>, we could express 17 heterologously in <i>Saccharomyces cerevisiae</i>. Six of these VLCFAEs were found to be enzymatically active with endogenous yeast fatty acid substrates. The spectrum of VLCFAs accumulated in expressing yeast strains was determined by gas chromatography/mass spectrometry. The active VLCFAEs revealed distinct patterns of differential sensitivity to different herbicides, while yeast endogenous VLCFA production, which involves its unrelated elongase (ELO) for sphingolipid synthesis, was unaffected. These findings pinpoint VLCFAEs as the target of the widely used herbicides, which have been in commercial use for 50 years, and provide important clues as to why spontaneous resistance to this class is rare.</p>
<p>S22MT14P02 INVERSION OF D-PHOSPHINOTHRICIN TO THE HERBICIDAL L-ENANTIOMER VIA EXPRESSION OF A MODIFIED D-AMINO ACID OXIDASE IN PLANT TISSUES T R Hawkes, R C Viner, P A Thompson, R P Dale, P H Hollinshead, P W Howe, A J Greenland, E J Heard and W A Pline-Srnic</p> <p>¹Syngenta, Jealott's Hill International Research Station, Jealott's Hill, Bracknell, Berks U.K. RG42 6EY; Tim.Hawkes@syngenta.com</p>	<p>S22MT14P03 REGULATION AND FUNCTION OF HERBICIDE SAFENER-INDUCIBLE GLUTATHIONE S-TRANSFERASES IN THE MODEL GRASS SPECIES <i>TRITICUM TAUSCHII</i> D E Riechers¹, Q Zhang¹ and F X Xu¹</p> <p>¹Department of Crop Sciences, University of Illinois, 1102 S. Goodwin Avenue, Urbana, Illinois, USA, <riechers@uiuc.edu></p>
<p>Conditional male sterility is a useful trait for hybrid crop production which may be obtained via genetic engineering of female parental lines for localized expression of certain enzymes within male floral tissues. The expressed enzyme is capable of converting a non-phytotoxic substance to a phytotoxic one. Engineered lines thus fail to produce viable pollen following spray application of the non-phytotoxic substance but are otherwise unaffected. Here we used D-phosphinothrinicin, resolved in 97% EE from the racemate, as the 'non-phytotoxic substance' and a mutant D-amino acid oxidase as 'converting enzyme'. D-phosphinothrinicin was a very poor substrate of the D-amino acid oxidase (DAMOX) from <i>Rhodotorula gracilis</i>. DAMOX was therefore modified by site-directed mutagenesis to generate mutant forms which oxidized D-phosphinothrinicin efficiently. Tobacco plants engineered to express mutant DAMOX under operable control of a CMV 35S promoter region exhibited much more damage after spray treatment with D phosphinothrinicin than did similarly-treated wild type control plants. Transgenic tobacco lines engineered to express mutant DAMOX from the anther-specific tap1 promoter region exhibited relatively little vegetative damage after spraying. However in some lines male fertility was profoundly reduced. Flowers which developed prior to spraying were normal and fertile, whereas flowers which developed afterwards exhibited normal stigmas but anthers loaded with little or no pollen. These flowers went on to form pods containing little or no seed. Thus, anther specific expression of a mutant D-amino acid oxidase combined with spray application of D-phosphinothrinicin can be used to create conditional-male sterility.</p>	<p>We are using the diploid wheat, <i>Triticum tauschii</i>, as a model plant to study safener-inducible herbicide detoxification genes (such as the glutathione S-transferases; GSTs) in cereal crops. The objective of our research is to better understand the expression of GST genes and determine how they are regulated by herbicide safeners at the molecular level. In addition to using molecular techniques to examine safener-induced expression of GST genes, we are utilizing proteomics techniques to identify the entire complement of GSTs and novel proteins (non-GSTs) that are regulated in response to safener treatment in dissected coleoptiles. Proteins were extracted from isolated coleoptiles, analyzed on two-dimensional protein electrophoresis gels (resolved by isoelectric point in the first dimension, and molecular mass in the second dimension), and the identity of individual protein spots was determined by mass spectrometry (MS) of peptide fragments derived from protease-digested proteins in the gel. In addition to MS analysis of individual proteins from the gel, we have also performed 2-D immunoblots probed with two different GST antisera. Results from our proteomics studies show that the majority of safener-induced proteins in the coleoptile are either phi or tau class GSTs, which vary greatly in both isoelectric point (pI 5 to 7) and molecular mass (24 to 29 kDa). Other safener upregulated proteins have also been identified that are not GSTs, but may be involved in the safener response/herbicide detoxification pathway in wheat coleoptiles. MS data and immunoblot analyses indicate that significant amounts of post-translational modification of GST proteins may be occurring.</p>

<p>S22MT14P04 DICHLOROMETHYL KETAL STRUCTURE AFFECTS THE EXPRESSION OF GLUTATHIONE S-TRANSFERASE ISOFORMS IN MAIZE</p> <p>I Jablonka¹, I Cummins², D Dixon² and R Edwards²</p> <p>¹Institute of Chemistry, Chemical Research Center, Hungarian Academy of Sciences, PO Box 17, H-1525 Budapest, Hungary, jabi@chemres.hu; ²Department of Biological Sciences, University of Durham, Durham DH1 3LE, UK, Robert.Edwards@durham.ac.uk.</p> <p>A strong correlation between the ability of a safener to increase glutathione S-transferase (GST) activity and its efficacy in protecting maize from herbicide injury has been demonstrated. The herbicide safener MG-191 and its analogs such as open-chain (1) and cyclic (2) dichloromethyl ketals were tested for their ability to differentially enhance the expression of members of the GST superfamily in maize. The GSTs were isolated from safener-treated plants, resolved by gel electrophoresis and detected by Western blotting, using antisera raised to ZmGSTF1-2 and ZmGSTU1-2. GST activity of shoot and root extracts were determined using CDNB, acetochlor and fluorodifen substrates. Higher inducing effect on GST(CDNB) activity was detected in roots than in shoot tissues by both ketal types. Using fluorodifen substrate the enhancement of GST activity was detected the highest following MG-191(2, n=0) treatment in shoot tissue. With open-chain ketals the inducibility of GST activity by derivative 1 (n=3) exceeded the effect of other derivatives. Nevertheless, no correlation was found between enzyme inducibility and their safening effectiveness. In Western blot experiments when the heterodimer ZmGSTF1-2 was used the expression of constitutive ZmGSTF1 and inducible ZmGSTF2 was enhanced only by MG-191 and its 6-membered ring analog (2, n=1) in shoots. These molecules were also the most potent inducers of the expression of ZmGSTU1 in shoot tissues. However, in roots the open-chain ketals were very active on the expression of this isozyme. Our results demonstrate that the safener structure plays a decisive role in specific expression of GSTs mediating the detoxification of herbicides.</p>	<p>S22MT14P05 CLODINAFOPO AFFECTS THE KAUTSKY CURVE</p> <p>M Abbaspoor and J C Streibig</p> <p>The Royal Veterinary and Agricultural University, Department of Agricultural Science, Thorvaldsensvej 40, DK-1871 Frederiksberg C, Denmark. jcs @ kvl.dk;</p> <p>In greenhouse experiments we assessed the selectivity of clodinafop, an ACCase inhibitor, for barley (<i>Hordeum vulgare</i>) and oat (<i>Avena sativa</i>) and how it changed the shape of the Kautsky curve (fluorescence induction curve). Biomass ED₅₀, based on the log-logistic dose response curves, for barley was as expected considerably higher than for oat in all experiments. The biomass ED₅₀ and relative potency [ED₅₀ (barley) / ED₅₀ (oat)] were relatively consistent among experiments when sprayed at the same phenological stage of plant development. Clodinafop changed the shape of the Kautsky curve especially at high doses and for oat more than for barley. From the numerous parameters that can be derived from OJIP steps of the Kautsky curve, we found that the F_{vj}, the relative changes at the J step [F_{vj} = (F_m-F_j)/F_m] and Area [the area between Kautsky curve and maximum fluorescence (F_m)] were linked to the biomass dose response relationships better than was F_v/F_m, maximum quantum efficiency of PSII, [F_v/F_m = (F_m-F₀)/F_m] for both species. Two DAS (Days After Spraying) F_{vj}, Area and F_v/F_m for barley were even more clearly linked to the biomass dose-response relationship than it was for oats. The linkage between the biomass and the fluorescence parameters may be used to shorten the screening period for ACCase inhibitors.</p>
<p>S22MT18P01 HARMONIZATION OF PESTICIDE REGULATION</p> <p>Wendy Sexsmith</p> <p>Pest Management Regulatory Agency, Health Canada 2720 promenade Riverside Drive Ottawa, Ontario K1A 0K9 Canada Wendy.Sexsmith@hc-sc.gc.ca</p> <p>An overview of the approach to harmonization of pesticide regulation in the Organization for Economic Cooperation and Development Working Group on Pesticides and the North American Technical Working Group on Pesticides. This will include the purpose for harmonization, the approaches being taken, what has been accomplished, roles of key participants, lessons learned and next steps.</p>	<p>S22MT18P02 CALIFORNIA PERSPECTIVE ON HERBICIDE REGULATION AND REGISTRATION REQUIREMENTS</p> <p>Regina Sarracino</p> <p>California Dept. of Pesticide Regulation, P.O. Box 4015, Sacramento, CA 95812-4015, rsarracino@cdpr.ca.gov</p> <p>The California Department of Pesticide Regulation's (DPR) comprehensive pesticide regulatory program requires that herbicides be registered by DPR before sold or used in the state. The US Environmental Protection Agency first registers products, but states can have additional laws and review process. This paper presents California registration requirements, including comparison to U.S. EPA's program using U.S. laws/regulations and California laws/regulations as information sources. California regulation begins with product registration; scientific data must be reviewed and found acceptable prior to registration, followed by worker/user safety activities, illness reporting, environmental monitoring, groundwater sampling, reevaluation of existing products, and pesticide use enforcement. California is a large state with 10, 000 registered pesticide products and over 200 commercial crops, in addition to non-agricultural uses. Data required to register an herbicide in California and the U.S. includes acute toxicology data on the formulated product, chemistry, efficacy, fish and wildlife if applicable, phytotoxicity on plants, and residue chemistry data on food crops. For a new active ingredient in California, chronic toxicology data is required and, for the first agricultural use, environmental fate/groundwater protection data. Court legal actions in 2004 may alter some requirements. USEPA and California share certain data reviews, conduct concurrent review of new reduced-risk products, and together set residue tolerances for some pesticides used on California crops. Both USEPA and DPR participate in international harmonization activities regarding data and labels.</p>

<p>S22MT18P03</p> <p>REGULATION OF PESTICIDES IN INDIA WITH SPECIAL REFERENCE TO HERBICIDES</p> <p><i>Dr. B.S. Phogat</i></p> <p><i>Central Insecticides Board & Registration Committee Sectt. Directorate of Plant Protection, Quarantine & Storage Ministry of Agriculture Government of India N.H. IV, Faridabad-121 001 Haryana, India E.Mail:bsphogat@yahoo.co.in</i></p> <p>Pesticides have inherent toxicity and also do not differentiate between target and non-target species, thus required to be used judiciously with great care to safeguard the users, animals, wild life and the environment. Like other countries, Indian Parliament enacted an Act, during 1968 called Insecticides Act 1968, to regulate the import, manufacture, sale, transport, distribution and use of pesticides with a view to prevent risk to human beings or animals and for matters connected therewith. As per the provisions of the Act and Rules framed thereunder, compulsory registration of pesticides needed at the Central level and licence for their manufacture and sale etc. are dealt with at the State level. Thus implementation of the provisions of the Act is a joint responsibility of Central, as well as State Governments. The Registration Committee constituted under the Act, evaluates the comprehensive data on various parameters viz., chemistry, bioefficacy, toxicity and packaging and grants registration only after satisfying itself about the safety and efficacy of the product. So far, 181 pesticides belonging to insecticides, fumigants, rodenticides, fungicides, herbicides and plant growth regulators have been registered for use in India. Quality control of pesticides is jointly monitored by State and Central Governments. Government of India also keeps on reviewing registered pesticides for their continued use and/or otherwise by constituting, Expert Committees from time-to-time and by this process, 24 pesticides have been banned for use in the country.</p>	<p>S22MT18P04</p> <p>SOUTHERN AND EAST AFRICAN PERSPECTIVE ON PESTICIDE REGULATION / GLOBAL HARMONIZATION OF PESTICIDE REGISTRATION REQUIREMENTS</p> <p>J F Louw¹, M Rossouw²</p> <p><i>¹Southern African Weed Science Society, P.O.Box 463, Ballito, 4420, South Africa, jflouw@mweb.co.za; ²SEARCH Secretariat, P.O. Box 72127, Parkview, South Africa, mrossouw@villacrop.co.za</i></p> <p>Pesticide regulation in Southern Africa commenced with the promulgation of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act in 1947 (Act 36/1947) which regulated the sales of all pesticides in South Africa. Over the years other countries in Southern Africa e.g. Kenya and Zimbabwe have developed their own registration procedures, while in other countries in the region, no or very little control existed over the import, sale and use of Agricultural remedies. In 1996 representatives from a number of countries in East and Southern Africa met in Lusaka with the purpose of harmonizing the regulatory systems that are used for the approval and registration of agricultural remedies in the Region. This was the birth of the SEARCH (Southern and Eastern African Regulatory Committee on Harmonization of Pesticide Registration) initiative. Initially 12 countries were involved with SEARCH. A harmonized application form as well as harmonized active ingredient and formulated product dossiers requirements and guidelines were compiled. These harmonized forms, dossiers, requirements and guidelines were accepted in principle by all 12 countries during the SEARCH 2001 meeting in Malawi. Currently the countries involved with the SEARCH initiative are: Angola, Botswana, Ethiopia, Kenya, Madagascar, Mauritius, Mozambique, Malawi, Namibia, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. The ultimate goal is regional co-operation on issues around the regulated responsible use of and trade in pesticides, which involves a harmonized regulatory system, harmonized protocols, harmonized labels and harmonized bio-pesticide regulations.</p>
<p>S22MT20BP01</p> <p>PHYSIOLOGY OF DORMANCY-BREAKING MECHANISMS IN RED RICE</p> <p><u>Marc Alan Cohn</u></p> <p><i>Department of Plant Pathology & Crop Physiology, Louisiana State University Agricultural Center, Baton Rouge, Louisiana, USA; mcohn@lsu.edu</i></p> <p>During the past 25 years, our work has helped to characterize seed dormancy of grasses, using red rice as a model system. The grains dry-afterripen, the rate and extent of which is dependent upon storage temperature and seed moisture content. Fully imbibed grains buried in flooded soil, or stored submerged in water or at 100% RH, remain dormant and viable for several years at ambient temperatures. Seed sensitivity to dormancy-breaking chemicals (DBC)s increases during soil-burial, suggesting that soil-applied DBCs will be a viable protocol to deplete the seed bank of dormant weed seeds.</p> <p>Our understanding of the interrelationships between various classes of non-hormonal DBCs has increased tremendously. Carboxylic acids were identified as a new class of DBC, and the activity of aldehydes, esters, and alcohols, among others, was related primarily to their lipophilicities. Differences in bioassay activity curves suggested that most of these chemicals do not directly break dormancy on their own, but serve as 'pro-drugs' that are active only after they are metabolized to their corresponding carboxylic acid. Evidence for the pro-drug concept comes from structure-activity studies, tracing metabolites via ¹³C-NMR, and the use of enzyme inhibitors, particularly 4-methyl pyrazole.</p> <p>Future studies and those in progress will be devoted to defining the means by which non-hormonal DBCs intersect with seed signal transduction pathways to terminate the dormant state and to develop commercial applications.</p>	<p>S22MT20BP02</p> <p>SOME PHYSIOLOGICAL AND COMPETITIVE ADVANTAGES OF RED RICE OVER RICE</p> <p><u>N R Burgos¹, P A Counce², D R Gealy³, R J Norman¹, V K Shivrain¹, and E N Stiers¹</u></p> <p>¹CSES, University of Arkansas, 1366 W. Altheimer Drive, Fayetteville, USA 72704, nburgos@uark.edu; ²Rice Research and Extension Center, Stuttgart, AR, USA; ³Dale Bumpers National Rice Research Center, USDA-ARS, Stuttgart, AR, USA.</p> <p>In the southern U.S. and other rice-producing countries, red rice (<i>Oryza sativa</i>) is a troublesome weed in rice production. Red rice is highly competitive, reduces harvesting efficiency, and contaminates harvested grain with red kernels. Red rice problem spurs the herbicide-resistant rice (Clearfield®, Liberty Link®) technology. To improve management strategies for red rice, we need to know crucial biological and physiological differences between it and cultivated rice. Experiments were conducted at Stuttgart and Fayetteville, AR, USA between 1999 and 2003 to gain more understanding of the biology and physiology of red rice. For a self-pollinated plant, red rice has extraordinary phenotypic diversity. In Arkansas (rice area ~ 0.6 million ha), two major types of red rice exist – strawhull and blackhull. Strawhull types are 84 to 180 cm tall, produce 24 to 193 tillers, and flower at 11 to 19 weeks after planting (WAP). Blackhull types are 76 to 196 cm tall, produce 12 to 194 tillers, and flower at 11 to 18 WAP. Some biotypes are as short as cultivated rice. Canopy structure differed. Red rice photosynthesized at a higher rate and adapted to shade better than rice. Carbon isotope discrimination analysis did not indicate that red rice evolved an intermediate C₃ pathway. In non-competitive conditions, red rice produced more tillers and biomass than rice. Seedling red rice had more root growth than rice 21 d after seeding. In competitive conditions, red rice responds more to nitrogen and takes up more nitrogen than rice.</p>

S22MT20BP03**HYBRIDIZATION BETWEEN RED RICE AND RICE IN THE U.S.: IMPLICATIONS FOR GENE FLOW AND FERALITY****D R Gealy¹ and L E Estorninos Jr²**

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Imidazolinone-resistant rice cultivars have been increasingly adopted in the southern U.S. since their initial introduction in 2002, largely due to the improved control of red rice in these systems. Although promising, herbicide-resistance technology has raised concerns about potential hybridization and gene flow between rice (*Oryza sativa* L.) and its weedy relative, red rice (*Oryza sativa* L.), and the potential development of herbicide-resistant or feral red rice populations. SSR marker analysis and phenotypic analysis of segregating populations are being employed in Arkansas to quantify, identify, and track red rice hybrids in grower and research fields. Outcrossing rates between red rice and herbicide-resistant or non-resistant rice have been variable, but nearly always less than 0.5%. Outcrossing depends on a number of factors, including red rice ecotype, rice cultivar, vertical and/or horizontal distances between panicles, synchronization of flowering periods, and seed production, as well as environment. Subsequent introgression of hybrid traits into the red rice population can be mitigated by additional factors including delayed flowering periods and/or low seed set in hybrids. Although gene flow between rice and red rice in U.S. rice fields is likely to remain a significant issue, establishment of feral populations of hybrid, weedy rice in non-rice or non-agricultural areas appears to be of relatively low risk due to the minimal availability of desirable *O. sativa* habitat outside of rice fields. Integrated strategies that address short- and long-term challenges of red rice control and resistance management will be necessary to optimize sustainability of rice production in the U.S.

S22MT20BP04**HERBICIDE SENSITIVITY OF *ECHINOCHLOA* ACCESSIONS IN ITALIAN RICE FIELDS****A Ferrero and F Vidotto**

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Echinochloa species are the main weeds infesting Italian rice fields. These plants show a great variability in morphological traits, such as size, panicle and spikelet characteristics, tillering ability and germination behavior, which often results in difficult and uncertain identification at the field level. Recent surveys indicated the presence in Italy of *Echinochloa* populations with different sensitivity to herbicides. In the present study, the variability of sensitivity to several rice herbicides has been investigated in eighty accessions that were identified and morphologically characterized in a large survey carried out in the Italian rice area. Efficacy of several herbicides was tested on seedlings grown in pots in greenhouse conditions. Seedlings were sprayed at the 3-4 leaf stage at four rates (0, 0.5x, 1x, and 2x recommended field rate) of azimsulfuron, bensulfuron-methyl, bispyribac-sodium, cyhalofop-butyl, molinate, propanil or quinclorac. Fresh weight reduction was determined at 7 or 15 days after spraying, depending on the herbicide applied. Sensitivity to the herbicides varied among the accessions. Fresh weight was reduced more than 90% in 17 (azimsulfuron), 1 (bensulfuron-methyl), 9, (bispyribac-sodium), 48 (cyhalofop-butyl), 3 (molinate), 29 (propanil), and 25 (quinclorac) accessions sprayed at the field rate. Increasing the herbicide dosage generally reduced the variability of response among accessions. Several low-sensitive accessions were found, in particular for azimsulfuron, bispyribac-sodium, cyhalofop-butyl, molinate, and propanil. These results relate to the wide variability found in morphological traits of *Echinochloa* plants. Knowledge of the actual composition of the *Echinochloa* populations present in a field is crucial for successful management of these weeds.

S22MT26P01**ROLE OF CONSERVATION TILLAGE AND CHEMICAL/NUTRIENT MANAGEMENT PRACTICES IN REDUCING WATER POLLUTION AND HYPOXIA IN THE GULF OF MEXICO AND BLACK SEA**

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The concept of conservation tillage systems was developed in the United States in the 1950's, but was not widely used and accepted until 1980's. This practice has helped replacing conventional plowing in many areas of the United States to reduce soil erosion. Conservation tillage has not been yet promoted on a large scale in Africa, Asia, Eastern Europe, and the Newly Independent States. Several conservation tillage systems (namely no-till, ridge till, and chisel plow) are currently being used to reduce soil erosion, but these systems may require better chemical management practices to reduce the potential on water pollution. Agricultural production systems in the USA, Europe, and the Newly Independent States have changed significantly in recent years and the public is concerned about the impacts of these systems on surface and groundwater quality. Because of these concerns, a study (1990-1998) was conducted to develop chemical management practices with the goals of reducing input costs and protecting water quality. This study concluded that conservation tillage systems increase infiltration, organic matter, microbial activity, and could be effective BMPs for controlling groundwater pollution. In addition, the World Bank has initiated several projects to reduce the transport of nutrients from nonpoint sources to the Black Sea. The objective of this paper is to present the evaluations of Iowa studies on conservation tillage and two case studies from Romania and Georgia where the World Bank is helping in the implementation of BMP's in reducing nutrient loadings to Black Sea and assessing the overall impacts on hypoxia.

S22MT26P02**RECONCILING AGRICULTURAL PRODUCTIVITY AND BIODIVERSITY****Annik Dollacker**

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Improving agriculture productivity in a sustainable way is inextricably linked to Sustainable Development. Integrated technologies and management practices that conserve land, water and living resources are a solution to address the matter. Bayer CropScience in cooperation with other stakeholders undertake run a number of pilot programmes focused on promoting good agricultural practices that simultaneously improve agricultural productivity and conserve biodiversity.

In Guatemala, Bayer CropScience has been working in partnership with the "Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)" and local stakeholders. Through the provision of adapted participatory training activities farmers are informed on how to better protect soil and water resources, conserve biodiversity and optimize pest management to enhance agricultural productivity.

In Brazil Bayer CropScience initiated a pilot programme with a citrus farm and São Paulo University. This partnership employed a replantation strategy for native plants alongside a water source on the farm. The initiative offers a valuable means to raising awareness for the need to integrate agricultural production and biodiversity conservation to ensure an economically viable production base.

Enhancing water sources protection and achieving richer biodiversity on farmland is also a key focus of Bayer CropScience UK's Biodiversity Project. The project, conducted at the company's field stations, aims to enhance on-farm plant and wildlife biodiversity and demonstrate how farmers can benefit from this. Habitat creation and restoration is an integral element, for example through the establishment of uncultivated field margins, conservation headlands or new hedgerows.

<p>S22MT26P03 THE ROLE OF HERBICIDES IN INVASIVE PLANT MANAGEMENT AND RANGELAND RESTORATION SYSTEMS</p> <p>Robert A. Masters, Vanelle F. Carrithers, John L. Troth, Adrian A. Chemello, and Rodney D. Schultz</p> <p>DowAgroSciences, LLC, 9330 Zionsville Road, Indianapolis, Indiana 46268 USA, ramasters@dow.com</p> <p>Invasive plants impede rangeland function by disrupting ecosystem processes. Managing invasive plants requires manipulating disturbance regimes that favor desirable species and wanted changes in successional trajectories. Reasons for the arrival, establishment, and spread of invasive plants should be understood before effective rangeland restoration strategies are developed. Removing an invasive plant species without attention to plant community dynamics often only opens niches for other undesirable species to occupy. Restoration of desirable plant communities that resist invasion is an appropriate goal for rangeland restoration programs. The integrated weed management paradigm provides a context for managing invasive plants that focuses on ecosystem processes and not on particular plant species or control practices. Prevention, detection, and control are key components of integrated management strategies. The suitability of weed control tools (biological, chemical, cultural, and mechanical) will vary according to the invasive plant and invaded site characteristics. The merits of each control measure and the potential for complementary or synergistic interactions when applying measures in appropriate sequences and combinations should be considered when developing rangeland restoration programs. Herbicides can serve as catalysts to expedite vegetation change, and thus lead to development of desired plant communities. The variety of selective herbicides and precision application technologies currently available provide land managers with many options. Used in concert with other plant control measures, herbicides can alter plant composition, manage plant community succession, and accelerate rangeland restoration.</p>	<p>S22MT26P04 THE EFFECT OF WATER REGIME AND SOIL MANAGEMENT ON METHANE (CH_4) EMISSION FROM RICE FIELD</p> <p>⁽¹⁾Prihasto Setyanto, ⁽²⁾Harris Burhan, ⁽¹⁾Suharsih, and ⁽³⁾Orbanus Naharia</p> <p>⁽¹⁾Research Station for Agricultural Environment Preservation, Jl. Jakenan-Jaken km 05 Pati 59182 Jawa Tengah, Indonesia</p> <p>⁽²⁾Syngenta Research and Development Station PO Box 08, Cikampek, Karawang, Indonesia</p> <p>Post Graduate School, Bogor Agricultural University, Darmaga, Bogor, Indonesia</p> <p>Collaborative field studies between Syngenta Research and Development Station, Cikampek and Agricultural Environment Preservation Research Station, Jakenan, was conducted to investigate the effects of water regime and soil tillage on CH_4 emission during wet and dry season crop. The treatments consisted of two factors; water regimes (A) and soil management (T). The water management regimes were; A1 – continuously flooded 5 cm, A2 - intermittent irrigation, A3 - saturated water condition at 0-1 cm water level. The soil management factors were; T1 - normal tillage, T2 - zero tillage + 0.4 kg a.i. paraquat ha^{-1}, T3 - zero tillage + 0.6 kg a.i. paraquat ha^{-1}. Methane gas samples were collected using a manually operated 40 x 40 x 100 cm plexi-glass chamber and the CH_4 concentration was measured using gas chromatograph equipped with a flame ionization detector. The CH_4 reductions ranged from 42% (A3T1) to 85% (A3T2) in wet season. In the dry season, reductions in CH_4 emissions ranged between 15% to 92%. The rice grain yield reductions ranged from 9% (A2T1) to 31% (A3T2). The best CH_4 gas mitigation option in terms of benefit gain and CH_4 reduction was the zero tillage, continuously flooded water regime plus application of 0.4 kg a.i. paraquat ha^{-1} (A1T2). In the wet season crop, the cost benefit with A1T2 was Rp. 281,800 per hectare and a reduction of 62.5% from the total CH_4 emissions. In the dry season, the best CH_4 gas mitigation option was the saturated water regime with normal tillage (A3T1), which gave a benefit of Rp. 270,000 and reduced CH_4 emissions by 16.4%.</p> <p>Key words: water management, soil management, methane emission, rice</p>
<p>S22MT26P05 PREDICTING CLODINAFOPO EFFICACY</p> <p>T S Andrews and R W Medd</p> <p>WEEDS CRC, NSW Agriculture, Forest Road, Orange, NSW, 2800 Australia, todd.andrews@agric.nsw.gov.au; dick.medd@agric.nsw.gov.au</p> <p>Recent analysis of industry data showed that clodinafop efficacy on wild oat was affected by a number of factors. Environmental variables that affected clodinafop included overnight minimum temperatures prior to spraying, maximum temperatures on the day of spraying and soil moisture levels. Surprisingly, this research also indicated that wild oat density and growth stage were not major factors affecting efficacy. Further research to validate this model was conducted in 2003. Experiments were set up where clodinafop was applied to wild oat infestations on six occasions at four contrasting field sites. On each occasion, the herbicide was applied at five dose rates and in three water volumes. Efficacy was assessed in terms of plant mortality approx. 30 days after application and wild oat panicle density was counted around anthesis. Fully automated weather stations collected a comprehensive set of soil and climatic data at each site. These data, along with other measurements such as leaf extension rates at the time of spraying, are being correlated with efficacy at each spray time and location using multi-site mixed model statistical techniques. The research represents a case study of how industry may undertake to provide a more prescriptive approach to supporting herbicides in the market place. Functional models of the effects of environment on herbicide efficacy will enable advisors/users to define specific conditions in Australia that result in reduced wild oat control. Such information could provide growers with the options of avoiding application under or using highest recommended rates, and would ultimately increase the efficiency of clodinafop use.</p>	<p>S24MT26P01 THE ARGENTINEAN NO TILL ADOPTION PROCESS AND ITS SIMILARITIES WITH SOME OTHER AMERICAN COUNTRIES CASES</p> <p>Roberto Atilio Peiretti</p> <p>Member of the Board of Directors of AAPRESID (Argentinean No Till Farm Association) www.aapresid.org.ar; and CAAPAS President (American Conference of Farmers Associations for a Sustainable Agriculture) www.caapas.org e-mail sdrob@idi.com.ar</p> <p>During the second part of last century and following the world trend, the Argentinean agriculture had undergone an intensification process. Even total production increased, agro-ecosystems were negatively impacted. Argentinean farmers reacted in front of the problem and developed a new farming model based on No Till. Before it could be successfully applied and scaled up, several limitations had to be removed. A new generation of planters and drillers as well as new agro-ecosystem managerial strategies had to be developed. The use of biotechnology, new agrochemicals, and integrated weed, insect and disease management strategies, nutrient cycling principles, and others; pillared the development of the new farming model that quickly yielded significant benefits. Soil erosion was highly neutralized and a better general agro-ecosystem functioning achieved. An improved water management and the achievement of a more favourable "crop environment", allowed the consecution of a higher, "environmentally cleaner" and less variable level of productivity and total production. The production costs were lowered, and the general economic result improved. Farmers quickly recognized and credited these benefits, adopt a highly proactive attitude and got heavily involved on the further development and adoption of the model. At the country level, adoption moved from a couple of thousands hectares to more than sixteen millions within a twelve year period. The benefits reached the whole spectrum of farm units, from those usually large scale and market oriented units, to the small scale mostly subsistence ones. Similar processes to the Argentinean one can be found across several other American countries.</p>

<p>S24MT26P02 IMPACT DIFFERENT TILLAGE PRACTICES HAVE ON CROP YIELD, PRODUCTION COST, PROFIT AND SOIL QUALITY IN A CORN/SOYBEAN ROTATION</p> <p>B.A. Alesi¹ R.A. BUMAN²</p> <p>¹Monsanto Company, Cordillera, 106 Pebble creek, Boerne, Texas, U.S.A. 78006, bruno.a.alesii@monsanto.com; ²Agren Inc., 1238 Heires Ave., Carroll, Iowa, U.S.A. 51401, bob@agren-inc.com</p> <p>The adoption of conservation tillage practices such as no-tillage is a growing trend in today's production agriculture. Farmers across the world are adopting no-tillage for the positive impact no-tillage has on improving soil quality. While past tillage research confirm the agronomic benefits farmers have experienced with regard to soil quality improvement and crop yield this research shed little light on the impact tillage has on production cost and farmers profitability. In 1997, Monsanto Company initiated the Centers of Excellent (COE's) project with the objectives and goals of evaluate various tillage systems and the impact they had on a variety of agronomic and economic factor involved with the production of a corn/soybean rotation. The Centers of Excellence project involved the use of on farm large-scale side-by-side field trial conducted at 13 COE sites across the corn/soybean belt of the United States from 1998 through 2002. Each COE site compared strip-tillage, no-tillage and conventional tillage corn systems as well as no-tillage and conventional soybean systems. Results over the five-year period showed no significant differences in crop emergence or yields among the different tillage system for both corn and soybeans. The no-tillage corn and soybean systems were found to have lower production cost and greater profits for the 5-year period. The higher profit realized with the no-tillage systems point to the need for farmers and advisors to carefully consider profit rather than yield when making decisions regarding which tillage practices.</p>	<p>S24MT26P03 UNDISTURBED TRASH BLANKETING IN RATOONS AS A KEY COMPONENT OF SOIL CONSERVATION AND INTEGRATED WEED MANAGEMENT IN SUGARCANE</p> <p>J.C. Díaz, R. Zuaznábar, E. Velarde, R. Córdoba, E. Cruz and L. González</p> <p>¹National Sugarcane Research Institute (INICA), Carr. Central Martínez Prieto km 2½, Boyeros, Havana, C.P. 19390, Cuba, e-mail: jcdiaz@inica.edu.cu</p> <p>The preservation of ratoon crop residues was assessed in field surveys in two sugarcane estates with heavy weed infestations. Furthermore, two fertilizer placement replicated trials were conducted under undisturbed trash blanket conditions. Results showed marked reductions in weed infestation and increases in cane yields, as well as economy of herbicides, labor and other inputs with generalization of trash blanketing. Incorporated center - stool fertilizer placement showed increase in foliar nitrogen leaf content. The practice of trash blanketing in well drained ratoon sugarcane has demonstrated a valuable soil conservation practice (preserving soil moisture and preventing erosion) and a key component of integrated weed management.</p>
<p>S24MT26P04 CONSERVATION OF NATURAL RESOURCES IN BRAZILIAN AGRICULTURE: THE ROLE OF TECHNOLOGY</p> <p><u>P J CHRISTOFFOLETI</u></p> <p>University of São Paulo – ESALQ/USP – Brazil – pjchrist@esalq.usp.br</p> <p>Preserving and enhancing the resource base on which Brazilian agriculture depends is a key national priority, as is protecting the environment that in much of Brazil is mainly influenced by agricultural practices. Tremendous success has been achieved in enhancing soil quality and preventing soil erosion through the widespread adoption of no-till soybeans. This practice has been made possible an expansion of soybean production in Brazil. Among the more important approaches has been the development of effective combinations of burndown and short residual herbicides to enable farmers to perform weed control and planting operations in close sequence. By using short residual herbicides in combination with burndown compounds, farmers can control the weeds more effectively and also have more flexibility to plant the soybeans. Another key opportunity for Brazilian agriculture is the adoption of "green cane" harvest in Sugarcane. Brazil is the largest global producer and to pursue desired air quality improvements, the government has mandated a phase-out of burning as a harvest aid operation for sugarcane. Green cane harvesting provides a variety of benefits, including weed suppression, moisture conservation, enhanced soil surface organic matter and reduction in soil erosion. With increased adoption of this technology, the weed dynamics and control program have been changed. Achieving the natural resource benefits of "green cane" harvesting will not be possible without continuing development of new crop protection technologies. Therefore, herbicides that pass through the residue blanket can be applied at the beginning of the growing season and will continually provide control of problematic weeds.</p>	<p>S24MT26P05 SOME ASPECTS OF CONSERVATION AGRICULTURE IN CENTRAL AND SOUTHERN AFRICA</p> <p>J B R Findlay</p> <p><i>Agricultural Resource Consultants, P.O. Box 3474, Parklands, 2121 South Africa. E-mail agrecon@pixie.co.za</i></p> <p>Large-scale commercial agriculture in South Africa, Kenya, Tanzania and Zimbabwe has adopted many principals of conservation agriculture. This has been based on various aspects such as production cost reduction (fuel and labour), erosion control in sugarcane planted on slopes (legislation), efficiency and time saving (cereal and row crop plantings), improved soil structure and texture (stable yields), organic matter retention and better moisture utilisation (rainfall and irrigation). The adoption of basic technologies such as the use of certified seed, soil analyses combined with correct fertilization levels, crop rotations, the adoption of proven pest management systems and, more recently, the introduction of genetically modified crops have made significant contributions.</p> <p>The challenge in Africa is for the many smallholder farmers to have access to these technologies to enable them to produce stable yields for sustainable food security, to produce a surplus for wealth creation, to improve their quality of life and to improve the environment. There are many organisations such as the African Conservation Tillage Network, GTZ, FAO, Monsanto, Sasakawa Global 2000, Technoserve, Land Care as well as organised agriculture that are successfully promoting conservation agriculture within these previously neglected communities.</p> <p>The adoption of conservation agriculture in Africa by smallholders is a reality. Some examples are maize production in Ethiopia, Ghana, Kenya, Malawi, Moçambique, South Africa and Zambia; rice production in Moçambique and Nigeria; cereals in Ethiopia and Kenya and teff in Ethiopia.</p> <p>In most African countries previous and existing agricultural policies have failed. A change is essential and conservation agriculture principals will provide many solutions.</p>

S24MT26P06**MINIMUM AND NO-TILL AGRICULTURE IN THE WESTERN
AND SOUTHERN CAPE WHEAT PRODUCING AREAS IN
SOUTH AFRICA****G.A. Agenbag**

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Crop production in the Western and Southern Cape wheat producing areas of South Africa is hampered by generally shallow and stony soils, characterized by a weakly-structured A-horizon and low organic C content. Although both areas can be described as winter rainfall-areas with long term annual means of 275 to 500 mm, climate in the Western Cape is typically Mediterranean with hot, dry summers and mild, rainy winters. In the Southern Cape the percentage of rainfall during the winter gradually decreases from about 80% in the west to 55% in the extreme east. Traditional production systems in these areas include fallowing and mouldboard/disk ploughing. Research on minimum and no-tillage in these areas started in 1976. Results showed little advantage due to minimum and no-tillage with regard to soil moisture in these areas, but improved soil fertility and workability due to increased soil organic material enhanced yields and help to reduce input costs. For this reason present research focuses on the development of sustainable crop rotations and improved N-fertilization programs. Although the adoption of minimum and no-till agriculture is gaining in momentum during recent years, the rapid development of herbicide resistant weeds in these areas, may have serious implications for the future sustainability of these tillage systems. The development and implementation of management strategies to ensure efficient weed control in minimum and no-till systems are thus of the utmost importance.

S24MT26P07**FARMER CENTRED CONSERVATION AGRICULTURE
INITIATIVES FOR AFRICA'S WEED MANAGEMENT****P. G. Kaumbutho¹, H. Mwangi² and J. Kienzle³**

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Conservation agriculture (CA) is gaining ground in Africa, with capacity to revolutionise farming practices in a sustainable way. Of the many challenges, CA promoters and piloting farmers have to contend with, weed management poses the greatest source of scepticism and threat to adoption by smallholder farmers. While weeding is mostly a women and children undertaking, mechanical weed control is hard to apply in CA systems and chemical weed control has special technical and socio-economic problems.

This paper highlights experiences with weed management for CA, mainly from on-farm pilot trials in East Africa. The paper links the necessary stages in the progression from traditional manual practices to mechanical and chemical weed control, as well as cover crops, towards adoption of no-till systems. Data and information from on-farm trials helps make the case for the insurmountable gains derivable from CA systems in general and advanced weed management in particular.

Challenges touch on problems of industrial and technology transfer support, complications of chemical weed control in smallholder crop rotation systems, needs for specialised capacity building and recommended actions towards effective paradigm shift and other dimensions. Approaches towards farmer empowerment, from partnership building to peer, institutional and policy support are presented. General development deterrents to agricultural development such as globalisation and particular problems related to HIV/AIDS are highlighted. Status and case information on impacts of the HIV/AIDS pandemic and the place for using CA system weed management in mitigating labour shortages caused by the pandemic are included.

S24MT5P00**PERSISTENCE BEHAVIOUR OF PYRAZOSULFURON ETHYL
IN TRANSPLANTED PADDY**

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Pyrazosulfuron ethyl (Ethyl 5-[(4,6-dimethoxypyrimidin-2-yl)-carbamoylsulfamoyl]-1-methylpyrazole-4-carboxylate), a newly introduced rice herbicide in India, belongs to sulfonylurea group, used to control a wide range of broad-leaved weeds in transplanted paddy fields. The main aim of the study was to determine the persistence behaviour of pyrazosulfuron ethyl in soil, water, straw, grain and husk in transplanted paddy under tropical climate of West Bengal (India). A field trial was conducted at University Research Farm during 2003 in transplanted paddy with Pyrazosulfuron ethyl 10 WP @ 20 and 40 g a.i.ha⁻¹. Periodically water and soil samples were collected and analyzed along with straw, grain and husk samples at harvest. The analytical methodology for estimation of pyrazosulfuron ethyl in soil/straw/grain/husk was extraction with acetonitrile+water (80:20) followed by partition with dichloromethane. Water samples were extracted with dichloromethane followed by evaporation. Afterwards all the samples reconstituted in acetonitrile and analyzed by HPLC with UV/VIS detector (RP C-18 column) at λ_{max} 230nm, using water (0.08% phosphoric acid) + acetonitrile (1:1) as mobile phase. The average half-life (DT_{50}) values in soil and field water were calculated using simple first order kinetics and found to be 7.53 and 2.6 days respectively. The dissipation pattern was a steady curvilinear decline. No residues could be detected in straw, grain and husk samples at harvest irrespective of doses. This study clearly revealed that pyrazosulfuron ethyl does not create any residual problem in rice eco-system under tropical climate.

S24MT5P00**DISSIPATION OF ACETOCHLOR RESIDUE IN
TRANSPLANTED RICE ECO-SYSTEM UNDER EAST INDIAN
AGRO-CLIMATIC CONDITION**

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Acetochlor [2-chloro-2'-ethyl-6'-methyl-N-ethoxymethylacetanilide] is a pre- and post- emergence herbicide to control annual grasses, broadleaf weeds in many crops including rice. To-date, information on acetochlor residues in transplanted rice ecosystem in India is scanty. This prompted the investigator to undertake a study on the fate and behaviour of acetochlor in soil, water, straw, grain and husk in transplanted rice under West Bengal (India) agro-climatic condition. A field trial with application of acetochlor 90 EC @ 100, 200 and 300 g a.i. ha⁻¹ in transplanted rice was conducted at University Research Farm during 2002. The water and soil samples were collected and analysed during rice growing period, and straw, husk and grain samples were analyzed after harvesting. The analysis involves extraction with dichloromethane followed by column chromatography over silica gel and subsequent elution with hexane + acetone (7:3), concentrated, analyzed by GC-ECD. The average half-life (DT_{50}) values in soil and field water irrespective of doses were calculated using simple first order kinetics and found to be in the range of 5-6 and 1-2 days respectively. At higher doses residues could be detected in grain only (0.01-0.02 µg/g). The pattern and rate of dissipation were similar in both soil and water and was rapid during first 7 days and afterwards it reaches to plateau. The initial residues were more in water than soil because of high water solubility of acetochlor.

<p>S24MT5P00 ENVIRONMENT POLLUTION STUDY OF ATRAZINE WITH SURFACTANTS IN THE INCEPTISOL OF INDIA</p> <p>R. K. Ghosh¹, A. Moitra², A. K. Mukharjee³ and P. K. Sarkar⁴</p> <p><i>Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur-741252, Nadia, West Bengal, India</i> <i>e-mail -rkgbckv@yahoo.com</i></p> <p>The Queen of Cereals, Maize (<i>Zea mays L.</i>) grown in the Inceptisols of India is facing a yield loss of 39.8% due to weed. Field experiments were conducted at the University farm during 2001-03 to study the bio-efficacy, phytotoxicity and environmental pollution effects of Atrazine with surfactants. Besides unweeded control (WC) and hand weeding (HW) Atrazine was applied @ 2 kg ha⁻¹ alone and with 4 surfactants @ 220 ml ha⁻¹. Observations were taken on numbers, dry weights and chlorophyll content of important weed flora, phytotoxicity on maize, available nutrients content and population of beneficial aerobic non-symbiotic N-fixing and P-solubilising bacteria. The predominant weed-flora found in the experimental plots was <i>Digitaria sanguinalis</i>, <i>Echinochloa colona</i>, <i>Cyperus rotundus</i>, <i>Chenopodium album</i>, <i>Melilotus alba</i>, <i>Digera arvens</i> and <i>Physalis minima</i>. All methods of weed management significantly reduced the weed dry weight. HW recorded 56% more grain yield than WC. The corresponding figure for Atrazine with Active 80 was 53%. The tested herbicide significantly reduced chlorophyll content of weeds. No phytotoxicity symptoms were observed. Positive effect on Atrazine was found without causing any hazardous situation in nature on the available nitrate and ammonium nitrogen content, micronutrient content and soil pH. Atrazine at the tested dose proved safe for the population of soil inhabiting beneficial NSNF and PSB. It can, therefore, be concluded that POE Atrazine + surfactant did not cause any environment pollution and can be a substitute for costly traditional method of HW for weed management in maize in the Inceptisols of India.</p>	<p>S24MT5P00 BIO-EFFICACY OF SOME ECO-FRIENDLY HERBICIDES IN TRANSPLANTED SUMMER RICE (<i>Oryza sativa L.</i>) AND THEIR EFFECT ON BENEFICIAL SOIL MICROORGANISMS</p> <p>Subrata Kr. Ghosh¹, R. K. Ghosh², Pritam Ghosh³ and Sankar Saha⁴</p> <p><i>Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya Nadia-741 252, West Bengal, India</i> <i>Email - pritambckv@yahoo.com</i></p> <p>Annually 15 million tonnes of rice is reported to be lost due to weeds in India. Accordingly, efficient, economic and time saving weed control practices should be programmed. Reliance on a few herbicides for controlling weeds in a particular crop year after year may lead to multiplication and spread of resistant weeds. The field experiment was conducted during summer season of 2002-2003 at Viswavidyalaya Farm. The treatments comprised six different doses of IR 5790 10EC (75, 100, 125, 150, 175 and 200g ha⁻¹), Pretilachlor 30 EC at 500 g ha⁻¹, Butachlor 50 EC at 1250 g ha⁻¹, Oxadiargyl 80WP at 100 g ha⁻¹, and unweeded control. The soil samples for colony-count of NSNF and PSB bacteria were collected from the rhizosphere of the crop at 2, 45 and 60 DAA of herbicides. Pretilachlor at 500 gha⁻¹ recorded the lowest density and dry weight of weeds closely followed by IR 5790 applied at 200gha⁻¹. Regarding grain yield, IR5790 at 200gha⁻¹ recorded the maximum of 6.28 tha⁻¹ which was closely followed by IR 5790 at 175gha⁻¹ (6.22 tha⁻¹), which were 33.1 and 31.8 % percent higher respectively than that of unweeded control. None of these herbicides tested in the experiment was found to be toxic to the crop. It was also found that all the tested herbicides reduced the population of NSNF and PSB bacteria at 2 DAA of the chemical but recovery took place gradually.</p> <p>It can be concluded that IR 5790, a new herbicide molecule can be used as eco-safely weed management in transplanted rice.</p>
<p>S24MT5P00 SOIL PERSISTENCE AND VEGETABLE RESPONSE TO HALOSULFURON IN BARE-SOIL VERSUS POLYETHYLENE MULCH CONDITIONS</p> <p>Timothy L. Grey¹, A. Stanley Culpepper¹ and Theodore M. Webster²</p> <p><i>¹The University of Georgia, Tifton, Georgia, 31793-0748, tgrey@tifton.uga.edu, stanley@arches.uga.edu; ²USDA/ARS, Tifton, Georgia, 31793-0748, twebster@tifton.uga.edu.</i></p> <p>Halosulfuron has been proposed as an alternative for nutsedge (<i>Cyperus</i> species) management in many vegetable crops due to the elimination of methyl-bromide. Crop tolerance is often the factor limiting its adoption. Different environmental conditions exist under polyethylene mulch, especially temperature and moisture regimes, which affect herbicide dissipation. Thus, herbicides applied to bare-soil (BS) versus under polyethylene mulch (PM) situations could vary with respect to activity and dissipation. Therefore, a series of studies were established to 1) determine the effect of PM and BS application on halosulfuron dissipation; 2) evaluate transplanted cucumber halosulfuron tolerance applied post-emergence and through drip tape irrigation (DRIP) and transplanted eggplant tolerance when DRIP applied; 3) and evaluate strawberry, collards, and seeded mustard tolerance to halosulfuron applied preemergence (PRE) to BS and under PM. Initial halosulfuron concentration was 18.6 and 17.7 ug/kg for the BS and PM, respectively. Twenty four hours after treatment, halosulfuron dissipation was different for the two systems and this continued for the length of the trial. Data indicated that PM decreased the rate of dissipation of halosulfuron versus BS. Vegetable injury and response varied by treatment, planting date, and species. Data indicated that halosulfuron may have a potential use in cucumber and eggplant when applied through drip tape irrigation and for strawberry, collards, and seeded mustard when PRE applied to BG or under PM. This is significant because many growers plant sequential crops on the same polyethylene bed. Additional research on halosulfuron application under PM, to BS, and through DRIP is needed.</p>	<p>S24MT5P00 EVALUATING OF MODEL FOR PREDICTING HERBICIDE LEACHING IN TROPICAL SOILS</p> <p>C.A. Spadotto¹, M.B. Matallo², L.C. Luchini², M.A.F. Gomes¹</p> <p><i>¹Embrapa Environment, Rod. SP 340 - km 127,5 - C.P. 69, CEP: 13820-000 – Jaguariúna (SP), Brasil. spadotto@cnpma.embrapa.br; ²Instituto Biológico, Rod. Heitor Penteado km 3,5 – C.P. 70, CEP: 13001-970 – Campinas (SP), Brasil.</i></p> <p>Diuron and tebuthiuron have been used in sugarcane crops in Brazil for many years, even on recharge areas of an important aquifer. This work was carried out to evaluate how well a simple model output approximates measured amounts of leaching of these herbicides in a clayey and a sandy tropical soils (respectively, a Typic Quartzipsamment and a Typic Haplorthox, according to the U.S. Soil Taxonomy), using undisturbed soil columns (small lisimeters). Attenuation Factor (AF) is a model based on fraction of applied amount that is likely to leach past a specified soil depth. It calculates rates of leaching and degradation, and assumes steady water flow. Therefore, soil sorption and degradation were also studied in laboratory work. Sorption was well represented by linear and Freundlich equations. Simple exponential equation was not able to represent degradation, thus a bi-exponential equation was used, and some model adjusting was needed. Average measured amounts of each herbicide were compared with amounts predicted by the multi-layered-soil AF model. The model was able to predict leaching amounts in the sandy soil, especially for diuron, however the model performance was not good in the clayey soil. Differences can be due to the model conceptual framework, assumptions and limitations, as well as to the input data set used. It is well known that differences can also be due to analytical limitations. It is noteworthy that dispersion, in addition to convection/advection, can be especially relevant in soil lisimeter scale, and preferential flow can be particularly important in highly structured Oxisols.</p>

<p>S24MT5P00 COMPARATIVE LEACHING OF TWO HERBICIDES IN THREE SOUTH AFRICAN SOILS</p> <p>H Ralph Meinhardt</p> <p><i>Agricultural Research Council, Plant Protection Research Institute, Private Bag X 134 Queenswood, South Africa</i></p> <p>Research has shown that the behaviour of pesticides differs in South African soils and under local conditions when compared with data generated in the country of origin of the pesticides. It has been shown for example that pesticides tend to leach more readily in SA soils and that extended half-lives of these compounds may be expected. Prolonged persistence of pesticides combined with high soil mobility are indicators of high pollution potential of pesticides.</p> <p>The primary goal of this study was to determine the leaching characteristics of the two herbicides namely tebuthiuron and azafenidin in three South African soils. In addition existing computer based - mathematical models (developed mainly in Europe) were evaluated for their effectiveness in predicting leaching and persistence of these two compounds under South African conditions.</p> <p>Field-leaching experiments were conducted on three different soil types in the Pretoria (Gauteng Province) area. At each site three replicate 150m² plots were used for each herbicide. The herbicides were applied to bare soil. Soil was sampled at 5 different intervals up to 120 cm below ground level and analysed for pesticide. Residue analyses were performed at day 0 (reference concentration), day 5, day 11, day 22, day 88 and 120 days after application.</p> <p>Soil adsorption coefficient determinations performed concurrently indicated that soil depth did not alter the adsorption of tebuthiuron and azafenidin. Leaching patterns were similar for both compounds, except that azafenidin was retained in higher levels in the upper soil layers.</p>	<p>S24MT5P00 BIO-EFFICACY AND PHYTOTOXICITY OF NEW GENERATION HERBICIDES AND THEIR EFFECT ON CHEMICAL AND BIOLOGICAL ENVIRONMENT OF SOIL IN TRANSPLANTED RICE</p> <p>A. K. Mukherjee, Madhumita Nandi, M. K. Nanda and R. K.Ghosh</p> <p><i>Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur-741252, Nadia, West Bengal, India akmukherjeebckv@rediffmail.com</i></p> <p>The field experiment was conducted at 'C' Block Farm, Kalyani, Nadia, West Bengal, India during summer 2002 to study the "Bio-efficacy and phytotoxicity of new generation herbicides and their effect on soil chemical and biological environment in transplanted summer rice (<i>Oryza sativa</i> L.). The experiment was laid out in Randomized Block Design with nine treatments replicated thrice. Besides unweeded control, hand weeding at 20 and 40 days after transplanting, four doses of Pyrazosulfuron-ethyl 10 WP (20,25,50 and 100 g ha⁻¹) and three doses of Acetachlor (100,150 and 200 ml ha⁻¹) were used as pre-emergence spray. The predominant weed species were <i>Echinochloa crus-galli</i>, <i>Leersia hexandra</i>, <i>Cyperus iria</i>, <i>Cyperus difformis</i>, <i>Marselia quadrifolia</i>, <i>Enhydra fluctuans</i> and <i>Eclipta alba</i>. The herbicides did not show any toxicity symptom on rice plant. Amongst the chemicals Pyrazosulfuron-ethyl proved better than Acetachlor. Higher doses of Pyrazosulfuron-ethyl controlled weeds more effectively than lower doses. Lowest weed chlorophyll content was recorded where Pyrazosulfuron-ethyl was applied at 100 g ha⁻¹. It was revealed that Pyrazosulfuron-ethyl proved stimulatory for both non-symbiotic N-fixing and P-solubilizing microorganisms whereas Acetachlor showed negative response. Soil micronutrients did not follow any definite pattern of change with crop growth. The Fe and Cu availability increased but Mn and Zn availability decreased may be because root exudates of both weed flora and rice plant making rhizosphere acidic. Thus it can be concluded that pre-emergence application of Pyrazosulfuron-ethyl is more effective in increasing the rice yield by controlling the weeds, favouring the beneficial soil microorganisms and by increasing availability of micronutrients.</p>
<p>S24MT5P00 EFFECTS OF SUBLETHAL DOSES OF 2,4-D, SIMULATING DRIFT, ON COTTON AND TOBACCO</p> <p>R.S. Oliveira Jr.; J. Constantin; P.H. Pagliari¹.</p> <p>¹<i>Departamento de Agronomia, Universidade Estadual de Maringá (UEM). Av. Colombo 5790 – 87020-900 Maringá, PR. E-mail: rsojunior@uem.br</i></p> <p>Hormonal-type herbicides such as 2,4-D are used to control many broadleaf weeds in Brazil, specially at burndown prior to summer crops. Drift of these herbicides may cause severe injuries on sensitive crops. Field experiments were carried out for two consecutive years in cotton and tobacco crops, by applying sublethal doses of 2,4-D (range from 0.84 to 26.80 g e.a. ha⁻¹) at different growth stages, as a simulation of eventual drifts to these crops. The range of doses was based on the assumption of a 0.125 to 4% drift level of a 1 L ha⁻¹ of commercial formulations. Cotton yield was severely affected by doses as low as 6.7 g e.a. ha⁻¹ at crop flowering, but the tolerance increases as plants get older. The most harmful effect of 2,4-D for cotton is the flower and floral buds drop. Tobacco was able to tolerate up to the highest doses without showing any visual or yield injury. No meaningful visual symptom was observed for tobacco plants sprayed after transplantation to field. Some of the problems claimed as 2,4-D drift may be related to growth regulator application after topping. None of the applied doses impacted negatively tobacco yield or quality. For all combinations of stages, crops and doses, symptoms of plant toxicity may range from no visual/economic injury to death. Lab residue analysis provided data to support that 2,4-D persistence in plants is short. Even when the herbicide was applied close to crop yield, residue levels were always lower than 50 ppb.</p>	<p>S24MT5P00 EFFECTS OF SUBLETHAL DOSES OF 2,4-D, SIMULATING DRIFT, ON GRAPES AND TOMATO</p> <p>R.S. Oliveira Jr.; J. Constantin; P.H. Pagliari; J.R. Fagliari; J.G.Z. Arantes¹</p> <p>¹<i>Departamento de Agronomia, Universidade Estadual de Maringá (UEM). Av. Colombo 5790 – 87020-900 Maringá, PR. E-mail: rsojunior@uem.br</i></p> <p>Grapes and tomato are considered two of the most sensitive crops regarding 2,4-drift. In many cases, such susceptibility has led to important restrictions of use of 2,4-D based products. Field experiments were carried out for two consecutive years in tomato and grapes, by applying sublethal doses of 2,4-D (range from 0.42 to 107.20 g e.a. ha⁻¹) directly to plants at different stages of growth, as a simulation of eventual drifts to these crops. The range of rates was based on the assumption of a 0.0625 to 16% drift level of a 1 L ha⁻¹ of commercial formulations. For tomato, rates of 3.36 g e.a.ha⁻¹, 6.72 g e.a.ha⁻¹ and 13.44 g e.a.ha⁻¹ of 2,4-D provided significative yield losses of 24.8% (13.88 t.ha⁻¹), 45.5% (25.12 t.ha⁻¹) and 91.2% (48.99 t.ha⁻¹), respectively. However, rates ≤13.44 g e.a.ha⁻¹ applied at 4-trusses stage or latter had no effect on crop yield or development. For tomato, tolerance to 2,4-D strongly increases with plant age. For vineyards, the most susceptible stage is the after-pruning period. At this stage, all applied rates of 2,4-D affected crop yield. After reaching the stage of 50% development of bunches, low doses (up to 13.40 g e.a. ha⁻¹) of 2,4-D had no negative effect on crop yield or plant development. For all combinations of stage, crop and rates, symptoms of plant toxicity may range from no visual/economic injury to death. No detectable residue (GC/MS, detection limit of 10 ppb) of 2,4-D was found in samples from all the field applications.</p>

<p>S24MT5P00 INFLUENCE OF FOURTHY YEARS OF SIMAZINE APPLICATION ON PLATS COVER AND SOIL MICROORGANISMS</p> <p>Henryka Rola¹, Jozef Rola¹, Mariusz Kucharski¹, Andrzej Nowak², Krystyna Przybulewska², Krzysztof Domaradzki¹, Agnieszka Majchrzak²</p> <p>¹Department of Ecology and Weed control, Institute of Soil Science and Plant Cultivation of Wroclaw, Poland e-mail: sekretariat@iungwr.neostrada.pl</p> <p>²Department of Microbiology, Academy of Agriculture of Szczecin, Poland e-mail: anowak@agro.ar.szczecin.pl</p> <p>In Poland, four years ago the specific field trials were initiated. On the same plots, every year, in spring, for 40 years, the simazine herbicides was applied in increase doses – 5 and 10 kg of simazine per ha.</p> <p>The aim of investigation was evaluation of influence of fourthy years simazine application on plants cover and soil microorganisms.</p> <p>On those plots, at first (1963) occurred 27 weed species. From this group of weeds , under influence of long term application of simazine, the following weed species were resistant: <i>Elymus repens</i>, <i>Lolium perenne</i>, <i>Amaranthus retroflexus</i>, <i>Erigeron canadensis</i>, <i>Geranium pusillum</i>, <i>Digitaria sanguinalis</i>, <i>Achillea millefolium</i>, <i>Artemisia vulgaris</i>, <i>Convolvulus arvensis</i>, <i>Equisetum arvense</i>.</p> <p>Long term application of simazine did not cause of residue accumulation in soil profile. The residues were situated mainly up to the depth of 40 cm. Concentration of simazine residues, in this soil layer amount to 0.05-0.25 mg*kg⁻¹. In the layer between 60 to 100 cm the amount of residues did not exceed 10⁻³ mg*kg⁻¹.</p> <p>In different soil layers changes in microorganisms counts were observed. After 40 years simazine application, in surface layer (0-10 cm) of the soil, count of bacteria increased about 20% and count of actinomycetes even up to 80% in comparison with the soil from control plots. This was connected with an decrease in the count of fungies, which has the value almost 40% lower than in the control soil. In the second soil layer (10-20 cm) all microorganism groups were inhibited.</p>	<p>S24MT5P00 LEACHING OF HERBICIDES AFTER AUTUNM AND SPRING APPLICATION</p> <p>O. Sakaliene¹ and I. Kavoliunaite²</p> <p>¹National Paying Agency under the Ministry of Agriculture, Pylimo 35-14, Vilnius, Lithuania, onaS@nma.lt ²Voke Branch of the Lithuanian Institute of Agriculture, Tiskeviciaus 9-26, Vilnius, Lithuania</p> <p>Lysimeter studies were conducted In Lithuania at Voke Branch of Institute of Agriculture. The fate of pendimethalin (1,0 kg a. i. ha⁻¹), clopyralid (0,3 kg a.i. ha⁻¹), mecoprop (1,5 kg a.i. ha⁻¹) and dicamba (0,15 kg a.i. ha⁻¹) was investigated in cylinder form ferroconcrete lysimeters 1,75 m² area and 0,55 meter of depth, filled with soil (sandy loam haptic luvisols, pH-6,1, humus-1,56 %).</p> <p>Three trials with the pre-emergence pendimethalin and as a post-emergence clopyralid, mecoprop and dicamba application on winter rye in autumn and at the same doses of clopyralid, mecoprop and dicamba spring application on winter rye were done (I-1996-1997, II-1998-1999, III-2000-2001). As a rotation crop-mix of oat and vetch was planted, on which herbicides were not used.</p> <p>Residues of leached herbicides were analyzed by GC/ECD.</p> <p>The aim of experiment was to investigate leaching ability of herbicides having different persistence at autumn and spring application.</p> <p>Fifteen months following autumn application leachate samples were analyzed for residue determination. During this period in I trial percolated 338 mm, in II-182 mm, in III-186 mm of water. Clopyralid was found in the highest amount -0,39-2,95%, mecoprop-0,20-0,62 %, dicamba-0,06-1,82 % and pendimethalin-0,01-0,08 % of applied.</p> <p>Over eight months, after winter rye spring application, in I trial percolated 136 mm, II-58 mm and III-82 mm of water, respectively. Mecoprop in lecheteat was not detected. Clopyralid and dicamba were detected in 1997 and 2001 by 0,03-0,93 % and 0,08-0,25 % of applied.</p> <p>The results suggested, that autumn application does give the potential to contaminate ground water by leaching of herbicides.</p>
<p>S24MT11P00 SIMULATION OF ¹⁴C-ATRAZINE LEACHING IN LYSIMETER STUDIES WITH PELMO AND MACRO_DB</p> <p>A A Smetnik</p> <p>Russian Institute of Phytopathology, General Tyulenev Str. 3-158, Moscow 117465, Russian Federation, smetnik@online.ru</p> <p>The Pesticide Leaching Model (PELMO 3.00) is used by German authorities for registration purposes. MACRO_DB is a decision-support tool for predicting pesticide fate and mobility in soils, which consists of soil, pesticide, climate and crop databases linked to parameter estimation routines and the simulation model MACRO and is used by Sweden authorities.</p> <p>The objective of the investigation was to evaluate these models using a leaching experiment conducted in field lysimeters.</p> <p>¹⁴C-atrazine (1 kg/ha) was applied to lysimeters containing undisturbed soil cores of loamy sand. Before the herbicide application 3 lysimeters were treated with sewage sludge at rates of 0.5, 5 and 20 t/ha. After herbicide application corn was sown. Over a period of 11 months the leaching water was collected. The amount of leached radioactivity was measured. At the end of the experiment the distribution of the compound in the soil was determined.</p> <p>¹⁴C-atrazine leaching did not correlate with the sewage sludge application rates. On totals (volume of the leached water, atrazine content in the leachate and in the soil profile) both models have given a quite good prediction (after their calibration). However, a detailed study of herbicide transport over time and depth in lysimeters shows essential differences between modelled and observed values. The results of MACRO_DB simulations are better than the PELMO output data because it considers pesticide preferential flow. Preferential processes must be taken into account for sandy soils as well as for structured soils. The use of mathematical models of pesticide leaching with their calibration on lysimeter data can reduce the serious errors.</p>	<p>S24MT11P00 WINNING, LOSING AND HOLDING OUR OWN WITH INVASIVES IN WISCONSIN, USA</p> <p>Jerry Doll</p> <p>University of Wisconsin Department of Agronomy, 1575 Linden Dr., Madison, WI 53706, jddoll@wisc.edu</p> <p>The current Wisconsin Noxious Weed Law never functioned well because it lacked a mechanism for adding and deleting species, did not attempt to educate or train, only focused on agricultural settings, and lacked financial support. In 1999, we began reinventing a functional noxious weed program to replace our defunct law. We have a document ready for introduction into the legislative process. The new law will 1) allow for annual modifications, 2) establish prohibited, restricted and watch categories at the state and county levels, 3) create a Noxious Weed Board, 4) include education and research as significant components, 5) provide funding to subsidize the costs of combating prohibited species, and 6) assign responsibilities within government agencies regarding implementation and execution of the law. At the moment the state fiscal crisis had stopped all progress and the new program is dormant. Nevertheless, the efforts to organize, educate, monitor and manage invasive species are anything but dormant. We formed the Invasive Plants Association of Wisconsin (IPA) which has convened two biennial conferences on invasives, we are starting to systematically document the location of invasive plants, and we are providing education on invasives via the IPA web site, conferences, printed word, and field demonstrations. Federal monies are subsidizing the control of <i>Rosa multiflora</i>. The state Departments of Transportation and of Natural Resources are cooperating to control <i>Euphorbia esula</i> along roadsides. Local groups are tackling <i>Lythrum salicaria</i> with biocontrol agents and biennials like <i>Pastinaca sativa</i> with mechanical and chemical means.</p>

S24MT11P00**STUDY OF SOME MAJOR WEEDS AND NOXIOUS PLANTS AFFECTING FORESTS AND PLANTATIONS IN NORTHERN IRAN****M. Mohammadi¹, M. A. Amlashi²**¹ Research Institute of Forests and Rangelands, P.O.Box 13185-116, Tehranm, Iran.Email: mohammadi@rifr.ac.ir² Guilan Research Center for Natural Resources and Animal Affairs, Rasht , Iran.

Nowadays, noxious weeds and unwanted plants are affecting natural forests and afforestations especially in northern parts of Iran. The high diversity and density of these plants need a heavy tool for their clearing and elimination and considerable amount of money and time as well. This study was carried out to identify invasive plants in forest

stands during five consecutive years in forest areas of Guilan, Mazandran and Golestan provinces. Twenty-nine areas in northern side of the country were visited and five sites were selected for further studies. Selected sites examined weekly or ten days interval.

The noxious weeds are appeared in various forms such as annual, biennial, perennial, bushes and shrubs. They occupy the vast area of forests and disrupt the normal growth of forest stands e.g. through competition for water, nutrients, light, shading of seedling and production of some materials which reduce the growth of plants and forest trees (allelopathy).

In this research, 22 annual, biennial and perennial plant species, 33 trees and shrubs and 5 forest tree,s sprouts were evaluated as invasive plants in forest stands and plantations in Northern Iran. Among them, 8 main species as: *Rubus* spp., *Sambucus ebulus*, *Paliurus spina-christi*, *Pteridium aquilinum*, *Smilax excelsa*, *Pteris cretica*, *Parotia persica* and *Carpinus betulus* L. were identified. They were cited by scientific name and some information about their ecology, phenology, damage and density percentage. The root suckers and sprouts of forest trees had also serious difficulties in silvicultural practices.

S24MT11P00**RANKING GLOBAL WEEDS FOR THEIR POTENTIAL TO INVADE THE UNITED STATES****C Parker¹, B P Caton² and L Fowler³**¹ Consultant, Weed Science Society of America, 5, Royal York Crescent, Bristol BS8 4JZ, U.K. chrsparker5@compuserve.com² USDA/APHIS/PPQ Center for Plant Health Science and Technology, 1017 Main Campus Drive Suite 2500, Raleigh, NC 27606-5202, Barney.P.Caton@aphis.usda.gov³ USDA/APHIS/PPQ Center for Plant Health Science and Technology, 1017 Main Campus Drive Suite 2500, Raleigh, NC 27606-5202, Larry.fowler@aphis.usda.gov

In 2001 a model was developed to rank pest plants for their potential to pose a threat to ecosystems in the greater United States. Information has been added to the species database and the model has been refined. Approximately 700 candidate species have been listed and about half of these fully scored for potential invasiveness, geographic suitability, damage and entry .In this phase, fact sheets were prepared for the next 25 highest scoring pest plants that are currently not known in the United States. Some of the fact sheets created include willow-leaved hakea (*Hakea salicifolia*), an ornamental shrub native to Australia that has invaded South Africa; tiebush (*Wikstroemia indica*), a tropical shrub toxic to mammals, but grown as a medicinal or culinary herb in Asia; haha-go-husa (*Gnaphalium affine*), an annual weed in Asia; and prostrate globe-amaranth (*Gomphrena celosioides*), an annual crop weed native to South America that has become naturalized in several countries in Asia, Australia and Africa. Under the U.S.A. Plant Protection Act of 2000, these 25 species will be considered for listing as noxious weeds. Other species were scored which are cultivated in the United States but not known to be naturalized. It is believed that ranked species in trade in the United States pose the greatest threat because pathways for entry already exist. By providing industry with the information from this project, it is believed that there will be a reduction in the use of ornamental plant materials that might endanger agricultural and natural ecosystems.

S24MT11P00**INFLUX AND HABITAT OF ALIEN INVASIVE WEEDS IN KOREA****Se-Mun Oh¹, B C Moon¹**1) *Plant Pathology Division, Department of Crop Protection, National Institute of Agricultural Science and Technology, RDA, Suwon 441-707, Korea,*
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For investigation on the present status of exotic weeds in Korea, the number of exotic weed species, their inflow time and its native regions were examined with literature and field survey was also conducted for seven years from 1995 to 2001. In order to obtain information on distribution and inhabitation of exotic weeds, we usually surveyed the surroundings of main harbors such as Inchun, Pusan, Gunsan, Mokpoe and Yeosu which grain is usually imported, near roadside for transport of import grain and around dairy farm and pastureland. In addition, we surveyed exotic weeds troublesome in cultivated area including crops like feed corn and grains. Newly found species were identified based on domestic and foreign plant picture book. *Exotic weeds naturalized in Korea are composed of 315 species in 37 families until 2001. Among the weed floras, 135 exotic weed species have been reported since 1980. The number of exotic weeds by the native regions was 72, 32, 122 and 29 in North America, South America, Europe and Asia, respectively. Many species of exotic weeds are distributed in the near of ports, roadside for transport of imported cereals, circumference of highway and reclaimed land with wastes. 72 and 56 exotic weeds are found in farmland and pasture, respectively. Also, exotic weed newly founded in cultivated area from 1995 to 1999 was reported as 34 species of 13 family.*

S24MT11P00**MECHANISMS OF INVASIVENESS OF THE EXOTIC WEED, SCOTCH BROOM (*CYTISUS SCOPARIUS* (L.) LINK) IN BRITISH COLUMBIA, CANADA****Raj Prasad¹**¹ Canadian Forest Service, Pacific Forestry Centre, 506 West Burnside Road, Victoria, B. C. V8Z 1M5, Canada,
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Scotch broom (*Cytisus scoparius* (L.) Link) and gorse (*Ulex europaeus* L.) are exotic plants that were introduced in Canada, over a century ago, but have escaped, proliferated and are posing a serious threat to forested and other landscapes in southern British Columbia. Their several characteristics which promote invasiveness and displacement of native species, are: reduced leaves, active stem photosynthesis, nitrogen fixation, prolific seed production, longevity of seed banks, rapid vertical growth, adaptability to various ecological niches and lack of natural enemies. There are few data on the impact of Scotch broom on conifers in British Columbia. Two experimental field plots were established on Vancouver Island to determine the nature and extent of invasiveness in forested areas and on impact on conifer crop trees. Influence of photosynthetically active radiation (PAR) on Scotch broom and Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco) seedling growth were measured. Results demonstrated that Scotch broom reduces the input of PAR and retards the height-volume growth of conifer seedlings. Detailed methods of control are discussed.

<p>S24MT11P00 INVASIVE ALIEN SPECIES: DEVELOPMENTS TOWARDS A DUTCH POLICY</p> <p>A.J.W.Rotteveel</p> <p><i>Plant Protection Service, P.O.Box 9102, 6700 HC Wageningen, the Netherlands. Email: a.j.w.rotteveel@minlnv.nl</i></p> <p>The Netherlands have in 1992 signed and in 1994 ratified the CBD convention and in doing so have committed itself to developing a policy against the negative impacts of invasive alien species (IAS) according to article 8h. This is not an easy task for several reasons. First of all Europe in general, and the Netherlands in particular, have a history of over 500 years of alien biological invasions. The Netherlands have always been, and still are, an important gateway into Europe, and from Europe to the world, of trade in plants. Moreover, the Netherlands are major producers of ornamentals which are sold all over the world. Dutch growers constantly search and develop new ornamental species everywhere in the world. In this context the Netherlands have a special position in the global invasive species problem and it is aware of its special position. The Direction for Nature Management of the Ministry of Agriculture, Nature Management and Food Quality is currently developing a policy towards IAS in close cooperation with the Plant Protection Service and the National Expertise Centre of the Ministry. The Plant Protection Service is already active in the technical field of IAS by contributing to IAS work of the International Plant Protection Convention (IPPC) and the European Plant Protection Organisation (EPPO). An update on the state of development will be presented.</p>	<p>S24MT11P00 NOVEL GRASSLAND FUEL CHARACTERISTICS CAUSED BY THE INVASION OF AN INTRODUCED AFRICAN PASTURE GRASS IN SOUTHEASTERN AUSTRALIA.</p> <p>John Stoner, Robyn Adams and Dianne Simmons.</p> <p><i>School of Ecology and Environment, Deakin University, 221 Burwood Highway, Burwood, Victoria, 3125, Australia. Email jrst@deakin.edu.au</i></p> <p>Phalaris (<i>Phalaris aquatica</i>) is a widespread introduced pasture species in southeastern Australia. It is forming a "new" vegetation type and consequently a "new" fuel type. Changes to fire regimes resulting from the "new" fuel characteristics of Phalaris may have important consequences for ecological management, fire management, and public and firefighter safety. Fuel characteristics, including fine fuel loads, depth of fuel bed, vertical height, horizontal continuity, stalk biomass and fuel bed bulk density, were examined in native Kangaroo Grass (<i>Themeda triandra</i>) grasslands invaded by exotic Phalaris (<i>Phalaris aquatica</i>). Mean fine fuel loads of Phalaris were 27.0 t/ha, approximately three times that of Kangaroo Grass. Depth of fuel bed, vertical height and stalk biomass were also significantly increased, whilst horizontal continuity and fuel bed bulk density were not significantly different, resulting in a well aerated, continuous fuel bed with a greatly increased biomass. Alterations to fuel characteristics caused by Phalaris invasion will significantly impact on fire behaviour, and are likely to cause irreversible damage to some native plant communities.</p>
<p>S24MT11P00 ERADICATION—EVALUATING WHEN TO GO FOR IT!</p> <p>F D Panetta¹ and Susan M Timmins²</p> <p>¹<i>Alan Fletcher Research Station, Department of Natural Resources and Mines & CRC for Australian Weed Management, PO Box 36, Sherwood, Queensland 4075, Australia, dane.panetta@nrm.qld.gov.au</i></p> <p>²<i>Science & Research, Department of Conservation, PO Box 10-420, Wellington, New Zealand, stimmins@doc.govt.nz</i></p> <p>Weed eradication is often desired but rarely achieved—it's a big ask! Eradication requires the elimination of every single individual of a weed, with little likelihood of re-invasion. Eradication may be the best management strategy, but only if it is possible. We have developed a decision tree to determine whether eradication should be considered for a particular weed infestation. It asks about the socio-political climate (e.g. is the weed widely cultivated), the probability of subsequent immigration, availability of suitable control methods, and the effort needed to eradicate the infestation. Various factors affect the amount of effort required to achieve eradication—logistic, detection, biological and control factors. Our scoring system captures their impedance value. Logistics takes into account the number and accessibility of infestations. Detectability relates to conspicuousness of the weed at various stages in its phenology within the invaded vegetation. Some biological characteristics—such as vegetative reproduction capability, short period before seed production and long-lived seeds—increase eradication effort. Similarly, eradication success can be impeded if expensive control methods or multiple treatments are required and if there is limited chance of stopping further dispersal of the weed. Another major influence on eradication feasibility is the area of infestation. Likelihood of success declines rapidly with increasing area of a weed infestation. Our approach combines the area of infestation with the factors that impede eradication to give an overall score for eradication effort. Whatever the score, eradication may still require long-term commitment and so should not be embarked upon lightly.</p>	<p>S24MT11P00 IVA XANTHIFOLIA NUTT. - NEW INVASION WEED IN SERBIA</p> <p>B Veljkovic¹, S Vrbnicanin², D Marisavljevic³</p> <p>¹<i>Chemical Agrosava, 11070 Novi Beograd, P. Toljatija 5/IV, Serbia, bveljkovic@agrosava.co.yu</i></p> <p>²<i>Poljoprivredni fakultet, 11080 Zemun-Beograd, Nemanjina 6, Serbia</i></p> <p>³<i>Institut za zaštitu bilja, 11000 Beograd, T. Dražzera 9, Serbia marisavljevicd@ptt.yu</i></p> <p>A great diversity of weed flora of about 1000 species exists in Serbia. From the total number of weed species, 58 belong to the adventive variety, predominantly from the <i>Asteraceae</i> family. The representatives of this family are aggressive weeds whose invasion is realized through strong competitive pressure in their new fitocenoze. One such aggressive weed is <i>Iva Xanthifolia Nutt.</i>, first time observed in Serbia in 1966 (Sainović & Koljadžinski) - permanent danger for ruderal and arable lands. The biological characteristics of <i>Iva Xanthifolia Nutt</i> are of an enormous vegetative and generative potential, efficiency in spreading, competitive domination in relation to the greater weed species, ecological plastics are preconditions for efficient spreading of this variety throughout the greater region of the Balkans. Observation and the quantitative evaluation of the presence of <i>Iva xanthifolia</i> has been done in 30 localities, in ruderal areas as well as on arable land. A numerical and efficacy scale from 1 to 9 was used (Westhoff & Maarel, 1973). Obtained results are presented on the UTM screen of a 10 X 10 km dimension. The greatest frequency has been observed in ruderal locations which presented a threshold on the door of agrophytocoenosis. In arable crops a high presence is observed in soyabean, corn and sugar beet. Previous investigations carried out to get information about the chemical control of <i>Iva Xanthifolia</i> in different crops gave good results especially in corn and sugar beet (Marisavljevic & Veljkovic, 2000).</p>

<p>S24MT11P00 STOP THE WEEDS, KILL THE SEED – MINIMISING WEED SEED SPREAD</p> <p>M J Barker¹, G Zerner², G W Fisher¹ and B J Wilson¹</p> <p>¹Queensland Department of Natural Resources, Mines and Energy, Land Protection, GPO Box 2454, Brisbane, Australia 4001, <i>Mirranie.Barker@nrm.qld.gov.au</i>; ²Queensland Department of Natural Resources, Mines and Energy, PO Box 2, Warwick, Australia 4370, <i>Gary.Zerner@nrm.qld.gov.au</i></p> <p>The most cost effective technique in the management of invasive weeds is prevention and early intervention. This is recognised as a principle in the Australian National Weed Strategy 1997. Yet most resources have been dedicated to controlling weed infestations with limited attention given to preventing their further spread.</p> <p>Human assisted spread is the major means of long and/or short distance movement for many weeds. This has been demonstrated by outbreaks of weeds that can be attributed to movement of contaminated products, harvesting machinery, earthmoving machinery, livestock and vehicles. Other means of movement include attachment to clothing.</p> <p>A project was conducted to develop practices to enable land managers, machinery operators and others to be able to minimise weed seed movement, to promote awareness of the issue and to develop legislative support. A subsequent project had the objective of further developing practices and promotion. A reference group of industry and government representatives advised the project officer on identifying needs and preparing products.</p> <p>The projects resulted in:</p> <ul style="list-style-type: none"> • Best practice procedures for cleandowns, inspections and washdown facility construction. • Inclusion of provisions in legislation creating offences for supplying contaminated things or moving contaminated vehicles on a road. • Developing a Hygiene Declaration scheme for vendors to advise purchasers that things being sold are, or maybe, contaminated • Producing location maps for existing washdown facilities and facilitating construction of new washdown facilities. <p>Development of promotion products to create weed seed awareness.</p>	<p>S24MT11P00 MESQUITE (<i>PROSOPIS JULIFLORA</i>): POTENTIALS AND PROBLEMS</p> <p>Kassahun Zewdie¹, Yohannes Lemma¹, and Olani Nikus²</p> <p>¹Holetta Agricultural Research Center, EARC, P.O.Box 2003, Addis Ababa, Ethiopia ²Melkassa Agricultural Research Center, EARC, P.O.Box 2003, Addis Ababa, Ethiopia</p> <p><i>Prosopis juliflora</i> is an alien tree species introduced to Ethiopia some 20 years ago. The tree has an aggressive invasive character invading pastureland, irrigated cultivated land and irrigation canals causing an irreversible displacement of natural pasture grasses as well as native tree species. The undesirable traits of the tree contributing to its lack of appreciation by the local people have been described. The paper reviewed the overall advantages of the tree in countries that are native origins for <i>Prosopis</i>. Assessment based on opinion polls has also been made on the impact of the tree on crop production, livestock production and the environment. The paper also suggests future actions to be undertaken to reduce the spread and minimize the negative impact of <i>Prosopis juliflora</i>.</p> <p>Key words: <i>Prosopis juliflora</i>, alien, Ethiopia</p>
<p>S24MT13P00 ALLELOPATHIC EFFECTS OF METANOL EXTRACTS AND ROOT EXUDATES OF <i>COMMELINA DIFFUSA</i>, <i>COMMELINA VIRGINICA</i>, <i>TRADESCANTIA</i> SP AND <i>ZEBRINA PENDULA</i> ON <i>LACTUCA SATIVA</i></p> <p>Arnaude De Ch Olga Regina <i>Universidad Nacional Experimental del Táchira. Decanato de Investigación. Dpto de Agronomía. Lab. de Fisiología Vegetal. Email: olarauna@unet.edu.ve</i></p> <p>The allelopathic potential of metanol extracts and root exudates of <i>Commelina diffusa</i>, <i>Commelina virginica</i>, <i>Tradescantia</i> sp and <i>Zebrina pendula</i> collected in coffee farms on the germination and radicle length of <i>Lactuca sativa</i> was evaluated in petri-dish bioassays. Metanolic extracts of leaves, shoot and root were roto-evaporated and lyophilized (once eliminated the solvent) and the remainder was re-dissolved in water before their application. Root exudates were obtained from plants originating from stolons and growing in 4-L pots on a pre-washed and sterilized sand substrate supplemented daily with 50 ml distilled water and with complete Hoagland solution every three days. The exudates collection system containing XAD-4 resin was installed 60 days after transplanting the stolons at about flowering initiation. Inhibitory activity of methanolic extracts was determined by adding desired concentrations of the extracts to petri dishes laid with Watman No 1 filter paper, over which seeds of <i>Lactuca sativa</i> were placed. Soluble and water insoluble extracts were also applied to <i>Lactuca sativa</i>. Each treatment was replicated three times. Percent germination and radicle length were determined at 24 and 48 hours after treatment. Extracts at all concentrations tested decreased radicle length in comparison to the untreated (distilled water) control. Water-soluble exudates of <i>Commelina diffusa</i>, <i>Tradescantia</i>, <i>Commelina virginica</i> and <i>Zebrina pendula</i> inhibited germination of <i>Lactuca sativa</i> (37, 3, 30 and 43% respectively) more than non-soluble exudates (23, 0 and 17%). It was concluded that metanolic extract and non-soluble exudates presented possible allelopathic effects.</p>	<p>S24MT13P00 WINTER WHEAT (<i>TRITICUM AESTIVUM</i>) AND CORN (<i>ZEA MAYS</i>) AS RECIPIENT SPECIES IN ALLELOPATHIC RESEARCH</p> <p>I Béres¹ and G Kazinczi²</p> <p>¹University of Veszprém, Georgikon Faculty of Agricultural Sciences, Keszthely, Hungary. E-mail address <i>herbologia@georgikon.hu</i>; ²Office for Academy Research Groups Attached to Universities and Other Institutions, Virological Group, University of Veszprém, Georgikon Faculty of Agricultural Sciences, Keszthely, Hungary. E-mail address <i>H11895HOR@ELLA.HU</i></p> <p>Corn (<i>Zea mays</i>) and winter wheat (<i>Triticum aestivum</i>) are the main arable crops in Hungary. Although chemical weed control can solve weed problems in these crops, because of different reasons (changes in ownerships, partition of large arable fields etc.) heavy weed infestations may occur, causing serious yield losses due to competition and allelopathy. The aim of our research work was to study the allelopathic effect of some annual and perennial weeds, widespread in corn and winter wheat. It has been concluded that allelopathic effect of weeds on germination and development of recipient species greatly depended on donor and recipient species, phenological stage of the donor plants, plant parts and preparation methods of the extracts (water, acetone and ethanol ones, different concentrations). Generally it can be said that extracts at high concentrations, and of organic solvents have more inhibitory effect as compared to lower concentrations and water ones, respectively. Corn proved better test species as compared to wheat. Shoot and root extracts of <i>Asclepias syriaca</i>, <i>Datura stramonium</i>, <i>Ambrosia artemisiifolia</i>, <i>Cirsium arvense</i> and seed leachates of <i>Iva xanthiifolia</i> significantly retarded the germination of corn. In pot experiments some results showed that phytotoxins present in plant residues get detoxified in soil over a longer decomposition period of three months. Neither the shoot water extracts nor the plant residues of winter annuals (<i>Centaurea cyanus</i>, <i>Galium aparine</i>, <i>Apera spica-venti</i>, <i>Alopecurus myosuroides</i>, <i>Matricaria inodora</i>, <i>Papaver rhoes</i>) retarded significantly the growth of winter wheat, suggesting that interference from these weed species is perhaps due to competition.</p>

S24MT13P00**USING COVER CROPS TO SUPPRESS WEED GROWTH****S R Bezuidenhout¹ and C F Reinhardt²**

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Weed control is an expensive necessity in crop production as competition reduces crop yields. Cover crops can be used as they improve sustainability and suppress weed growth. A field trial was conducted to evaluate the influence of three cover crop residues on weed growth and *Zea mays* performance. The cover crops, *Secale cereale*, *Avena sativa* and *Lolium multiflorum*, were planted in March 2002 and sprayed with glyphosate in September 2003. These residues were left *in situ*, with *Zea mays* planted into this residue with no further control of the weeds. Weed biomass, species and density and *Zea mays* germination and growth were assessed. Competition from weeds resulted in sub-optimal development of the cover crops. This meant that the cover crop residues were unable to adequately reduce weed growth, as weed densities increased during maize growth compared to the control. As a result, *Zea mays* germination following planting, and at four month growth height, was lower when compared to the chemically weeded treatment. When compared to the weedy control, the poorer performance of the cover cropping treatments may indicate that, in addition to competition for light, water and nutrients, chemicals released from the decomposing mulches may be interfering with the growth of the crop.

S24MT13P00**INVESTIGATION THE PROBABLE ALLELOPATHIC EFFECTS OF ROOT EXUDATION OF WHEAT (*TRITICUM AESTIVUM* L.) COTTON (*GOSSYPIUM HIRSUTUM* L.) AND SUNFLOWER (*HELIANTHUS ANNUS* L.) ON DIFFERENT GROWTH AND DEVELOPMENT STAGES AND YIELD OF SUNFLOWER****Asadollah Hejazi¹ and Saeid Soufizadeh¹**

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Recognition the toxic effects of chemicals produced by plant residuals in agroecosystems on crops is important. In order to study the allelopathic effects of the root exudations of wheat, cotton and sunflower on different stages of growth and development and yield of sunflower, an experiment was conducted based on a completely randomized design, including a factorial experiment in the Institute of Biochemistry and Biophysics at University of Tehran in 2002. The irrigation treatments consisted of root exudations of wheat, cotton and sunflower each in four concentrations: 0, 50, 100 and 150 mg/lit of water. Characteristics like the height of plant, number of flowers in anthodium, number of seeds, dry matter of forage and seed yield were determined. Results indicated that there were a significant difference between factors and their interactions and also between different concentrations of root residuals in 0.01 level. The surprising finding in this experiment was the effect of cotton root exudation treatment with the dosage of 150 mg/lit on the leaf number of sunflower that had an additive effect in comparison with those of other treatments and caused the leaf number to increase. Generally among the irrigation treatments the impact of exudation of wheat root residual, especially with the dosage of 150 mg/lit on the studied characteristics, as compared with those of other plants, was more negative and caused sunflower seed yield to reduce to 300 kg/hectare, in comparison with that of control treatment with 1100 kg/hectare, which was significantly different in 0.01 level.

S24MT13P00**EFFECT OF ALLELOPATHIC PLANTS ON HOST - VIRUS RELATIONS****J Horváth¹, A P Takács², I Beréz¹ and G Kazinczi²**

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The term allelopathy has recently been broadened, including not only plant-plant interactions but also plant-microorganisms relations. Therefore the aim of our future work was to study the effect of some allelopathic weeds on systemic host - virus relations (*Nicotiana tabacum* 'Samsun' - *Obuda pepper virus* (ObPV); *Solanum nigrum* - ObPV). Water extracts made from the fresh shoots and roots of *Abutilon theophrasti*, *Cirsium arvense* and *Asclepias syriaca* were used for watering and spraying host plants. Hosts were mechanically inoculated with ObPV at four leaves stages. Water extracts of different weed species did not prevent virus infection. In some cases the appearance of systemic symptoms were delayed due to the allelopathic extracts. Sprayed root water extracts of *A. syriaca* and shoot extracts of *C. arvense* only slightly reduced the concentration of ObPV in *N. tabacum* 'Samsun' host. Plant extracts used in *S. nigrum* - ObPV relation, and for irrigation in *N. tabacum* 'Samsun' - ObPV relation did not reduce significantly virus concentration. In one case - sprayed with water extracts of *A. syriaca* roots - promoting effect on virus concentration has been observed in *S. nigrum* - ObPV relation. Our preliminary results suggested that there are no correlations between the inhibitory effect on the test plants and that on the host virus relations.

S24MT13P00**INFLUENCE OF BLACKBERRY (*RUBUS HIRTUS* W.K.) ON THE SESSILE OAK RESTORATION AT FRUSKA GORA MT. (SERBIA)****L Djurdjevic¹, M Mitrovic¹, P Pavlovic¹, S Perisic¹ and M Macukanovic-Jocic²**

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After cut or thinning of trees in the sessile oak and hornbeam forests on Fruska Gora Mt. (Serbia) the blackberry (*Rubus hirtus* W. K.) become overpopulated. Thus the natural forest restoration by seeds is prevented. Despite blackberry is normally present in oak forests it becomes a serious forest weed. The paper analyzes influence of blackberry to the growth of the sessile oak seedlings, and phenolic inhibitors measurements in blackberry leaves and soil under blackberry shrubs (using HPLC). From the beginning of experiment the number of sessile oak seedlings becomes reduced, so that in third year only 2.33 plants/m² (or 9.33 %) remained. In blackberry leaves total bound phenolics content of 21,927.8 µg/g and total free phenolics of 2,472.2 µg/g were measured. The highest content of bound p-coumaric, ferulic and vanillic acid (244.4-500.5 µg/g) was measured whereas the content of free acids was lower. The content of total phenolics and phenolic acids in soil surface layer under the blackberry shrubs was few times lower in comparison to the leaves. We presume that blackberry as the dominant species in degraded stands of the sessile oak and hornbeam forests on Fruska Gora Mt., has a negative allelopathic influence on the sessile oak restoration.

<p>S24MT13P00 CHARACTERIZATION OF FOLIAR-APPLIED POTASH SOLUTION AS A NON-SELECTIVE HERBICIDE IN MALIAN AGRICULTURE</p> <p>M S Martin¹, A R Goble¹, M N'Diaye², B Dembélé², K Gamby² D Mullins¹, R Fell¹, and J H Westwood³</p> <p>¹<i>Virginia Tech, Department of Entomology, Blacksburg, VA 24061;</i> ²<i>Institut d' Economie Rurale, Bamako, Mali; ³Virginia Tech, Department of Plant Pathology, Physiology, and Weed Science, Blacksburg, VA 24061, westwood@vt.edu</i></p> <p>Research in Mali has demonstrated that solutions of potash have herbicidal activity when used as either a soil drench or foliar spray. Although the herbicidal effects of concentrated salts and ash were widely recognized before the era of selective herbicides, no scientific reports exist on herbicidal aspects of potash. Soil-applied solutions of potash are highly phytotoxic but have undesirable persistence, whereas foliar applications show the desirable qualities of a contact herbicide: foliar necrosis of wetted tissues, but no residual effects. To explore the potential of potash as an herbicide, we have undertaken a detailed characterization of this substance. Foliar applications of aqueous potash solutions were toxic to a variety of crops and weeds, including dicot and monocot species. Elemental analysis of potash from Mali showed the major component to be potassium (41,020 ppm) followed by sulfur (883 ppm), phosphate (254 ppm), and other elements at much lower levels. Potash is readily available to Malian farmers as a byproduct of burning wood and crop residues. It is currently used in low amounts as a food additive. This represents an inexpensive, naturally-occurring herbicide that may fill needs for nonselective weed control in Malian agriculture.</p>	<p>S24MT13P00 PHYTOCHEMICAL SCREENING OF <i>MAYTENUS EMARGINATA</i></p> <p>B R Pandit and S Prajapati</p> <p>Department of Life Sciences, Bhavnagar University, Bhavnagar – 364 002</p> <p>The plant <i>Maytenus emarginata</i> [Willd], a member of Celastraceae family, commonly known as "Viklo" is growing luxuriantly in Saurashtra region of Gujarat, India. The thorny shrub is gray to grayish brown in color and used for medicinal purpose. The tender leaves are chewed raw in the treatment of Jaundice. Scientifically no work is available on the study of this plant.</p> <p>Present paper deals with the phytochemical studies. The maximum amount of chlorophyll was observed during winter and maximum amount of proteins, amino acids and percentage of alkaloids were observed during monsoon.</p> <p>The accumulation of heavy metals by plants varies in different taxon and also in different parts of the same taxon. Generally raw consumption of the drug results into accumulation of heavy metals in the human body, which produces many diseases. Hence quantitative analysis of heavy metals was assessed.</p> <p>Out of the eight isolated alkaloids, two are reported as antitumour. Details of all the eight alkaloids are discussed in the paper. The present study suggests that the best time for collecting plants for medicinal uses is monsoon.</p>
<p>S24MT13P00 THE ROLE OF ALLELOPATHY IN THE SPREADING OF WEEDS IN HUNGARY AND ITS INFLUENCE ON THE INCREASING ABUNDANCE OF THE WEEDS POSSESSING SUCH TRAIT</p> <p>Á Tóth¹, L Szentey² and M Torma³</p> <p>¹<i>Central Service for Plant Protection and Soil Conservation, H-1519 Budapest, Pf.:340, Toth.Adam@ntksz.ontsz.hu</i> ²<i>Ministry of Agriculture and Regional Development, Department for Plant Protection and Agro-environment, H-1055 Budapest, Kossuth Lajos tér 11.</i> ³<i>Szeged University, College of Agriculture, H-6800 Hódmezővásárhely, Andrassy 15.</i></p> <p>Spreading and abundance of weeds in Hungarian cultivated areas have been monitored since 1950. Beside four general surveys, a country-wide monitoring programme has been run since 1990 on <i>Ambrosia artemisiifolia</i> and since 2000 on <i>Asclepias syriaca</i> and <i>Cyperus esculentus</i>. In addition to their botanical importance, such surveys are of great interest for plant protection, because a key element of successful weed control is to know, which species are present at a particular place and how high their abundance may be. Moreover, weed management programmes cannot be developed without knowing the trends of weed spreading. As a result of the surveys we could monitor changes of weed populations on cultivated areas. We wanted to find the ecological and economic reasons for increased or decreased importance of certain weeds. Continuing studies in 2003, we found relationships, such as changes of ownership and crop management programmes, building-up of resistance, slow warming and use of new herbicides on large areas (sulfonylureas). In case of certain weed plants, however, there had to be one or more reasons responsible for further enhancing conspicuously fast spreading or increasing weed infestation. With this in mind, we studied the following species: <i>Ambrosia artemisiifolia</i>, <i>Amaranthus retroflexus</i>, <i>Chenopodium album</i>, <i>Cirsium arvense</i>, <i>Matricaria inodora</i>, <i>Datura stramonium</i>, <i>Sorghum halepense</i>, <i>Elymus repens</i>, <i>Helianthus annuus</i>, <i>Xanthium spp.</i>, <i>Abutilon theophrasti</i> <i>Asclepias syriaca</i>, and found a common feature for all of them: ALLELOPATHY. We concluded that a weed species possessing this trait has an advantage over the majority of the other ones during their competition.</p>	<p>S24MT14P00 THE MECHANISM OF ACTION AND SAFETY IN CORN OF MESOTRIONE</p> <p>T R Hawkes¹, D C Holt¹, P G Thomas¹, C J Andrews¹, S Hollingworth¹, M P Langford¹ and G . Mitchell¹</p> <p>¹<i>Syngenta, Jealott's Hill International Research Station, Jealott's Hill, Bracknell, Berkshire U.K. RG42 6EY; Tim.Hawkes@syngenta.com</i></p> <p>Mesotrione, the active ingredient of the herbicide Callisto™, is an inhibitor of the 4-hydroxyphenylpyruvate dioxygenase (HPPD) step in plastoquinone biosynthesis. Callisto™ is used to control broad-leaved weeds in maize. Mesotrione is an especially potent (e.g. Kd 15 pM) inhibitor of HPPD from broad-leaved weeds such as <i>Arabidopsis</i> and, accordingly, forms quite a stable complex (t ½ c. 2d at 25°C) with this enzyme. Safety to corn derives not only from a relatively low rate of herbicide uptake but also from a relatively fast rate of cytochrome P450 catalysed 4-hydroxylation. Accordingly, some sweetcorn lines, which are impaired in their ability to perform this hydroxylation, either as a result of natural/mutational variation or of pre-treatment with cytochrome P450 inhibitors, exhibit significantly increased susceptibility to mesotrione damage. Additional crop safety also derives from the fact that mesotrione is a much less potent inhibitor of the HPPD in monocotyledonous plants than it is of that in dicotyledonous plants. It is, for example, several hundred fold weaker an inhibitor of HPPD from wheat (Kd 7 nM, t ½ for dissociation of the enzyme/ inhibitor complex c. 10 min) than of HPPD from <i>Arabidopsis thaliana</i>. The importance of this inherent target-site resistance to crop safety is illustrated by the fact that, whereas wild-type tobacco is visibly damaged by applications of less than 2 g/ ha of mesotrione, transgenic tobacco engineered to express the HPPD gene from either wheat or oats is fully resistant to applications of several hundred grams.</p>

S24MT14P00**THE ROLE OF THE GLUTATHIONE S-TRANSFERASE ENHANCEMENT IN THE PROTECTIVE ACTION OF HERBICIDE SAFENERS****T Matola and I Jablonkai**

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Herbicide safeners are considered to increase the tolerance of crop plants to herbicides by enhancing the rate of herbicide detoxication in the protected plants. In order to further clarify the significance of induction of glutathione S-transferase (GST) enzymes and endogenous glutathione (GSH) levels in safening the maize against the acetochlor the relationship of structure to safening efficacy, GST and GSH inducibility was studied by using safening and non-safening analogues of the MG-191 safener.

Mono- and dihaloacetals, ketals and amides were synthesised and tested for their ability to alleviate toxicity of acetochlor to maize. Our findings revealed that the presence of dichloromethyl moiety in the safener structure is not a prerequisite for the activity since monohalo acetals and amides showed also reasonable safening activity. Both open-chain and cyclic acetals were less active than the corresponding ketals. The ring size does not seem to be a decisive factor in the safening activity of cyclic ketals. The results on differential enhancement of the GST activity of maize demonstrated that the safener structure affects the specific expression of GSTs mediating detoxication of acetochlor in shoot as well as in root tissues. The amides were more effective inducers of GSH levels than acetals or ketals. Since no correlation was established between the degree of elevation of GSH levels and GST activities and the safening activity of experimental molecules it can be concluded that the protective action of safeners is not necessarily related to their ability to induce factors involved in the acetochlor detoxication.

S24MT14P00**APPLICATION TIMING OF THE SAFENER ISOXADIFEN-ETHYL AFFECTS MAIZE TOLERANCE TO FORAMSULFURON****J A Bunting¹, D E Riechers¹ and C L Sprague²**

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Foramsulfuron is a postemergence sulfonylurea herbicide for use in maize that provides selective control of grasses and some broadleaf weeds. Our objective was to determine the physiological and biochemical basis for differential tolerance of maize hybrids to foramsulfuron. Greenhouse and laboratory experiments using [¹⁴C]foramsulfuron were conducted to determine if hybrid tolerance was due to differential uptake, translocation, or metabolism of the herbicide. Applications of foramsulfuron were made with or without the safener, isoxadifen-ethyl. HPLC analysis of leaf extracts showed that differences in hybrid tolerance were primarily due to differential herbicide metabolism. An organophosphate insecticide, known to inhibit cytochrome P-450 monooxygenases, synergized foramsulfuron activity in both the tolerant and sensitive hybrids, indicating that maize hybrid tolerance to foramsulfuron is at least partially due to herbicide metabolism by P-450s. To further examine the role of the safener, applications of isoxadifen-ethyl were made 24 h before or after, or at the same time as foramsulfuron. The tolerant hybrid was injured when isoxadifen-ethyl was applied 24 h after foramsulfuron, but much less injury was observed when isoxadifen-ethyl was applied 24 h before or at the same time as foramsulfuron. Our current results indicate that the timing of foliar absorption and translocation of the safener isoxadifen-ethyl (relative to the herbicide foramsulfuron) may be a key factor in determining maize hybrid tolerance to foramsulfuron, and that proper spray adjuvants may be required to optimize absorption of foramsulfuron in conjunction with isoxadifen-ethyl. The rate of foramsulfuron metabolism is regulated by isoxadifen-ethyl, and maize hybrids differ in tolerance to foramsulfuron and in their response to isoxadifen-ethyl.

S24MT14P00**INVESTIGATIONS INTO THE MODE OF ACTION OF THE NOVEL GRASS HERBICIDE OXAZICLOMEOFONE****K E Pallett, S K Miller and D J Cole**

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Oxaziclofone (MY-100; 3-[1-(3,5-dichlorophenyl)-1-methylethyl]-2,3 dihydro -6-methyl-5-phenyl-4H-1,3-oxazin-4-one) is a new grass herbicide developed in a partnership between Bayer CropScience and Zenon for the control of *Echinochloa* spp. in paddy rice and transplanted rice. It causes stunting and chlorosis of susceptible grass weeds in the glasshouse, in common with a number of known herbicides, however preliminary investigations indicate no inhibitory effects on known targets and processes. In order to gain some insight of the mode of action of an investigation into the histological and cytological effects of the herbicide has been carried out. Wheat was used as a model species in which the herbicidal symptoms could be readily identified and investigated. These have been compared to those of the growth-inhibiting herbicides, cinmethylin, dichlobenil and oryzalin that exhibit similar symptomology. The symptoms occurring on wheat plants treated with oxaziclofone and cinmethylin did show similarities such as root protuberances and cell wall staining. Other growth inhibiting compounds such as oryzalin (mitotic inhibitor) and dichlobenil (cellulose biosynthesis inhibitor) can be distinguished from oxaziclofone by the appearance of swollen cortical cells and, in the case of oryzalin, by the appearance of aberrant mitotic figures. These studies have shown that the mode of action of oxaziclofone is novel and can be distinguished from those of dichlobenil and oryzalin. There are similarities to cinmethylin, however, initial results have shown that oxaziclofone does not inhibit asparagine synthetase and the target site for oxaziclofone remains to be identified and appears to be unique amongst known and commercialised herbicides.

S24MT18P00**PUTTING WEEDS ON THE BIOSECURITY AGENDA****A C Bishop**

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The Biosecurity agenda internationally, nationally and at a local level tends to focus on animal diseases, zoonoses, and plant disease and pests. More recently, the term biosecurity triggers references to protection against bioterrorism. Weeds are often seen as a separate issue, or at best an adjunct, to the biosecurity agenda. Reasons for this include the complexity of the weed management area, more immediate issues of exotic animal and plant disease spread and containment, and less advanced or developed areas of aspects of weed science such as weed risk assessment, and the biology of invasive weeds.

This paper discusses weeds as an issue in relation to International treaties and agreements. An examination of weeds and how they relate to biosecurity policy development and delivery in Australia at a Federal and State level is also presented. The application of biosecurity approaches to animal and plant pathogens is reported with aspects of these approaches and procedures examined for application to weed issues. The examination indicates sharing of methodology and policy approaches in other biosecurity areas may help standardise approaches to weed biosecurity issues.

Weeds must be recognised as an issue of equal importance to animal and plant pathogens on the biosecurity agenda, if weed impacts are to be effectively contained. Refinement and promotion of weed risk assessment methods, and profiling the importance of weed science in addressing weed issues will assist in this process. Prioritising weeds as a biosecurity issue will require the development of scientifically sound weed management policy both internationally and nationally.

<p>S24MT18P00 EFFICACY AND SUSTAINABILITY ASSESSMENT OF PESTICIDES (INCLUDING HERBICIDES) IN CANADA</p> <p>N Malik</p> <p>Pest Management Regulatory Agency (PMRA), Health Canada, 2720 Riverside Drive, Ottawa, Ontario, K1A 0K9. E-mail address: najib_malik@hc-sc.gc.ca</p> <p>In accordance with the Pest Control Products Act, pesticides must be demonstrated to be safe, effective, and to have a benefit or value prior to acceptance for registration for sale and use in Canada. Pest control products that are subject to registration include herbicides, PGR's, adjuvants, insecticides, fungicides and anti-microbials. PMRA conducts a review of scientific data submitted in support of the proposed use claims and includes an assessment of the efficacy, crop tolerance, impact on rotational crops, resistance management strategy, and contribution to sustainability. Value assessment includes a determination of the lowest effective rate (LER) in terms of level, duration and consistency of control across a broad range of conditions. This avoids excessive dosages that may increase pesticide residues in food and result in increased exposure to applicators, bystanders, and the environment. LER provides a baseline for effective risk assessment and risk management decisions. LER also contributes to sustainable pest management objectives and mitigation of resistance development. A key initiative of PMRA regarding resistance management is the implementation of resistance management labelling which requires the addition of Mode of Action Groups and resistance management statements on the labels of commercial pesticides for agricultural uses. PMRA encourages submission of applications for reduced risk products under the reduced risk strategy. Recently <i>Chondrostereum purpureum</i> was registered for the inhibition of sprouting and regrowth of hardwood species in rights-of-way and forestry sites. Harmonizing efficacy data requirements with international regulatory organizations, such as EPPO, remains an ongoing objective</p>	<p>S24MT18P00 EARLY DETECTION AND IMPROVING CAPACITY TO SUPPORT EMERGENCY RESPONSE TO INVASIVE PLANTS</p> <p>Alan V. Tasker, National Noxious Weed Program Manager</p> <p>U.S. Dept of Agriculture, Animal & Plant Health Inspection Service. Riverdale, MD 20787 alan.v.tasker@aphis.usda.gov</p> <p>Some exotic plant pests leave immediate evidence of their presence. Other types of foreign pests, as well as seeds or other propagules, however, may go undetected for months or even years in the absence of proper surveillance. Without early detection, these pests can become established and permanently damage agriculture and natural resources. The member Agencies of FICMNEW (Federal Interagency Committee for the Management of Noxious and Exotic Weeds) have been engaged in development of an Early Detection and Rapid Response (EDRR) plan to expand the national capacity to detect and respond to invasive plant infestations. APHIS is planning or expanding numerous programs to improve rapid response. These include the APHIS/WSSA weed Listing project, an APHIS Incident Command System, Department of Homeland Security liaison mechanisms, and a new Offshore detection program. Cooperative Agricultural Pest Survey (CAPS) will be a part of this expanded system. Managed by USDA's Animal and Plant Health Inspection Service's Plant Protection and Quarantine (PPQ) program, CAPS reports finds of damaging foreign organisms—exotic plant pests, diseases, and weeds—throughout the United States into the National Agricultural Pest Information System (NAPIS). This database, makes the survey information easily accessible to the public, as well as supporting decision-making and program design. Early response requires identification and verification of detected species, which involves APHIS national identifiers, and will include new CSREES regional identification centers. These programs will be integrated with other new rapid response programs from other State and Federal Agencies.</p>
<p>S24MT18P00 FEDERAL NOXIOUS WEEDS: POTENTIAL PATHWAYS INTO THE UNITED STATES</p> <p>Polly Lehtonen, Botanist</p> <p>U.S. Dept of Agriculture, Animal & Plant Health Inspection Service. Riverdale, MD 20787 polly.p.lehtonen@aphis.usda.gov</p> <p>In a typical year, agricultural inspectors and botany identifiers within the Animal and Plant Health Inspection Service (APHIS) and the Department of Homeland Security intercept and identify about 3,500 Federal noxious weeds. In the five years prior to April 2003, the most frequently intercepted Federal noxious weeds were onionweed (<i>Asphodelus fistulosus</i>), itchgrass (<i>Rottboellia cochinchinensis</i>), red rice (<i>Oryza spp.</i>), swampmorningglory (<i>Ipomoea aquatica</i>), giant hogweed (<i>Heracleum mantegazzianum</i>), turkeyberry (<i>Solanum torvum</i>), and dodder (<i>Cuscuta spp.</i>). Agricultural inspectors at the border find these Federal noxious weeds and others in various pathways, including passenger baggage, bird seed, human foodstuffs, plant and seed shipments for consumption and propagation, herbal medicine and dried flowers. Itchgrass seeds often hitchhike on railroad cars from Mexico; animated oats (<i>Avena sterilis</i>) hitchhike with stones, tiles, and sheepskins from Europe and the Middle East. Cargo and conveyances containing Federal noxious weeds are returned to the country of origin, treated, or destroyed. Inspectors seize and destroy regulated plant material in passenger baggage.</p>	<p>S24MT20BP00 SEED PRODUCTION POTENTIAL OF PREDOMINANT WEED SPECIES IN LOWLAND AND IRRIGATED UPLAND ECOSYSTEMS</p> <p>A.Senthil*, C. Chinnusamy, R. Shanmugasundaram and O.S. Kandasamy</p> <p>AICRP-Weed control unit, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003, INDIA</p> <p>Seed production potential of predominant weed populations needs to be taken into account when estimating the long-term impact of any crop management practices. Prediction of weed seed production under field conditions is essential to the successful adoption of crop management practices, which will give the idea about subsequent weed infestations ensuing from a well-stocked seed bank. Twenty-five plants in each weed species were selected randomly from the cropped fields of low land and irrigated upland condition and the number of seeds produced per plant and weed seed rain were calculated based on the no. of fruits and seeds per fruit and number of plants per square meter. In low land ecosystem, between the two predominant grassy weeds, higher seed production potential was observed with <i>Echinochloa clona</i> (3,530 seeds / plant). But, <i>Echinochloa crus-galli</i> contributed for higher weed seed rain of 92,254 seeds / m². Among the two predominant broad leaved weeds, <i>Ammania baccifera</i> had higher seed production potential as well as weed seed rain recording 2,670 seeds / plant and 33,110 seeds/m². In upland irrigated condition, <i>Trianthema portulacastrum</i> was the dominant weed closely followed by <i>Parthenium hysterophorus</i>. However the seed production potential was higher with <i>Parthenium hysterophorus</i> (10,130 seeds / plant). The higher seed production potential of <i>Parthenium hysterophorus</i> contributed for the highest weed seed rain of 2,43,126 seeds / m².</p>

<p>S24MT20BP00 STUDY ON WEED SEED BANK AT DIFFERENT SOIL LAYERS OF LOWLAND AND IRRIGATED UPLAND SITUATIONS</p> <p>A.Senthil*, C. Chinnusamy, R. Shanmugasundaram and O.S. Kandasamy</p> <p>AICRP-Weed control unit, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003, INDIA</p> <p>Composition of weed flora depends on seed bank composition and its dynamics. Seed bank is the source of weeds that persist in agricultural fields. The composition and density of weed seed in the soil vary greatly but are closely linked to the cropping history of the land. Hence a study on weed seed buildup under different agro ecosystems (low land and irrigated upland conditions) was made so as to predict the population of weed species in subsequent crops. Soil samples from 0-15 cm and 15-30 cm depths were collected from different locations of low land and irrigated upland conditions and were spread over shallow trays for germination and observations were recorded on number of weed seeds germinated and species wise emerged weeds. Significant differences were found for total weed seed density in each soil layers between different sampling locations (Blocks) of both lowland and upland irrigated conditions. Generally more number of weed seeds was observed in the upper layers (0-15 cm) than in the deeper layers (15-30 cm). Occurrence of grassy weeds was distinctly higher in the composition of weed seed bank in low land condition whereas, in upland irrigated condition broad-leaved weed species dominated the composition. <i>Echinochloa crus-galli</i> and <i>Eclipta alba</i> were the dominant grassy and broad leaved weed species respectively under lowland clay soil condition, whereas in irrigated upland with vertisol condition, <i>Echinochloa cruda</i> and <i>Trianthema portulacastrum</i> were the dominant grassy and broad leaved weed species respectively.</p>	<p>S24MT20BP00 ASSESSMENT OF COMPETITION BETWEEN TOMATO (<i>LYCOPERSICON ESCULENTUM MILLER</i>) AND BARNYARDGRASS (<i>ECHINOCHLOA CRUS-GALLI</i> [L.] P. BEAUV.) WITH A RECIPROCAL YIELD MODEL</p> <p>A Atri and M Partovi</p> <p><i>Plant Pests and Diseases Research Institute, P.O. Box 1454, Tehran 19395, Iran, atri@ppdri.ac.ir</i></p> <p>Barnyardgrass is one of the most important noxious weeds of tomato fields in Iran. An experiment was conducted at the Varamin Research Center during 2000 to study competition between tomato and barnyardgrass. The experimental design was a randomized complete block with 15 treatments and three replications. The treatments included pure stands of tomato at 2, 4 and 6 plants/m², barnyardgrass at 10, 60 and 110 plants/m², and mixed stands of the two species at complete factorial densities. Results indicated that tomato was a stronger competitor than barnyardgrass. The biologic and economic yields of tomato were affected mainly by intraspecific competition, while interspecific competition was mostly responsible for variation of these characteristics in barnyardgrass. Evaluation of competitive ability by comparing regression coefficients showed that the effect of each tomato plant on its economic and biologic yields was equivalent to 29 and 31 plants of barnyardgrass, respectively. In other words, each 0.034 and 0.032 plants of tomato had an equivalent effect of one barnyardgrass on reciprocal biologic and economic yields of tomato.</p>
<p>S24MT20BP00 QUANTITATIVE COMPETITION OF VOLUNTEER RYE (<i>SECALE CEREALE</i> L.) IN WHEAT (<i>TRITICUM AESTIVUM</i> L.).</p> <p>Alireza Atri¹ and Mohammad Ali Baghestani¹</p> <p>¹<i>Plant Pests and Diseases Research Institute, P. O. Box .19395-1454, Tehran, Iran. alirezaatri@yahoo.com</i></p> <p>In order to study the competition effects by using reciprocal yield model of wheat against volunteer rye, an experiment was conducted at Research Center of Karaj and Varamin during 2001 and 2002 years. The experimental design was randomized complete block with 24 treatments and 4 replications. The competition design was bivariate factorial. The treatments included the pure stands of wheat at four-plant densities 350, 450, 550 and 650 plant/m² and volunteer rye at 10, 30, 50 and 60 plant/m² and mixed stands of two plants at complete factorial densities. Results indicated that the rye was a stronger competitor compared to wheat under water stress. With increasing precipitation, competitive ability of wheat increased against volunteer rye. The biologic and economic yields of wheat were mainly affected by interspecific competition in Karaj region. There was the same results at the first year of experiment in Varamin region, but at the second year due to increasing precipitation the biologic and economic yields of wheat were equally affected by inter and intra specific competition. Economic yield was more affected compared to biologic yield by rye densities. Evaluation of competitive ability, using regression coefficients showed that in Karaj, the effect of each rye plant on reciprocal grain yield of wheat at first and second years were equivalent to 3 and 2 plants of wheat, respective and in Varamin were equivalent to 3 and 1.2 plants of wheat, respectively. In other words, each 0.36 and 0.51 plants of rye in Karaj and each 0.33 and 0.84 plants of rye in Varamin had an equivalent effect of one wheat on reciprocal economic yields at first and second years, respectively.</p>	<p>S24MT20BP00 STUDY ON MORPHOLOGICAL AND PHYSIOLOGICAL CHARACTERISTICS AFFECTING ON COMPETITIVENESS OF WINTER WHEAT (<i>TRITICUM AESTIVUM</i>) AGAINST WILD OATS (<i>AVENA LUDOVICIANA</i>)</p> <p>Eskandar Zand¹ and Mohammad Ali Baghestani¹</p> <p><i>Weed Research Department, Plant Pest and Disease Research Institute, P.O.Box 1454, Tehran 19395, Iran, eszand@yahoo.com, baghestani@hotmail.com,</i></p> <p>In order to determine the effects of the morphological and physiological characteristics of different wheat genotypes against wild oats (<i>Avena ludoviciana</i>), field trials were carried out at weed research station of Plant Pest and Diseases Research Institute near the Karaj city during the 2000-2001 and 2001-2002 growing season . The experiments were conducted as a randomized completed block design with four replications and with factorial arrangement of treatments. Treatments included six wheat genotypes at two weedy levels (weedy and weed free). The wheat genotypes used in this study were three more-competitive (MC) genotypes (6618, M-75-5, M-75-13) and three less-competitive genotypes (Alamoot, Ghafghaz and M-75-5).The experiments results indicated that 6618 and M-75-5 genotypes were MC and LC, respectively on the base of competitive index (CI), wild oats biomass and grain yield in pure and mixed stand. Results indicated that wheat MC genotypes can be distinguished from LC ones through canopy height, total fertile stem, leaf area index (LAI), cumulative total dry matter (CTDM), crop growth rate (CGR), and relative growth rate (RGR). These criteria can be used in plant breeding program for screening MC genotypes from LC ones against wild oats.</p>

S24MT20BP00**RESEARCH ON ABUTILON THEOPHRASTI/MEDICUS COMPETITION AND CONTROL IN SUGAR BEET****E. Bördner¹, R. Gerhards¹, P. Hamouz² and J. Soukup²**¹*Institute of Agronomy, University of Bonn, Katzenburgweg 5, D-53115 Bonn, E-Mail: boerdner@uni-bonn.de, r.gerhards@uni-bonn.de*²*Czech University of Agriculture, dpt. of General Plant Production, Kamycka 957, 16521, Prague CZ, E-Mail: hamouzp@af.czu.cz, soukup@af.czu.cz*

Abutilon theophrasti (Velvetleaf), is cultivated as a fibre crop in China and Tibet. From there it spread out to the Balkan and the Mediterranean Countries and was introduced to America and Australia through the settlers. In the USA and Canada, it is one of the worst weeds in soybean and cotton. For about ten years, *A. theophrasti* occurs in Germany, mostly in sugar beet fields. It is tolerant to most sugarbeet herbicides. Field studies were conducted in Czech Republic and Germany in 2003 to quantify competition effects between sugar beet, *A. theophrasti*, and other weed species and to test several control methods. The number of seedlings for all species observed, the development stage and the aboveground biomass, beet weight and the number of *A. theophrasti* capsules were determined over the growing season. Averaging all treatments and independent of other weeds' competition sugar beet yield was significant reduced when the density of *A. theophrasti* was moderate to high (36-300 plants per m²) compared to a low density (2.7-9.3 plants per m²). Sugar beet yield is negatively correlated to *A. theophrasti* density and aboveground biomass. The common herbicide-mixture with the active components Desmedipham, Phenmedipham, Chlорidazon, Quinmerac, Ethofumesat and Haloxyp-R could control all weed species except for *A. theophrasti*. Therefore *A. theophrasti* could produce highest aboveground biomass in these plots. The additional application of Safari (Triflusulfuron) decreased *A. theophrasti* density and aboveground biomass and thus increased yield of sugarbeet by 23 %. The combination with a hoe increased yield by 41 %. Other combined treatments did not suppress *A. theophrasti* competition. Because of the strong competition effect, the lack of effective control methods and the large number of seeds produced by *A. theophrasti* it is recommended to document sugar beet fields where this species has been introduced and to develop new control strategies against *A. theophrasti* in sugar beet including chemical, mechanical and prophylactic agents.

S24MT20BP00**IMPACT OF FALLOWING WITH OR WITHOUT CHROMOLAENA ODORATA ON THE WEED COMMUNITIES IN SUBSEQUENT CROP FIELDS IN CAMEROON****M. P. Ngobo¹, S.F. Weise¹ and M.A. McDonald²**¹*International Institute of Tropical Agriculture, P.O. Box 2008 (Messa) Yaoundé, Cameroon. Email: m.ngobo@cgiar.org and s.weise@cgiar.org; ²SAFS, University of Wales, Bangor, Gwynedd LL57 2UW, United Kingdom. Email: mamcdonald@bangor.ac.uk*

In the humid forest regions of south Cameroon (central Africa), sectoral and macroeconomic policy reforms that occurred in the late 1980s led to a land-use intensification process, with amongst other environmental consequences, a shortening of fallow duration. Herbaceous fallows dominated by the Asteraceous shrub *Chromolaena odorata* (L.) King & Robinson are replacing secondary forest fallow lands. A trial was established to differentiate the impact of Chromolaena dominating fallow from the influence of site edaphic traits, independent or not from Chromolaena domination, on the weed composition. Weed species associated with the plots were assessed 6, 14, 30 weeks after planting the crops. Cassava, maize and groundnuts were intercropped in the fields opened from 5 - 7 year old fallows of Chromolaena or non-Chromolaena plots with different fallow histories. Soil samples were taken from each study plot to assess the impact of some soil parameters on the distribution and abundance of dominant weed species. Results clearly indicate an enrichment of the weed flora with time after planting, in all treatments, but not much difference between treatments if not for the richer weed flora in fields established after clearing fallows not dominated by Chromolaena. When studying responses to soil characteristics, there were obviously two groups of weed species: on one side Chromolaena associated with secondary forest pioneer species and on the other side, 'problem' weeds such as *Stachytarpheta cayennensis* (Rich.) J. Vahl, *Cyperus rotundus* L. and *Sida rhombifolia* L. that were more abundant in fields planted after Chromolaena-dominated fallows.

S24MT20BP00**CARACTERIZATION OF RED RICE BIOTYPES UNDER COMMERCIAL CONDITIONS IN THE RIO ZULIA IRRIGATION DISTRICT IN THE DEPARTMENT OF NORTE DE SANTANDER, COLOMBIA**CANAL, RAFAEL.¹ y ARNAUDE DE CH. OLGA²¹ Coagronorte. Cúcuta. Colombia. E-mail: rcanalp@yahoo.com² Universidad Nacional Experimental del Táchira. Decanato de Investigación. Dpto de Agronomía. Lab. de Fisiología Vegetal. Email: oarana@unet.edu.ve

Red rice (*Oryza sativa*) is a competitive weed that is widely distributed among rice fields in Colombia. Because red rice is conspecific with commercial rice and has similar nutritional and agro-climatic requirements it is difficult to control selectively in the rice crop. Research was conducted to identify and characterize red rice biotypes and to determine the importance of this weed under commercial conditions in the Rio Zulia irrigation district in the Department of Norte de Santander, Colombia. For morphological characterization, twenty-two red rice biotypes and three commercial rice varieties (Oryzica-1, Oryzica-3 and Fedearroz-50) were planted in pots filled with a representative rice soil in a randomized complete block design with three replications. The seeds of the red rice biotypes had black- or straw-colored glumes that were more pubescent than those of commercial varieties. Red rice biotypes were also characterized for the shattering of their seed and their greater tendency to lodge compared to commercial rice. According to the field survey, red rice infestations varied between 7 % and 22 % in the zones known as La Floresta and Buena Esperanza, respectively. The ample morphological variability and the high infestation levels observed corroborate that red rice is a problematic weed and that additional efforts should be made to control it, especially by integration of tactics to decrease its prevalence and negative impact on rice yield.

S24MT20BP00**THE MELLIFEROUS WEED FLORA IN BLACE SURROUNDING (SERBIA)****S. PERIŠIĆ¹, B. KARADŽIĆ¹, L. ĐURĐEVIĆ¹, M. MAČUKANOVIĆ-JOCIĆ²**¹*Institute for Biological Research "Siniša Stanković", 29. Novembra 142, 11060 Belgrade, Serbia and Montenegro e-mail: profazs@beotel.yu*²*Faculty of Veterinary Medicine, University of Belgrade, Bulevar JNA 18, 11000 Belgrade, Serbia and Montenegro*

The melliferous weed flora near Blace region (south Serbia) was analyzed in this article. Floristic research was conducted during the period from 1997-2001. Out of total number of plants (448), weeds apiflora involved 124 (25.41%) species. Melliferous weed species belong to 29 families, out of which Asteraceae (16.13%), Fabaceae (15.32%) and Lamiaceae (14.51%), exceed in number. Indices of nectar (Inp) and pollen production (Ipp) were assessed according to the methods Jašmak (1980) and Umeljić (1999). The most significant melliferous species (plants with the highest nectar and/or pollen production index) are: *Anchusa officinalis*, *Atropa bella-donna*, *Calamintha vulgaris*, *Campanula rapunculoides*, *Campanula trachelium*, *Carlina vulgaris*, *Echium vulgare*, *Glechoma hederacea*, *Rubus caesius*, *Malva sylvestris*, *Lotus corniculatus*, *Lythrum salicaria*, *Brassica nigra*, *Centaurea cyanis*, species of genus *Stachys*, *Plantago* and *Trifolium*.

According to indicator values with respect to moisture, light, temperature, soil acidity (pH values) and observed nitrogen concentrations in the soil, analyzed species are classified into 12 ecological groups and 10 subgroups.

On the basis of performed research, it may be concluded that weeds represent very important source of pollen and nectar. Their proportion in the flora of Blace surrounding is significant and they are also important indicators of the habitat.

<p>S24MT20BP00 MORPHOLOGICAL RESPONSE TO ABOVE- AND BELOW GROUND COMPETITION IN SEEDLINGS OF <i>RUMEX CRISPUS</i> L.</p> <p>E A Pye, M L Hansson and P Redbo-Torstensson</p> <p><i>Department of Ecology and Crop Production Science, SLU, Sweden.</i> <i>Alexandra.Pye@evp.slu.se, Margareta.Hansson@evp.slu.se, Peter.Redbo-Torstensson@evp.slu.se</i></p> <p>The aim of the study was to investigate how a problematic weed species copes with nutrient- and light-related stresses caused by interspecific root and shoot competition, respectively. This knowledge is important for the process of developing efficient non-chemical control strategies. <i>R. crispus</i> seeds were sown into a dense <i>Lolium perenne</i> L. sward established in boxes. Using a split-plot design, half of the <i>Rumex</i> seedlings were grown in a polythene pipe to exclude root competition and the other half in gaps of corresponding diameter. Additional treatments were fertiliser levels (70 and 180 kg N/ha) and clipping of the sward to either five or twelve cm height. After three months, fresh and dry weights for shoots and roots (tap root and fine roots) were measured, as well as the number of leaves and total leaf area. The exclusion of root competition was by far the dominate factor influencing the performance of the <i>Rumex</i> seedlings. Seedlings growing in pipes had a higher number of leaves, a greater total leaf area, and higher dry weight for both shoots and roots. Clipping regime strongly affected plant morphology, causing thinner and fewer leaves with longer rosette petioles in the taller sward. Nitrogen level had little direct effect, but often interacted with light level as seedlings competed more successfully for light when nitrogen was available. The main conclusion is that root competition decidedly reduces growth of <i>Rumex crispus</i>, while the species makes morphological adaptations in response to shoot competition.</p>	<p>S24MT20BP00 ECOPHYSIOLOGICAL TRAITS ENHANCING COMPETITIVENESS OF IRANIAN WINTER WHEAT (<i>TRITICUM AESTIVUM</i>) AGAINST WILD OAT (<i>AVENA LUDOVICIANA</i>)</p> <p>Hamid Rahimian Mashhadji¹ and Eskandar Zand²</p> <p>Tehran University, College of Agriculture, Karaj, Iran , hrahimian@hotmail.com 2- Dept. of Weed Science, Plant Pest & Diseases Research Institute, Tabnak Ave. Evin, Tehran, Iran, eszand@yahoo.com</p> <p>An experiment was conducted during 1996-1997 growing season in Mashhad,(NE of Iran) to evaluate the genetic improvement in ecophysiological traits that contributes to competitiveness of Iranian winter wheat cultivars against wild oat. Six Iranian winter wheat cultivars released during the past 40 years were planted in a randomized complete block design with factorial arrangement of treatments and three replications. Each cultivar was planted at its own optimum seeding rate with and without wild oat competition. Wild oat was planted at a constant density of 80 plants per square meter. The results showed that more recent cultivars had much higher competitive ability than older cultivars. Alvand (The most recent cultivar) had higher dry matter accumulation rate, crop growth rate (CGR), leaf area index (LAI) and relative leaf area growth rate (RLGR) compared to Bezostaya (the oldest cultivar). Alvand positioned a higher proportion of its leaf area in the upper canopy layer. Wild oat height was lower when it was competing with Alvand in comparison to when it was competing with Bezostaya. It was found that following characteristics were the most important criteria to evaluate the competitive ability of winter wheat against wild oats: 1) Leaf area at the end of wheat tillering stage. 2) Final wheat leaf area index.3) Relative leaf area index of crop in comparison to wild oat, and 4) The canopy layer where the highest wheat leaf area is positioned</p>
<p>S24MT20BP00 DEVELOPMENT AND COMPETITION OF <i>CYNODON DACTYLON</i> (L.) PERS. IN SUGAR CANE</p> <p>M. A. A/Rahman</p> <p>Sugar cane Research Dept., Kenana Sugar Co., Sudan</p> <p>A field study was conducted on the furrow irrigated sugar cane fields of Kenana Sugar Company, Sudan. The objective was to assess the growth and competitiveness of <i>Cynodon dactylon</i> (L.) Pers. that was established in newly planted cane (PC) and continued into subsequent ratoon crops. One week after cane planting, <i>C. dactylon</i> seedlings three weeks old, were transplanted along the cane rows at a density of 31 plants/ 10m row. The infestation was allowed to compete with sugar cane for the entire growing seasons. At the end of the first year crop (PC), The biomass of shoots and rhizomes of <i>C. dactylon</i> were 162 g/m² and 1.8 Kg/m³, respectively. The shoot biomass of <i>C. dactylon</i> increased to 257 and 277 g/m² in the second (1R) and Third (2R) year crop, respectively. Likewise, the biomass of rhizomes increased to 4.7 and 5.6 Kg/m³, respectively. Sugar cane stalks populations and cane yields also decreased progressively with each successive crop where <i>C. dactylon</i> was better established.</p> <p>Key words: <i>Cynodon dactylon</i>, competition, sugar cane, crop cycle</p>	<p>S24MT20BP00 ROLE OF MOISTURE AND PLANT POPULATION ON COMPETITION BETWEEN WHEAT AND WILD OAT UNDER LATE SOWN CONDITIONS</p> <p>Samunder Singh^{1,2} and R. K. Malik¹</p> <p>¹<i>Department of Agronomy, CCS Haryana Agricultural University, Hisar 125 005, India.</i> ²<i>Presently, visiting fellow, University of Florida, USA. samunder@crec.ifas.ufl.edu</i></p> <p>Wild oat (<i>Avena ludoviciana</i>) is the most competitive grass weeds of wheat in India. Crop-weed competition is influenced by several factors including sowing time, moisture and plant geometry. Delayed sowing of wheat from November to December in north-west India has been found better where wild oat is a dominant weed. Increased control of wild oat by herbicides under late sowing could be due to poor competitive ability of wild oat and can be exploited for better weed control efficacy. Weed competition studies were carried out under field conditions using rhizotron tubes of 1.25 m length placed in trenches and covered with soil to provide natural climate. Six plant population (6:0, 5:1, 4:2, 3:3, 2:4, 1:5) and three moisture ratios (0.6, 0.9 and 1.2 ID/CPE) were compared in dunal sand supplemented with Hewitt nutrient solutions with 4 replications. Plant height, total and effective tillers, root length, root/shoot weight and grain yield was recorded at harvest. Increase in moisture from 0.6 to 1.2 ID/CPE ratio, significantly increased effective tillers, plant height, shoot weight and grain yield of wheat, but total tillers, root length and root weight was unaffected, data averaged over population. The grain yield of wild oat decreased with increase in moisture in competition with wheat; other parameters were unaffected except increase in shoot weight. Plant population of wheat and wild oat in the rhizotron tubes had significant effect on the recorded parameters except plant height. The data suggests that wheat was more competitive with wild oat under late sown conditions.</p>

S26MT26P01
**EXPERIENCES WITH APPLICATION OF CONSERVATION
AGRICULTURE IN KENYA: CASES FROM THE SEMI-ARID
FOOT SLOPES WEST AND NORTH-WEST OF MOUNT
KENYA.**

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Rapid population growth and food demand on the dry foot slopes West and North-West of Mount Kenya have lead to high natural resources pressure and an urgent need for sustainable production approaches. The paper examines experiences of small and large scale farmers with conservation agriculture. Small scale farmers growing maize, beans, wheat and potato were sampled. Conservation farming methods included ripping, mulching with minimum tillage and mulching with minimum tillage and agroforestry. On large scale, a farm practising conventional tillage was compared to an adjacent farm practising conservation tillage. Under small scale farming, ripping increased soil moisture, reduced runoff and increased grain yields. Mulching with minimum tillage drastically reduced runoff and doubled ASW at the beginning of the season and could double maize and bean grain yields in average seasons. To reduce evaporation losses, farmers combined Gravellia (wind break) and minimum tillage with mulch and root pruning. Gravellia also provided shade, mulch, fodder, firewood and timber. On large scale, conservation tillage lead to higher ASW and wheat yields, lower fuel cost, fewer dust storms, better soil structure and reduced soil erosion. Both small and large scale farmers applied herbicides to control weeds. Large scale farmers fallowed (sheep grazed) in a rotation basis. Conservation farming will play an important role in realizing food security in the area. Recently, a WOCAT film has raised the interest and participation of different stakeholders. Challenges include farmer training, further dissemination, affordable farm equipment and policy development. Progress will depend on active participation of all stakeholders.

S26MT26P03
**CONSERVATION TECHNOLOGIES FOR SUSTAINABLE
MANAGEMENT OF THE RICE-WHEAT CROPPING SYSTEMS
OF THE INDO-GANGETIC PLAINS (IGP)**

Raj Gupta¹ and Ashok Seth²

Rice and wheat are the staple food crops occupying nearly 13.5 million hectares of the Indo-gangetic plains (IGP) of South Asia covering Pakistan, India, Bangladesh and Nepal. These crops contribute more than 80% of the total cereal production and are critically important to employment and food security for hundreds of millions of rural families. The demand for these two cereals is expected to grow between 2 to 2.5% per annum until 2020, requiring continued efforts to increase production and productivity. Expansion and intensification of the rice-wheat system during the Green Revolution (GR) period involving use of high yielding varieties, fertilizers and irrigation starting from the 60s led to increased production and productivity of both these crops. However, continued intensive use of GR technologies in recent years has resulted in lower marginal returns and, in some locations to salinization, overexploitation of groundwater, physical and chemical deterioration of the soil, and pest problems. This paper presents findings from recent research on resource conservation technologies involving tillage and crop establishment options that are enabling farmers to sustain productivity of intensive rice wheat systems. Field results show that the resource conservation technologies provide higher yields, reduce water consumption, and show promise in reducing negative impacts on the environment. The paper assesses the role played by institutional innovations in international agricultural research and socio-economic changes in the IGP countries in the rapid development and adoption of these technologies by farmers.

S26MT26P02
**CONSERVATION TILLAGE PRACTICE IN SUB-SAHARAN
AFRICA: EXPERIENCE OF SASAKAWA GLOBAL 2000**

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Sasakawa Global 2000 (SG 2000), an international NGO for assisting small-scale farmers in Sub-Saharan African Countries to increase staple food crop production, has introduced Conservation Tillage (CT) technology to Ghana in 1993.

In collaboration with the national Crops Research Institute (CRI) and the private company, SG 2000 has developed "No-till with mulch" cultivation system especially suited to small-scale farmers. Farmers obtained 3 to 6 t/ha of maize compared with 1t/ha by traditional one. CT technology package of SG 2000 having herbicides and fertilizer offers various advantages such as increased organic matter on the soil surface, soil erosion prevention, soil fertility restoration in the long run. Farmers can reduce labour, save time and expand the size of cultivated area at little cost. CT is profitable even using such input as herbicides, improved seed and fertilizer.

Widely adopted by a large number of small farmers in Ghana, now the practice has been spreading to Mozambique, Ethiopia, Malawi, and more countries where SG 2000 are in operation.

By using CT technology, farmers do not need to plow the fields for preparation. And applying an herbicide before planting, farmers are relieved from weeding usually done by hand labour. Weeds killed by an herbicide then dry up and become part of the mulch cover.

This study proves that CT technology is a vital tool for promoting agricultural development in a sustainable manner. Examples of CT practice in selected SG 2000 country projects are discussed and impact of CT on various aspects is elaborated.

S26MT26P04
**EFFECT OF HERBICIDES ON WEEDS IN WHEAT (*Triticum
aestivum* L.) AS INFLUENCED BY TILLAGE SYSTEMS**

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Rice-wheat system is most common crop sequence in North-Eastern plain of India. For resource conservation no-till system is gaining acceptance for wheat cultivation. This has led to considerable change in population dynamics of weeds in wheat. Field studies were conducted during 2000-01 and 2001-02 to study the efficacy of isoproturon plus 2,4-D at 0.75 + 0.5 kg ha⁻¹, triasulfuron at 0.02 kg ha⁻¹, sulfosulfuron at 0.025 kg ha⁻¹, metribuzin at 0.175 kg ha⁻¹ and clodinafop at 0.06 kg ha⁻¹ in no-till and tilled systems. All herbicides were applied at 30 days after sowing with a hand sprayer in 500 L ha⁻¹ of water as post-emergence spray. Weeds enclosed in a quadrat of 0.25 m², randomly placed in each plots, were analyzed for species compositions and cumulative dry weight of weeds. Pre-dominant weed species were *Rumex retroflexus*, *Phalaris minor* Retz., *Melilotus alba* Medicus, *Chenopodium album* L. and *Cyperus rotundus* L. Lower population of all weeds were recorded in no-till than tilled plots. Dry matter accumulation followed the similar trend. Tank mix application of isoproturon plus 2,4-D had minimum population and dry weight of weeds. The herbicides ranking according to weed control was: isoproturon plus 2,4-D > triasulfuron > sulfosulfuron > metribuzin > clodinafop. Wheat yields were higher in no-till plots than tilled plots. Herbicide mixture of isoproturon plus 2,4-D had maximum wheat grain yield in both the systems of crop establishment. Triasulfuron, sulfosulfuron, metribuzin and clodinafop were effective against most, if not all weed species and enhanced wheat grain yield.

S26MT26P05**UTILIZATION OF LOCAL ORGANIC FARM RESOURCES IN INTEGRATED NUTRIENT MANAGEMENT FOR SUSTAINABLE AGRICULTURE IN EASTERN INDIA**

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The productivity in different cropping systems in India is declining day by day due to more dependence on chemical fertilizers and low use of organics. The farmers have to use more quantities of fertilizers to sustain the production level. The experiments conducted in different locations of the university farms as well as farmers field have confirmed that the sustainability in production can be maintained if 25-50 % of the nutrient requirement is met through organic resources like decomposed straw, green manure , biofertilize , enriched compost & crop residues. The results revealed that the substitution of 25-50 % nitrogen in rice through organic sources in Rice-Wheat System gave equal or higher yields over 100% NPK through chemical fertilizers. Application of 20Kg /ha extra N at last ploughing helped in efficient residue management in Rice-Rice System. The low cost enriched compost prepared by the farmers from farm wastes are useful in sustainable Agriculture. The use of organics not only make the production sustainable but also mitigate the multi nutrient deficiencies like S and micronutrients. Inclusion of groundnut greengram and other legumes in cropping system are useful in sustainable Agriculture particularly in Rice-Rice and Rice-Wheat cropping System .in India.

S26MT5P01**EFFECTS OF MOLINATE AND SULFONYLUREAS USED FOR WEED CONTROL IN PADDY RICE ON *LEMNA MINOR***G. Dinelli¹, I. Marotti¹, A. Bonetti¹, M. Minelli¹ and P. Catizone¹

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Aquatic plant toxicity tests are frequently conducted in environmental risk assessment to determine the potential impact of contaminants on primary producers. For the evaluation of agricultural impact on rice paddy organisms, the chemical approach is not sufficient. The present study was designated to evaluate acute toxicity of several herbicides (molinate, azimsulfuron, bensulfuron, cinosulfuron, ethoxysulfuron and metsulfuron) on *Lemna minor* L. using the growth inhibition test. In addition, the phytotoxicity of adjuvants extracted from granular and emulsifiable liquid molinate formulations on *L. minor* was investigated. The herbicides were chosen as commonly used for weed control in rice paddies, an environment where *L. minor* commonly lives. The experimental approach involved standard laboratory conditions for the different chemicals. Plant growth was monitored over 12-days period following treatments by counting the fronds present and by determining leaf parameters (total leaf area, total leaf perimeter, chlorosis). After 12-days fresh and dry weight of *Lemna* plants were determined. The toxic endpoint (EC_{50}) was 4.2 mg ai / L for pure molinate, while the EC_{50} ranged between 0.5 and 15 μ g / L for sulfonylurea herbicides. The molinate adjuvants showed toxic endpoints ranging between 250 and 500 mg/L. At low concentration (5-20 mg / L) the adjuvants extracted from molinate granular formulation caused an increase of *Lemna* growth rate. The results indicated that immediately after the treatments with molinate and certain sulfonylureas the concentration of the active ingredient in paddy rice water exceeded the phytotoxicity threshold for *L. minor*.

S26MT5P02**ATRAZINE IN WATER AND BIODEGRADATION IN A RECHARGE AREA OF GUARANY AQUIFER IN BRAZIL**

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The region of Ribeirao Preto City, Brazil, is an important agricultural area and recharge location for groundwater of the Guarany Aquifer. This paper reports research conducted to study atrazine in the Aquifer as well as biodegradation in soils of the area. Surface and ground water were collected and atrazine was measured by HPLC (High Performance Liquid Chromatography) followed by studies to predict leaching on the area by the CMLS-94, Chemical Movement Layered Soil simulation model. Soil samples were collected monthly for general microbiological and atrazine biodegradation studies. Treatments with incubation in various media were conducted and atrazine was measured by HPLC. Water samples collected showed only four atrazine detections in surface water with residues varying from 0.02 to 0.09 ppb. However, none of them were confirmed with GC-MS. No atrazine was detected in groundwater samples. Data obtained by the CMLS-94 simulations predicted that atrazine would not have reached the depth of the confined aquifer (40m). Soil incubation results have shown that some samples were able to degrade totally atrazine in the medium without N source, but they remained intact in N medium showing large variation depending on soil and media conditions. The detection of the presence of atrazine biodegrading microorganisms may explain the absence of residues in groundwater at the edge of the watershed, as shown in the water residue analysis and in the simulation model.

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S26MT5P03**EFFECT OF GYPSIFEROUS WATER ON THE BIOLOGICAL ACTIVITY OF ATRAZINE, 2,4-D AND METOLACHLOR**SL Masike¹, CF Reinhardt² and LK Kanyomeka³

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Possible herbicide injury to crops has been reported in areas where gypsiferous water is used for irrigation, suggesting a possible interaction between herbicides and gypsiferous water. This utilization of gypsiferous water for irrigation of crops is one major method promising to reduce the problem of effluent mine drainage disposal and also the shortage of irrigation water. Gypsiferous water is already used for irrigation of crops such as maize and wheat, on a commercial scale. The influence of gypsiferous water on key behavioural aspects of three important herbicides: atrazine, 2,4-D and metolachlor were assessed in separate pot experiments. Dose response curves for the parameters' dry matter yield were obtained with a herbicide concentration range consisting of ten rates. Gypsum was mixed thoroughly with soil at the rate of 10% gypsum per total volume. Bioassay experiments were done to assess the bioactivity of the three herbicides in the presence or absence of gypsum. The results indicated that the activity of atrazine and 2,4-D were significantly increased in the presence of gypsum, while that of metolachlor was significantly reduced. These differential effects on herbicide activity would have important practical consequences for herbicide performance, i.e. weed control efficacy, selectivity, and behaviour in soil.

S26MT5P04**PERSISTENCE OF CHLORSULFURON IN SANDY LOAM SOIL IN RELATION TO TEMPERATURE**

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An experiment was conducted during 2000-2001 to study the persistence of chlorsulfuron in a sandy loam soil incubated for different periods (0, 7, 15, 30, 60 & 120 days) at 15, 25, and 35 °C, using maize (*Zea mays L.*) as test plant in the screen house at Chaudhary Charan Singh Haryana Agricultural University, Hisar, India. The degradation of chlorsulfuron was found to be positively correlated with temperature. The increase in dry weight of shoot of maize at different incubation periods as compared to zero day incubation was 16, 24, 39, 56 and 72 % at 7, 15, 30, 60 and 120 days of incubation, respectively. Whereas, increase in concentration of chlorsulfuron (0 to 40 ppb) caused significant reduction in dry weight of maize shoot. The relative decrease in shoot dry weight was 48, 54, 64, 74 & 82 % with 2.5, 5, 10, 20 & 40 ppb chlorsulfuron, respectively. The dry weight of roots also followed the similar trends. After 120 days of incubation the relative potency of chlorsulfuron decreased by 1.81, 2.32 & 2.62 times at 15, 25 & 35 °C compared to zero day incubation. At 120 days of incubation the GR₅₀ (dose required for 50% growth reduction) at 35 °C was approximately 10 times higher than that at 15 °C. The half-lives of chlorsulfuron 142, 93 and 80 days at 15, 25 and 35 °C, respectively.

S26MT5P05**RHIZOSPHERE EFFECT OF HERBICIDES ON NITROGEN FIXING BACTERIA IN RELATION TO AVAILABILITY OF NITROGEN IN RICE SOIL****M B Hossain and M A Sattar**

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Herbicides applied to the crop field to get rid of unwanted plants. In our country labour crisis and cost of crop production had increased day by day. Besides killing weeds, these chemicals sometimes adversely affect the growth and activities of beneficial microorganisms in soil. There were no available reports on the stimulating effect of herbicides on microbial population in the rice rhizosphere soil. Therefore, a thorough investigation was necessary to draw a definite conclusion on the effect of herbicides on growth and activities of soil microorganisms. The aim of the study to investigate an experiment the effect of two herbicides with different doses, viz. ronstar [5-terbutyl-3-(2,4-dichloro-5-isopropoxyphenyl)-1,3,4-oxadiazol-2-one] and butabel [N-(butoxymethyl)-2-chloro-2,6-diethyl-acetanilide] @ 1/2, 1 and 2 of recommended dose as kg a.i. ha⁻¹ in rice rhizosphere soil. The experiment was laid out complete randomized design with three replications. Soil samples were collected at 0(1hr), 10, 20, 30 and 45 days after herbicides application. Herbicides, ronstar and butabel were stimulated except 0 and 45 days after inoculation. After 0 days (1hr) herbicides more stimulated upto 30 days for all the doses of herbicides including control. From this results herbicides positively stimulated the population of N₂-fixing microorganisms, mineralization of total nitrogen and availability of inorganic nitrogen in the rice rhizosphere soil up to 30 days except 0 and 45 days after application of herbicides.

S26MT13P01**INVOLVEMENT OF REACTIVE OXYGEN SPECIES GENERATED FROM MELANIN SYNTHESIS PATHWAY IN PHYTOTOXICITY OF L-DOPA****Mayumi Hachinohe and Hiroshi Matsumoto**

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L-3,4-Dihydroxyphenylalanine (L-DOPA) is known as one of the most potent allelochemicals. Our previous study indicated that this phenolic non-protein amino acid effectively suppressed root elongations of several plant species. In mammalian cells, L-DOPA has been reported to cause the cell death by reactive oxygen species generated from oxidation processes of L-DOPA to melanin (Basma et al., 1995; Lai and Yu, 1997; Haque et al., 2003). In order to elucidate the involvement of reactive oxygen species in phytotoxic action of L-DOPA, the formation of melanin, lipid peroxidation induced by L-DOPA, and the effects of antioxidants on its phytotoxicity were determined. When carrot cells were treated with L-DOPA for 8 days, cell growth rates decreased approximately to 60 and 80% at 10⁻³ and 10⁻⁴M, respectively. The formation of melanin, which is an end product of oxidation of L-DOPA, increased continuously throughout the exposure periods (6 days). These data suggest that the growth reduction by L-DOPA occurs with the formation of melanin in the cells. Both ascorbic acid and α-tocopherol partially protected the growth reduction by L-DOPA. Furthermore, melanin level did not increase in the presence of the antioxidants. Lipid peroxidation determined by malonyldialdehyde formation increased significantly with 10⁻³M L-DOPA, however, it did not occur in the presence of ascorbic acid and α-tocopherol. These results suggest that growth reduction of carrot cells by L-DOPA is at least partially due to oxidative stress accompanied by melanin formation. Phytotoxicity of L-DOPA might be due to reactive oxygen species that are generated by the melanin synthesis pathway.

Basma et al., 1995; J. Neurochem. 64: 825-832.

Lai and Yu, 1997; Biochem. Pharmacol. 53: 353-372.

Haque et al., 2003; Biochimica et Biophysica Acta 1619: 39-52

S26MT13P02**ALLELOPATHIC EFFECTS OF CUCUMBER (*CUCUMIS SATIVUS L. CV. IBA'*) ON CERTAIN COMMON WEED SPECIES IN JORDAN****N N Issa and J R Qasem**

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The present work was carried out to investigate any possible allelopathic activity of cucumber (*Cucumis sativus L. Cv. Iba'*) on certain common weed species in Jordan under laboratory and glasshouse conditions. Full strength aqueous shoot extract of cucumber severely reduced germination and growth of *Amaranthus retroflexus L.*, *Chenopodium murale L.*, *Eruca sativa* Mill, *Malva sylvestris* L., *Portulaca oleracea* L. and *Solanum nigrum* L. grown in Petri-dishes. Differences in sensitivity of different weeds to extract are evident, with *E. sativa*, *M. sylvestris*, and *S. nigrum* were most susceptible species. As low as 1 ml extract added to the growing medium was sufficient to significantly reduce germination and growth of all weed species tested, and the effect increased with extract concentration. Water leached from cucumber foliage parts exhibited phytotoxicity on all weed species and significantly reduced their germination and different growth parameters, with more deleterious effects on roots than on shoots. Volatiles emanated from shoot extracts of cucumber were also phytotoxic and the effect was more pronounced on shoot and root growth of all weed species and stem and root lengths were disintegrated. Soil-incorporated dried shoot residues enhanced growth of all weeds indicating that allelochemicals are volatiles in their nature. In contrast decayed residues inhibited growth of many weeds tested. While foliage-applied extract showed no significant effects on weed growth, soil-applied extract was phytotoxic and reduced germination and growth of all weeds with *M. sylvestris* and *S. nigrum* were most affected.

<p>S26MT13P03 WEEDS RESPONSES TO ALLELOCHEMICALS DERIVED FROM BUCKWHEAT (<i>FAGOPYRUM ESCULENTUM</i> MOENCH.)</p> <p>A Golisz and S W Gawronski</p> <p><i>Department of Pomology and Basic Natural Sciences in Horticulture, Faculty of Horticulture and Landscape Architecture, Warsaw Agricultural University, ul. Nowoursynowska 166, 02-787 Warsaw, Poland; e-mail: golisz@alpha.sggw.waw.pl; gawronski@alpha.sggw.waw.pl</i></p> <p>Allelopathic activity of buckwheat has been reported in several studies (Gawronski <i>et al.</i> 1993, Iqbal <i>et al.</i> 2002, Golisz <i>et al.</i> 2002) but complex studies are still missing. The aim of this work was to study the effects of buckwheat allelochemicals on quackgrass and arabidopsis plants growth and on germination of common weeds. Experiments were carried out in the field, growth chambers and laboratory conditions. The results showed that buckwheat cultivation, on heavily infested with quackgrass field, significantly inhibited growth and development of quackgrass and reduced biomass accumulation (up to 90%). Allelochemicals contained in aqueous extracts of buckwheat negatively affected quackgrass plants by: (i) visible wilting, (ii) developing symptoms of senescence and (iii) changed plant gas exchange. The effect of these compounds on weeds germination was diverse: inhibitory (strong, moderate and slight) via no effect to slight stimulation. Chlorogenic acid and quercentin showed allelopathy – inhibitory – activity on <i>A. thaliana</i> L. plants. Gene expression (by cDNA-AFLP) in quackgrass was changed by buckwheat allelochemicals.</p> <ol style="list-style-type: none"> 1. Gawronski S.W., Ciarla D., (1993) Buckwheat in prevention and control of weeds. Communications of the Forty International Conference I.F.O.A.M. – Non-chemical weed control, Dijon France. 2. Golisz A., Ciarla D., Gawronski S.W., (2002) Allelopathic activity of buckwheat – <i>Fagopyrum esculentum</i> Moench. Third Word Congress on Allelopathy, Tsukuba Japan. <p>Iqbal Z., Hirade S., Noda A., Isojima S., Fujii Y., (2002) Allelopathy of buckwheat: assessment of allelopathic potential of extract of aerial parts of buckwheat and identification of fagomine and other related alkaloids as allelochemicals. <i>Weed Biology and Management</i> 2: 110-115.</p>	<p>S26MT13P04 ALLELOPATHIC POTENTIAL OF <i>EUCALYPTUS ROSTRATA</i> LEAF RESIDUE ON SOME METABOLIC ACTIVITIES OF <i>ZEA MAYS</i> L.</p> <p>Gabr, M. A.¹; Al-Wakeel, S. A. M.¹; Hamed, B. A.² and Hegab, M. M. Y.²</p> <p>¹ Department of Botany, Faculty of Science, Cairo University, Giza, Egypt.</p> <p>² Department of Botany, Faculty of Science, Cairo University, Beni-Suef Branch, Beni Suef, Egypt. (e-mail: momtazyehya@hotmail.com)</p> <p>A greenhouse pot experiment was conducted to investigate the possible allelopathic effect of <i>Eucalyptus rostrata</i> leaves residue on the growth criteria and some metabolic activities associated with growth of 10, 20 and 30 – day – old corn plants. The lower level of <i>Eucalyptus</i> treatment (0.5 %, w/w) induced a stimulatory effect on the growth of shoot and root of corn plants. The positive effect was more obvious in shoot than in root growth. Inversely, high levels of incorporated <i>Eucalyptus</i> residue (1 and 2 %, w/w) caused marked reduction in the estimated growth parameters of both shoot and root, relative to their respective controls, and this reduction was concentration dependent. The total phenolic aglycone content of mature <i>Eucalyptus</i> leaf was 16.89 mg g⁻¹ dry weight present as water-soluble secondary metabolites. HPLC revealed that, the p-coumaric acid was the most dominant, while caffeic, cinnamic and ferulic acids were detected in lesser amounts. The total phenolic content of corn shoot increased with the lower concentration of <i>Eucalyptus</i> residue and decreased with higher treatments. The lowest rate of allelochemicals induced stimulatory effect on the accumulation of photosynthetic pigment particularly chlorophyll "a" content. The enhancement of pigment accumulation was correlated with increase in the total carbohydrate production. Similarly, the total nitrogen and total phosphorus as well as nucleic acids were markedly induced. Negative pattern of changes in the metabolism of carbohydrate, nitrogen, phosphorus, phenolic compounds and nucleic acids as well as photosynthetic pigment was observed in corn plant treated with high rates of <i>Eucalyptus</i> leaf residue. These negative effects were concentration dependent.</p> <p>Key Words: Allelopathy, Allelochemicals, <i>Eucalyptus rostrata</i>, <i>Zea mays</i>, growth and Metabolic activities.</p>
<p>S26MT13P05 ALLELOPATHIC POTENTIAL OF SOME MULTIPURPOSE TREE SPECIES (MPTS) ON WHEAT AND SOME OF ITS ASSOCIATED WEEDS</p> <p>M A Khan, G Hassan and K B Marwat <i>Department of Weed Science NWFP Agricultural University Peshawar- 25130, Pakistan E-mail: ahmadzaipk@yahoo.com</i></p> <p>Laboratory based studies were undertaken during October/November, 2003 in Weed Research Laboratory, Department of Weed Science, NWFP Agricultural University, Peshawar, Pakistan to investigate the allelopathic potential of aqueous extracts of leaves of <i>Prosopis juliflora</i> and <i>Eucalyptus camaldulensis</i> and bark of <i>Acacia nilotica</i>. The concentrations studied included 150, 100 and 50 g L⁻¹. A check (0 g L⁻¹) was also included for comparison. The dry plant materials were ground and soaked for 24 hours in water. Ten seeds each of <i>Triticum aestivum</i>, <i>Avena fatua</i>, and <i>Carthamus oxyacantha</i> were used as test species. The data were recorded on germination percentage, seedling length (mm) and biomass (mg) plant⁻¹. There were two identical runs of the experiment. The inhibition was recorded in all the species tested for all the parameters studied, but it was most pronounced in the germination percentage. <i>C. oxyacantha</i> was the most inhibited species, while wheat was most tolerant. Only 20% seeds germinated in this species when exposed to <i>E. camaldulensis</i> at 150 g L⁻¹. All other concentrations of <i>P. juliflora</i> and <i>E. camaldulensis</i> proved severely inhibitory to germination of <i>C. oxyacantha</i>. For other parameters the inhibition was observed at higher concentrations of <i>P. juliflora</i> and <i>E. camaldulensis</i>. <i>A. nilotica</i> emerged as the weakest species in inhibiting the growth parameters of the tested species. The findings reveal that the allelopathic potential of <i>P. juliflora</i> and <i>E. camaldulensis</i> could be exploited for weed management in wheat due to the highlighted window of selectivity in wheat for the extracts studied. Further research is recommended to standardize the feasibility of commercial exploitation of these species as natural herbicides.</p>	<p>S26MT13P06 SCREENING FOR BIOHERBICIDE-PRODUCING STREPTOMYCETES ISOLATED FROM SOILS IN JORDAN</p> <p>I Saadoun¹, S Bataineh¹, and K M Hameed²</p> <p>¹ Department of Applied Biological Sciences, Faculty of Science and Art, ²Department of Plant Production, Faculty of Agriculture, Jordan University of Science and Technology P.O. BOX 3030, Irbid - 22110, Jordan, Phone +962- 2- 7201000 Ext. 23494, Fax: 962- 2- 7095014, E-mail: isaadoun@just.edu.jo</p> <p>Intensive application of chemical herbicides in Jordan is a growing concern to the environment. To avoid their negative effect indigenous actinomycetes' secondary metabolites are investigated as bioherbicide alternative. Screening for bioherbicides-producing soil <i>Streptomyces</i> in Jordan and their activity against weeds was considered. A total number of 149 <i>Streptomyces</i> isolates were recovered from 15 different locations in Jordan and screened for their phytotoxic activity against cucumber and ryegrass seeds. Surface sterilized seeds were placed adjacent to 10 mm wide strip of <i>Streptomyces</i> cultures streaked along the diameter of starch casein nitrate agar plates and incubated at 28°C. Phytotoxic activity was assessed based on the suppression of seed germination, discoloration of the root tip, reduction in the growth of the root and the shoot and final death of the root. Five active isolates were recorded. A diluted (1:1) cell-free broth of the most active isolate, MB13, from shaken broth culture incubated for 7 days at 28°C was used to irrigate cucumber and ryegrass seeds on filter paper inside Petri-dishes. Seed germination of ryegrass was completely inhibited, and the growth of cucumber radicles and the shoot was reduced by 75% compared to the control, distilled water only. An indigenous <i>Streptomyces</i> strain which may provide an alternative to the synthetic herbicides and with a potential to control weeds has been discovered and subject to further investigations.</p>

<p>S26MT13P07 PRIORITIZING CONSERVATION OF MEDICINAL PLANTS IN SUB-SAHARAN AFRICAN FORESTS</p> <p>G H Chekuimo Tagne</p> <p>The demand for traditional herbal medicine is increasing rapidly in Sub-Saharan countries mainly because of harmful effects of synthetic chemical drugs. Harvesting plants for medicines to treat anything from mad cow disease to malaria could help alleviate the poverty of African communities. The recent upsurge in the use of herbal medicines has led to enormous commercial possibilities but many key issues remain unresolved.</p> <p>Worldwide a total of at least 35000 plants species are used for medicinal purposes. The subcontinent has a rich floral diversity, totalling about 24 000 species, with 4 000 species used in traditional medicine. A study realized in Cameroon showed about 25 diseases are being cured by more than 500 medicinal plant species, which contribute in traditional medicine and the Cameroonian pharmacopoeia. While the future of African medicinal plants lies on enhancing people's participation in the utilization and conservation of its forests, their use and conservation are across sectoral concerns that embrace not only the health care, but also nature conservation, biodiversity, economic assistance, trade and legal aspects.</p> <p>However, unsustainable forest management is causing biodiversity loss and massive soil erosion, as well as negatively affecting the economic future of many communities around the globe, especially in the Sub-Saharan tropics. The careful management of remaining forestlands will greatly determine collective ability to accommodate the world's growing needs for food, medicine, wood, as well as the future of the planet's biodiversity. Protection and preservation of traditional medicine, as well as African Sub-Saharan tropical forests are essential to ensure access to traditional forms of health care.</p>	<p>S29MT7P01 THE POTENTIAL FOR THE HONEYBEE TO CONTRIBUTE TO GENE FLOW BETWEEN CANOLA VARIETIES.</p> <p>Jeanine Baker¹ and Christopher Preston¹</p> <p>¹Cooperative Research Centre for Australian Weed Management, School of Agriculture and Wine, University of Adelaide, PMB 1, Glen Osmond, SA 5064, jeanine.baker@adelaide.edu.au</p> <p>Unwanted gene flow from herbicide resistance canola is of some concern in the community and existing literature indicates that gene flow can occur between canola varieties over large distances, but as isolated events. It has been suggested that these outbreaks are the result of insect mediated pollen transfer. A study was undertaken at Roseworthy, South Australia to determine the level of honeybee movement between canola fields. The proportion of honeybees leaving a field and continuing to forage in another field was estimated by spraying the bees with fluorescent paint as they foraged for nectar within a field. The following day honeybees were collected in adjacent fields and the numbers with traces of fluorescence dye on their bodies were recorded. The results showed that honeybees tended to return to the same field when resources were abundant, but that they foraged over larger distances when resources were scarce or patchy. These findings suggest that the honeybee has the potential to contribute to gene flow over large distances but at a very low frequency. To investigate the potential impact of bee foraging behaviour, and associated gene flow, on a landscape scale these data and other published information on the basic behaviour of the honeybee were incorporated into a computer simulation model to test the hypothesis that insect mediated pollen transfer accounts for the low levels of gene flow that have been observed to occur sporadically at long distances from the source.</p>
<p>S29MT7P02 ROTATION, TILLAGE AND SEED DATE EFFECTS ON VOLUNTEER ROUNDUP READY WHEAT POPULATIONS</p> <p>R E Blackshaw¹, K N Harker², G W Clayton², J T O'Donovan³, E N Johnson⁴, Y Gan⁵, B Irvine⁶ and D A Derkens⁶</p> <p>¹Agriculture and Agri-Food Canada, PO Box 3000, Lethbridge, AB T1J 4B1 Canada, blackshaw@agr.gc.ca; ²Agriculture and Agri-Food Canada, Lacombe, AB T4L 1W1 Canada, harker@agr.gc.ca, claytong@agr.gc.ca; ³Agriculture and Agri-Food Canada, Beaverlodge, AB T0H 0C0 Canada, odonovanji@agr.gc.ca; ⁴Agriculture and Agri-Food Canada, Scott, SK S0K 4A0 Canada, johnsone@agr.gc.ca; ⁵Agriculture and Agri-Food Canada, Swift Current, SK S9H 3X2 Canada, gan@agr.gc.ca; and ⁶Agriculture and Agri-Food Canada, Brandon, MB R7A 5Y3 Canada, birvine@agr.gc.ca, derkens@agr.gc.ca</p> <p>Roundup Ready (RR) hard red spring wheat is currently being evaluated for potential commercialization in Canada. A four-year field experiment was conducted at six sites in western Canada to determine the effects of RR crop frequency, tillage system, and seed date on volunteer RR wheat populations. A wheat-canola-wheat-field pea rotation was established with various levels of RR crops in the wheat and canola phases of the rotation. Volunteer RR wheat populations were determined preseeding, before in-crop herbicides, preharvest, and postharvest of each year. Volunteer RR wheat was managed with tillage, preseed quinalofop, glufosinate plus clethodim in Liberty Link canola, quinalofop in RR canola, and imazamox/imazethapyr plus clethodim in field peas. When sufficient rainfall occurred after wheat harvest, numerous RR wheat plants emerged in September and October and were subsequently killed by winter frosts. Shallow cultivation compared with zero-tilt stimulated greater fall emergence and greater and/or earlier emergence of RR wheat the following spring. In cool, dry springs and at early seed dates, very few RR wheat plants were present at seeding and control measures were not warranted. Volunteer wheat was nearly always present at the time of applying in-crop herbicides, thus emphasis needs to be placed on in-crop control. The majority of RR wheat plants emerged in the year following wheat production with relatively small numbers being present in subsequent years. However, unforeseen events such as hail injury or sawfly damage can lead to high volunteer RR wheat densities that require control measures being conducted over more than one year.</p>	<p>S29MT10P01 INTEGRATED WEED MANAGEMENT IN RICE-BASED CROPPING SYSTEMS</p> <p>Kil-Ung Kim</p> <p><i>Dept. of Agronomy, College of Agriculture and Life Sciences, Kyungpook National University, Taegu 702-701, Korea</i> E-mail:kukim@knu.ac.kr</p> <p>This paper briefly reviews weed management technologies in rice based cropping systems. Herbicides, due to their effectiveness and easiness in application, have become the major control measure in most Asian rice production systems. However, the repeated use of the same herbicides evolved more than 10 resistant weeds (mostly broadleaf weeds), against sulfonylurea herbicides, and <i>Echinochloa crus-galli</i> to butachlor and propanil. Herbicide rotation is recommended to minimize development of herbicide resistant weeds. In temperate Asia, rotation of rice with winter annual crops such as barley, wheat, garlic, onion and some vegetables grown under vinyl house has become widely adopted production systems. Double cropping is believed to help reduce infestations of difficult-to-control weeds in both rice and winter annual crops. Herbicides are also being used for the major control method in winter annual crops. Almost one-half of agricultural areas in Asia are covered by rain-fed rice based cropping systems. In tropical Asia, farmers grow vegetables (onion, eggplant, tomato, and garlic) in the dry season and rice in the wet season. Hand weeding and use of some herbicides are mainly used for controlling <i>Cyperus rotundus</i> and <i>Digitaria sanguinalis</i> etc. in vegetables. Another increased trend in Asian rice production systems is direct-seeded rice, occupying about 21% of the total rice area. Effective herbicides properly combined with other management technologies, based on rice ecosystems and economic condition, can be a presently available IWM package. Farmer incentives for adopting IWM package depend upon the relative prices of rice, labor and herbicides.</p>

<p>S29MT10P02 WEED MANAGEMENT IN MAJOR CROPS</p> <p>D.L.P. GAZZIERO</p> <p><i>Embrapa Soja, Caixa Postal 231, CEP 86001-970, Londrina, Paraná, Brasil. E-mail: gazziero@cnpso.embrapa.br</i></p> <p>The integrated management system should be used to control weeds, even though there are very few methods of control available. The weed management should be integrated to the farm production system to reduce the occurrence of weeds. Weed management means a work philosophy, which results in benefits of weed control throughout the years. Soybean, maize and wheat are crops that use high level of herbicides consumption, due its efficiency and fastness of work performance of chemical control. The high level of technology adopted in those crops results in vigorous development of the plants which is a competition advantage for them against the weeds, and providing conditions to the herbicides perform appropriated, allowing the reductions in doses and in use of some of them. Such system encompasses crop rotations, mulching, cultural weed control and weed control between crop seasons and the technology of herbicide application. There is a direct relationship among the dynamic of weed plant, soil preparation. The no till system constrain the development of some weed species such as <i>Brachiaria plantaginea</i>, but also provide a good condition for development of <i>Conyza bonariensis</i>, <i>Senecio brasiliensis</i> and <i>Digitaria insularis</i>. The intensive usage of glyphosate in transgenic soybean (RR) will select tolerant and resistant weed species. The nature reacts to the men actions and adapt to the new condition. It is possible to keep the major crops free of weeds, depending upon the weed management system.</p>	<p>S29MT15P01 NEW METHODOLOGIES FOR THE MANAGEMENT OF PARASTIC WEEDS</p> <p>J. K. Ransom¹, F. Kanampiu² and J. Gressel³</p> <p>¹<i>North Dakota State University, Fargo, ND, joel.ransom@ndsu.nodak.edu</i>, ²<i>CIMMYT, Nairobi, Kenya, f.kanampiu@cgiar.org</i>, ³<i>Weizmann Institute of Science, Rehovot, Israel, jonathan.gressel@weizmann.ac.il</i></p> <p>Parasitic weeds continue to be devastating pests of major food crops, particularly in the developing world. <i>Striga</i> and <i>Orobanche</i> are the two most important genera of parasitic weeds and cause the greatest losses in Africa, southern Europe and western Asia. Integrated control practices which focused on factors such as crop rotation, tolerant varieties, soil fertility management, and herbicides have shown value in reducing losses, but have been poorly adopted and have failed to slow the spread of these pests. The purpose of this paper is to review the most recent methodologies that have been developed for the control of <i>Striga</i> and <i>Orobanche</i>, particularly those that are deemed to have potential for widespread adoption by small-scale farmers. The most promising new <i>Striga</i> control practice in maize is coating seeds of genotypes with resistance to ALS-inhibiting herbicides with herbicides such as imazapyr and pyriproxyfen prior to planting. Extensive on-farm testing in several countries in Africa with two species of <i>Striga</i> has demonstrated the cost effectiveness of this technology when densities reach crop-damaging levels. Glyphosate resistant crops hold promise, though their use is currently constrained by the lack of registration of transgenic crops in most countries where <i>Striga</i> and <i>Orobanche</i> are endemic. The use of bio-control such as crop seed applied pathogens of <i>Striga</i> and <i>Orobanche</i> may have an impact in controlling these species before they emerge. The development and deployment of resistant varieties holds increasing promise as sources of resistant are identified and their mechanisms of action are better understood.</p>
<p>S29MT15P02 DENSITY DEPENDENCE IN THE STRIGA-HOST INTERACTION AND ITS CONSEQUENCES FOR STRIGA MANAGEMENT</p> <p>P R Westerman, T van Mourik, T J Stomph and W van der Werf</p> <p><i>Group Crop and Weed Ecology, Department of Plant Sciences, Wageningen University and Research Centre, PO box 430, 6700 AK Wageningen, The Netherlands, Paula.Westerman@wur.nl, TjeerdJan.Stomph@wur.nl</i></p> <p>Farmers in the semi-arid regions of Africa can choose among a large number of strategies to control <i>Striga hermonthica</i>, a root hemi-parasite of grain crops. The decision to employ a particular method of control will - among other things - depend on its effectiveness. The objectives of this study were 1) to identify density dependent and independent stage transitions in the <i>S. hermonthica</i> life cycle and quantify these in a greenhouse trial and 2) to evaluate control strategies in a long term perspective by modelling the seed bank dynamics. In the experiment, sorghum plants were exposed to four seed densities of the parasite (20 000 – 350 000 seeds m⁻²). Below ground <i>S. hermonthica</i> development was assessed at 30 day intervals until crop maturity. Above ground development was assessed weekly. All stage transitions appeared to be density independent, except attachment of the <i>S. hermonthica</i> seedling to the host root. At 60 d post-emergence of the host, a fixed proportion of the seeds had attached to the host root system, but this was followed by a large and strongly density dependent mortality during the next 30 days, resulting in almost constant numbers of attached parasites per host, irrespective of the initial infestation level. Density dependence was included into the model to evaluate its impact on effectiveness of different control strategies. It was found that seed bank dynamics was not sensitive to control strategies that have their effect before the density dependent stage, but very sensitive to control strategies that affect <i>S. hermonthica</i> post-attachment.</p>	<p>S29MT16P01 PROSPECTS FOR IMPROVING THE SELECTIVITY OF CURRENT MECHANICAL WEEDERS</p> <p>D A G Kurstjens</p> <p><i>Wageningen University, Soil Technology group, Mansholtlaan 10, 6708 PA Wageningen, The Netherlands, dirk.kurstjens@wur.nl</i></p> <p>Selectivity between weeds and crops is a key feature of all post-planting weed control methods. As large-scale arable cropping relies heavily on selective herbicides, this exhaustible resource should be carefully preserved, e.g. by exploiting multiple selectivity resources. This paper explores how potential resources for mechanical selectivity can be exploited more efficiently. Like with herbicides, mechanical selectivity arises from different crop and weed plant sensitivity (e.g. plant height and flexibility, root anchorage, available reserves) with respect to the applied damaging mechanisms (e.g. burying, uprooting, desiccation, light deprivation, mechanical impedance, fungal attack) and the applied "dose" (e.g. cultivation aggressiveness, weather and soil conditions after cultivation). Many ways to manipulate these three components have been explored experimentally (e.g. adapted planting time, stale seedbeds, adjusting cultivation aggressiveness and timing). However, systematic analysis of these three components reveals several new options. With precise implement guidance and depth control, the pursued type of mechanical damage could be matched to expected weather conditions and to the most different sensitivity characteristic. Relationships between plant size and sensitivity to being uprooted or buried help to optimise timing and weeding mode of action, particularly when combined with models to predict weed emergence flushes and early growth. Models to predict desiccation of uprooted weeds and recovery of buried plants could help develop reliable weather-adapted weeding strategies. Although topsoil properties affect weeding selectivity, the potential of seedbed manipulation to decrease crop sensitivity and improve implement performance has received little study. A field measurement protocol and modelling approach to support such studies will be outlined.</p>

<p>S29MT16P02 PERSPECTIVES FOR HIGH TECHNOLOGY TO IMPROVE PHYSICAL WEED CONTROL IN ROW CROPS</p> <p>S Christensen¹</p> <p>¹Danish Institute of Agricultural Sciences, Department of Agricultural Engineering, Research Centre Bygholm, DK-8700 Horsens, Denmark, <i>svend.christensen@agrsci.dk</i></p> <p>Inter-row hoeing in row crops has reached a high level of automation, now with automated guidance systems to ease the steering task. So far no commercial automated physical methods have been developed for weeding the intra-row or close-to-crop area, which currently requires substantial input of hand weeding in most herbicide-free row crops. The inclusion of high technology for intra-row weeding might become a breakthrough in physical weed control in row crops leading to significant reductions, or even elimination, of the need for hand weeding. The major obstacle for the development of selective and accurate intra-row weed control is the lack of automated detection and classification of crop and weeds. Requirements for an automated intra-row weeder to operate with high accuracy become particularly crucial in poorly competitive row crops with limited spacing between individual crop plants. To further increase accuracy and reliability under such difficult circumstances, research is now focusing at the prospects of using electronic crop seed mapping to assist subsequent computer vision for identification of crop and weed seedlings. Crop seed positioning at sowing uses the technology of Real Time Kinematics DGPS to create an electronic field map with geo-referenced seed positions for each individual crop seed. The seed map data can then be used for guiding a vision camera to the approximate positions of the crop seedlings. From these position estimates, a very accurate map of crop seedlings can be produced and thereby form the basis for very precise weeding in the close-to-crop area.</p>	<p>S29MT21P01 REDUCING HERBICIDE USE THROUGH INTEGRATED FOREST VEGETATION MANAGEMENT PRACTICES</p> <p>K Little¹, P Adams², H Frochet³, J. Gava⁴, S Gous⁵, R A Lautenschlager⁶, G Örländer⁷, K V Sankaran⁸, R G Wagner⁹, Run-Peng Wei¹⁰, I Willoughby¹¹</p> <p>¹Institute for Commercial Forestry Research, PO Box 100281, Scottsville, South Africa, 32009, E-mail: keith@icfr.upn.ac.za; ²Forestry Tasmania, 79 Melville Street, Hobart, Tasmania, 7000, E-mail: paul.adams@forestrytas.com.au; ³Lerfob, UMR INRA-ENGREF, Equipe Croissance et Production, CR INRA de Nancy 54280 Champenoux, France, E-mail:frochet@nancy.inra.fr; ⁴Cia.Suzano de Paper e Celulose, Tavares, Km 169, Cx Postal 228, CEP 18.200-000, Itapetininga - SP, E-mail:jgava@suzano.com.br; ⁵Forest Health and Protection, Forest Research, Private Bag 3020, Rotorua, New Zealand, E-mail: stefan.gous@forestresearch.co.nz; ⁶Atlanta Canada Conservation Data Centre, PO Box 6416, Sackville, NB E4L 1G6, E-mail: rautenschlager@mta.ca; ⁷Växjö University, SE-351 95 VÄXJÖ, Sweden, E-mail: goran.orlander@ips.vvu.se; ⁸Kerala Forest Research Institute, Peechi-680 653, Kerala, India, E-mail:sankaran@kfri.org; ⁹University of Maine, 5755 Nutting Hall, Orono, Maine, USA, 04469, E-mail: bob_wagner@umaine.maine.edu; ¹⁰Sino-Forest Corporation, 3129-40, 31/F., Sun Hung Kai Centre, 30 Harbour Road, Wan chai, Hong Kong, E-mail: runpeng-wei@sinoforest.com; ¹¹Forestry Commission Research Agency, Alice Holt Lodge, Farnham, Surrey GU10 4LH, United Kingdom, ian.willoughby@forestry.gsi.gov.uk</p> <p>Mechanical, manual, thermal, biological and chemical weed control methods have, to a large extent, been developed independently. The effectiveness and relatively low cost of herbicides has resulted in management systems which are reliant upon their continued availability, and has led to the almost total exclusion of non-herbicidal methods of weed control. Greater public awareness, perceptions of risk, and resulting pressures exerted by some forest certification systems, have increased the need to develop alternative methods and to reduce dependence on herbicide technology alone. In response, forest vegetation management research has been widened in recent years to include alternatives to herbicides, along with initiatives aimed at reducing present herbicide use. A review of current progress indicates that reduced herbicide use can, in theory, be achieved. There are however, a number of commercial, economic and social issues associated with the practical application of this knowledge, notwithstanding the fact that a more integrated approach is required to combine relevant methods of vegetation management. This paper, together with appropriate examples, highlights past and current research to develop alternatives to herbicides, as well as identifying instances of the successful or unsuccessful implementation of this technology.</p>
<p>S29MT21P02 GLOBALLY-USED FORESTRY HERBICIDES AND THEIR POTENTIAL FOR IMPACTS ON SOIL AND WATER RESOURCES</p> <p>J L Michael¹, Y Dumas², S F Gous³, J Hytonen⁴, K M Little⁵, U Nilsson⁶, C A Spadotto⁷, D G Thompson⁸, I Willoughby⁹, T Yaacoby¹⁰</p> <p>¹Southern Research Station, USDA Forest Service, 520 DeVall Drive, Auburn, AL USA 36849, <i>michael@auburn.edu</i>; ²Cemagref, French Institute of Agricultural and Environmental Engineering Research, Domaine des Barres, 45290 Nogent-sur-Vernisson, France, <i>yann.dumas@nogent.cemagref.fr</i>; ³Forest Health and Protection, Forest Research, Private Bag 3020, Rotorua, New Zealand, <i>stefan.gous@forestresearch.co.nz</i>; ⁴Finnish Forest Research Institute, Box 44, FIN-69101 Kannus, Finland, <i>jyri.hytonen@metla.fi</i>; ⁵Re-establishment Research Institute for Commercial Forestry Research, PO Box 100281, Scottsville, South Africa 32009, <i>Keith@icfr.upn.ac.za</i>; ⁶Southern Swedish Forest Research Centre, Box 49, 230 53 Alnarp, Sweden, <i>urban.nilsson@ess.slu.se</i>; ⁷Embrapa Environment, C.P. 69 - Jaguariuna, SP 13820-000 Brasil, <i>spadotto@cnpmc.embrapa.br</i>; ⁸NRC Canadian Forest Service, 1219 Queen St. East, Sault Ste. Marie, Ontario, Canada P6A 5M7, <i>dthompson@nrcan.gc.ca</i>; ⁹Forestry Commission Research Agency, Alice Holt Lodge, Farnham, Surrey GU10 4LH, United Kingdom, <i>ian.willoughby@forestry.gsi.gov.uk</i>; ¹⁰Plant Protection and Inspection Services, Ministry of Agriculture, PO Box 78, Bet-Dagan 50250, Israel, <i>yaacoby@agri.hii.ac.il</i></p> <p>Globally, land management activities can significantly alter ecosystem components on temporal and spatial scales. Alterations in wildlife habitat and potentially adverse impacts on soils and aquatic ecosystems are notable social concerns in the field of forest vegetation management (FVM). However studies have shown that FVM which usually occurs 1-3 times over a 20-100+ year-long crop rotation represents a minor impact compared to those resulting from population growth, forest harvest, or to agricultural activities which occur several times annually. FVM activities include plant protection, noxious weed control, conifer and hardwood culture restoration of semi-natural areas and improvement of recreational areas and wildlife habitat. FVM may be accomplished using a variety of tools including mechanical, manual, chemical, biological, and silvicultural methods. Among these tools, chemical herbicides combined with various silvicultural methods are often the preferred approach to FVM because they are the most cost efficient, reliable and effective means available. Herbicides may be spot applied, injected into single stems, applied in discreet bands, or broadcast applied either by aerial or ground-based equipment. More than 30 forest herbicide active ingredients are registered for use in various countries for FVM. The registration process usually includes exhaustive toxicological, environmental impact and environmental fate studies. Fewer than 10 of these active ingredients represent more than 85% of the total amount of forestry herbicide applied worldwide. This paper will review the evidence from published research which indicates that contrary to popular opinion there is little potential for long-term detrimental impacts on soil and water resources.</p>	<p>S31MT7P01 HERBICIDE TOLERANT CROPS IN SOUTH AMERICA IN THE PRESENT AND PREDICTIVE STATEMENTS FOR THE FUTURE AGRONOMIC ASPECTS</p> <p>P J CHRISTOFFOLETI¹, P A MONQUERO¹ and R F LOPES-OVEJERO¹</p> <p>¹Universidade de São Paulo – ESALQ/USP – Brazil – <i>pjchrist@esalq.usp.br</i></p> <p>Despite the fact that Brazil is one of the world leaders in soybean production, with more than 19 million ha, there is only 3,0 million ha of herbicide tolerant (HT) soybean. The National Commission of Biosafety has released a report in 2003 that planting HT soybean to glyphosate do not offer any risk to environment and health and that HT soybean to glyphosate could be planted in the country, as long as, monitoring of the environmental impact must be done during for five years. Several advantages are pointed out in the present and in the future as consequence of planting HT crops, that include increase in the crop yield, more efficient use of pesticides, among others, even tough several of them are predictive statements to be confirmed. In the same way some negative predictive statement for the future could be done considering agronomic aspects, which include weed shifts to weeds that are hard to kill by the herbicide and herbicide resistant weeds. Several hard to kill weeds by glyphosate in Brazil and Argentina has been selected during the last years, specially in areas of no till systems. Biotypes resistant to glyphosate of <i>Lolium multiflorum</i> are also present in Brazil in the southern region. The prediction for the future is that this weed shift and selection of resistant biotypes are going to continue in the future and the use of the technology of HT crops will still need other herbicides to control these hard to kill weeds and resistant biotypes.</p>

<p>S31MT7P02 INFLUENCE OF HERBICIDE-RESISTANT CANOLA ON THE ENVIRONMENTAL IMPACT OF WEED MANAGEMENT</p> <p>T A Brimner¹, G J Gallivan² and G R Stephenson³</p> <p>¹Department of Botany, University of Guelph, Guelph, ON, tbrimner@uoguelph.ca; ²Consultant, Ottawa, ON, ggallivan@sympatico.ca; ³Department of Environmental Biology, University of Guelph, Guelph, ON, gerry.stephenson@rogers.com</p> <p>Between 1996, when herbicide-resistant (HR) canola was introduced, and 2000, the amount of HR canola grown in Canada increased from 10% of the total area of canola grown to 80%. Due to HR technology, the major types of herbicides used by growers have changed, ultimately affecting the amount and environmental impact of the active ingredient applied. Herbicide use data and the areas of conventional and HR canola grown were examined from 1995 to 2000 to determine the amount of herbicide applied. The Environmental Impact (EI) per hectare of herbicide use was calculated for conventional and HR canola using the Environmental Impact Quotient and the amount of active ingredient applied. From 1995 to 2000, the amount of active ingredient applied per hectare of canola declined by 42.8% and the EI per hectare declined 36.8%. The amount of active ingredient per hectare applied to conventional canola was consistently higher than that applied to HR canola between 1996 and 2000. Similarly, the EI of herbicide use per hectare in conventional canola was higher than that of HR canola during the same time period. Since 1996, herbicide use shifted from broadcast applications of soil-active herbicides to post-emergence applications of herbicides with broad-spectrum activity. The decline in herbicide use and EI since the introduction of HR varieties was likely due to increased use of chemicals with lower application rates, a reduced number of applications and a decreased need for herbicide combinations.</p>	<p>S31MT7P03 TOLERANCE OF SUGARBEET TO CHLORIMURON-ETHYL</p> <p>Tao Bo¹, Ding wei¹ and Luan feng xia²</p> <p>¹Northeast Agriculture University Agronomy College Harbin 150030 btao1@163.com, ²Heilongjiang Entry_Exit Inspection and Quarantine Bureau Harbin 150001</p> <p>Sugarbeet is very susceptible to Chlorimuron-ethyl residue with inhibition of normal growth. This paper presented the research on the tolerance of sugarbeet to Chlorimuron-ethyl residue. A hundred and six line of sugar beet were selected on tolerance to Chlorimuron-ethyl reside in green house. Significant difference existed in the tolerance of different variety sugar beet when tested with concentration 0.1 µg/kg of Chlorimuron-ethyl residue. Six line of sugar beet expressed high tolerance to Chlorimuron-ethyl, rate of germination of sugar beet was 100%, but only one line(NE02-1) was fine growth. Rate of germination of four line was 50%, their growth was inhibited, other lines was very susceptible did not germinate with concentration 1 µg/kg of Chlorimuron-ethyl residue. When dosage of Chlorimuron-ethyl with 7.5g ai/hm² was applied in post germination, tolerant line(NE02-1) of sugar beet growth fine, other lines was gradually damp off and died. There were obvious different physiological action among tolerant line, middle tolerant line and susceptible line with concentration 0.5 µg/kg to Chlorimuron-ethyl residue. When concentration of chlorimuron-ethyl residue was increased, root vitality of tolerant line(NE02-1) was decreased little, but other lines were obviously decreased. When dosage of Chlorimuron-ethyl with 7.5g ai/hm² was applied in post germination, chlorophyll contain of tolerant line(NE02-1) of sugar beet was decreased in initial stage, after 10 day recovered normal. Chlorophyll contain of middle and susceptible line of sugar beet were decreased obviously, sugar beet's leave withered, died at end.</p> <p>Key words: Sugar beet, Chlorimuron-ethyl residue, Tolerance, Susceptible</p>
<p>S31MT7P04 EFFECTS OF GLYPHOSATE ON SYMBIOTIC NITROGEN FIXATION/NITROGEN ASSIMILATION AND YIELD IN GLYPHOSATE-RESISTANT SOYBEAN</p> <p>R.M. Zablotowicz¹ and K.N. Reddy¹</p> <p>¹USDA-ARS, Southern Weed Science Research Unit, P.O. Box 350, Stoneville, Mississippi 38776, E-mail rzablotowicz@ars.usda.gov ; kreddy@ars.usda.gov</p> <p>Glyphosate-resistant (GR) soybean has revolutionized weed control in soybean production. The effects of glyphosate on nitrogen fixation, nitrogen assimilation, and yield of GR soybean under weed-free conditions were determined in a two-year field study. Four glyphosate (0.84, 1.68, 2.52 + 2.52 and 0.84 + 0.84 kg ae/ha) treatments applied at 4 and 6 weeks after planting (WAP) were compared to no glyphosate (weed-free) control. Soybean plants were harvested between 4 and 8 WAP, and roots assessed for nitrogenase activity (acetylene reduction assay, ARA), respiration and nodulation, and foliar nitrogen content. Soybean seed yield and seed nitrogen content were determined. No consistent effect of glyphosate was observed on either ARA or root respiration. In 2002, both ARA and respiration were about a third of that in 2003, attributed to drought in 2002. All glyphosate treatments reduced foliar nitrogen content (26 to 42%) in 2002, and three glyphosate treatments reduced foliar nitrogen content (9 to 14%) in 2003, with the greatest reduction when glyphosate was applied at the highest rate. Soybean yield compared to nontreated control was reduced by 11% by two applications of 2.52 kg ae/ha glyphosate in 2002, but seed yield was not affected in 2003. Total seed nitrogen harvested was reduced by 32 and 17% compared to nontreated soybean respectively, when 2.54 kg ae/ha glyphosate was applied in 2002 and 2003. These studies indicate that nitrogen fixation and/or assimilation in GR soybean was consistently reduced at high rates of glyphosate and the greatest reductions occurred with soil moisture stress following glyphosate application.</p>	<p>S31MT7P05 GLYPHOSATE-INDUCED MALE STERILITY IN RR COTTON IS ASSOCIATED WITH CHANGES IN MICROTUBULES ORGANIZATION IN ANTER ENDOTHECIUM CELLS</p> <p>H Yasuor¹, M Abu-Abied², E Sadot², J Riov¹ and B Rubin¹</p> <p>¹R H Smith Institute of Plant Science & Genetics in Agriculture, Faculty of Agricultural, Food & Environmental Sciences, Hebrew University of Jerusalem, Israel, yasuor@agri.huji.ac.il;</p> <p>²Department of Ornamental Horticulture, ARO, Volcani Center, Bet-Dagan, Israel.</p> <p>Glyphosate (1.44 kg ae/ha) applied at the reproductive stages to glyphosate-resistant (RR[®]) cotton (DP5415RR) resulted in a temperature-dependent male sterility. This male sterility is associated with changes in the organization of the secondary cell wall thickenings (CWT) in the endothecium layer of the anther. The orientation of the CWT was changed from a longitudinal to a transverse position, preventing the formation of the "U shape" CWT, which normally allow anther dehiscence. Using immunofluorescent staining with monoclonal antibodies against α-tubulin, we observed that the orientation of the microtubules was also changed from a longitudinal to a transverse position. Confocal microscopy showed that the changes in the microtubule position overlapped the changes observed in the endothecium CWT. In order to further study the possible involvement of glyphosate in microtubule organization, <i>Arabidopsis thaliana</i> seedlings expressing GFP-tubulin (TUA6) were exposed to glyphosate (10 mM). Cortical microtubules in the epidermal cells of the hypocotyl were examined 18 h after treatment using a confocal microscope. The orientation of the microtubules in untreated <i>Arabidopsis</i> control plants was longitudinal (normal), whereas in glyphosate-treated plants the orientation was transverse. In addition, <i>Arabidopsis</i> treated plants accumulated high concentrations of shikimic acid (>2mg g⁻¹ fresh weight), demonstrating a specific effect of glyphosate. These results suggest that male sterility induced by glyphosate in RR cotton is associated with changes in microtubules orientation leading to CWT modifications.</p>

<p>S31MT7P06 ROUNDUP READY WHEAT AND CANOLA ROTATION FREQUENCY EFFECTS ON WEED COMMUNITIES</p> <p>K N Harker¹, G W Clayton¹, R E Blackshaw², J T O'Donovan³, E N Johnson⁴, Y Gan⁵, B Irvine⁶, D A Derksen⁶ and G P LaFond⁷</p> <p>¹Agriculture and Agri-Food Canada, 6000 C & E Trail, Lacombe, AB T4L 1W1 Canada, harker@agr.gc.ca, claytong@agr.gc.ca; ²Agriculture and Agri-Food Canada, PO Box 3000, Lethbridge, AB T1J 4B1 Canada, blackshaw@agr.gc.ca; ³Agriculture and Agri-Food Canada, Beaverlodge, AB T0H 0C0 Canada, o'donovan@agr.gc.ca; ⁴Agriculture and Agri-Food Canada, Scott, SK S0K 4A0 Canada, johnson@agr.gc.ca; ⁵Agriculture and Agri-Food Canada, Swift Current, SK S9H 3X2 Canada, gan@agr.gc.ca; ⁶Agriculture and Agri-Food Canada, Brandon, MB R7A 5Y3 Canada, birvine@agr.gc.ca, derksen@agr.gc.ca; and ⁷Agriculture and Agri-Food Canada, Indian Head, SK S0G 2K0 Canada, lafond@agr.gc.ca</p> <p>Roundup Ready (RR) hard red spring wheat is currently being evaluated for potential commercialization in Canada. A four-year field experiment was conducted at six sites in western Canada to determine the effects of RR crop frequency, tillage system, and seed date on weed populations. A wheat-canola-wheat-field pea rotation was established with various levels of RR crops in the wheat and canola phases of the rotation. Weed populations were determined before and after in-crop herbicide applications in the first (wheat) and fourth (field peas) year of the study. Pre-seed weed management involved tillage or glyphosate ± quizalofop ± 2,4-D. In-crop weed management involved glyphosate ± 2,4-D in RR wheat, thifensulfuron/tribenuron + clodinafop propargyl in conventional wheat, glufosinate + clethodim in Liberty Link canola, glyphosate ± quizalofop in RR canola, and imazamox/imazethapyr + clethodim in field peas. In most cases, pre-seeding tillage and/or early seeding increased weed density. Volunteer wheat and canola densities were relatively low at most sites and were not consistently influenced by specific treatments. High frequencies of RR crops in rotation most commonly improved weed management. Canonical discrimination analyses across locations indicated that redroot pigweed, green foxtail, wild buckwheat and wild oat all associated with the rotation devoid of in-crop glyphosate. In addition, across all locations, there were no strong weed species associations with the rotation involving three years of in-crop glyphosate. However, three years of in-crop glyphosate at Lacombe and Lethbridge increased the density and variability of henbit and common mallow, respectively.</p>	<p>S31MT10P01 INTEGRATED APPROACHES TO MANAGING WEEDS IN FIELD CROPS IN WESTERN CANADA</p> <p>J T O'Donovan¹, R E Blackshaw², K N Harker³, G W Clayton³, J R Moyer², L M Dosdall⁴ and D C Maurice⁵</p> <p>¹Agriculture and Agri-Food Canada (AAFC), P. O. Box 29, Beaverlodge Alberta, Canada T0H 0C0, O'Donovanj@agr.gc.ca; ²AAFC, P.O. Box 3000, Lethbridge, Alberta Canada T1J 4B1, Blackshaw@agr.gc.ca and Moyer@agr.gc.ca; ³AAFC, 6000 C & E Trail, Lacombe, Alberta, Canada T4L 1W1, Harker@agr.gc.ca and Claytong@agr.gc.ca; ⁴University of Alberta, Edmonton, Alberta, Canada T6G 2P5, Lloyd.dosdall@ualberta.ca; ⁵Western Cooperative Fertilizers Ltd, 11111 Barlow Trail SE, Calgary, AB T2P 2N1, D.Maurice@WestoAg.com</p> <p>In western Canada, the move to integrated weed management (IWM) with reduced dependence on herbicides is being driven by low crop prices, weed resistance to herbicides, and environmental concerns. A rational initial step when implementing IWM is to determine if herbicide application is required in the first place. Crop yield loss models have been developed to assist with this decision. However, the weed-economic threshold can be influenced considerably by management practices. A number of our field studies showed that enhancing crop competitiveness through planting competitive varieties relatively shallowly at high seeding rates, and through banding rather than broadcasting nitrogen can reduce the impact of weeds on crop yield and the amount of weed seed entering the soil seed bank. Increasing crop seeding rates also enhanced herbicide performance, especially when herbicides were applied at reduced rates. Other studies demonstrated that weed management should not be considered in isolation since it can influence the severity of alternative pests. For example, while early compared to late herbicide application resulted in higher canola (<i>Brassica napus</i>) yields and revenues, late application resulted in less canola damage due to root maggots (<i>Delia</i> spp.). This suggests that some weedy background may ameliorate root maggot damage. Additional studies investigated the potential benefit of diverse crop rotations. For example, the inclusion of an early-cut silage crop in a rotation dramatically reduced wild oat (<i>Avena fatua</i>) populations. Similarly, growing sweet clover (<i>Melilotus officinalis</i>) as a green manure in rotation with cereal and oilseed crops showed tremendous potential to suppress weeds.</p>
<p>S31MT10P02 EVALUATION OF COMPETITIVE ABILITY OF WINTER WHEAT (<i>TRITICUM AESTIVUM</i> L.) GENOTYPES AGAINST WEEDS</p> <p>Mohammad Ali Baghestani¹ and Eskandar Zand¹</p> <p>Weed Research Department, Plant Pest and Disease Research Institute, P.O.Box 1454, Tehran 19395, Iran, baghestani@hotmail.com, eszand@yahoo.com</p> <p>In order the study to competitive ability of winter wheat cultivars genotypes against weeds, a three year trail was conducted as preliminary (1999) and complementary (2000-2001) experiments at weed research station of Plant Pest and Disease Research Institute in Karaj. The preliminary experiment was carried out in randomized completed block design (RCBD) with four replications with a factorial arrangement of treatments. Treatments included twelve genotypes of wheat at two levels (weedy or weed free). The results of preliminary experiment showed that wheat genotypes 6618, M-75-13, M-75-15 were selected as more competitive (MC) and Alamoot, Ghafghaz and M-75-5 were less competitive (LC) genotypes. <i>Avena ludoviciana</i> and <i>Goldbachia laviegata</i> were selected to be the dominant broad- and narrow-leaf weeds in the complementary experiment. The complementary experiment was conducted as a RCBD with four replications. Treatments included six wheat genotypes at three weedy levels (<i>Goldbachia laviegata</i>, <i>Avena ludoviciana</i> and weed free control). The results of complementary experiment indicated that lines 6618 and M-75-5 were as MC and LC, respectively using competitive index (CI), weed biomass and grain yield in pure and mixed stand. Results indicated that CI was a suitable index for determination of MC from LC wheat cultivars. The comparison of morphological and physiological characteristics of lines 6618 and M-75-15 can be used as an important criterion for determination of competitive ability of wheat against weeds in breeding programs.</p>	<p>S31MT10P03 EFFECT OF HERBICIDES AND ROW SPACING ON WHEAT</p> <p>Khan Bahadar Marwat¹, Muhammad Iqbal Marwat² and Gul Hassan¹</p> <p>¹ NWFP Agricultural University, Department of Weed Science, Peshawar 25130, Pakistan, kmarwat@psh.paknet.com.pk; ² Institute of Development Studies, NWFP Agricultural University, Peshawar 25130, Pakistan</p> <p>To evolve economically feasible and integrated weed management package for wheat, an experiment using RCB (split-split plot) design was conducted at Peshawar during 1998-99 and 1999-2000. The three factors included, three wheat varieties (Bakhtawar-92, Ghaznavi-98, and Inqilab-91); three types of herbicides [(broad-spectrum (2,4-D 72EC+Isoproturon 75WP), broad leaf (2,4-D 72EC), grass herbicide (Isoproturon 75WP), and weedy check)] and three row spacings (18, 25 and 32cm). Varieties, herbicides, row spacing, varieties x herbicides, varieties x row spacing and herbicides x row spacing significantly affected weed density, grain yield, harvest index, net income and benefit cost ratio. Broad-spectrum, broadleaf and grassy herbicides controlled grassy weeds by 86.11%, 4.76% and 85.11%, whereas broad-leaf weeds, by 79.69%, 77.98% and 13.43%, respectively. Wheat variety Bakhtawar-92 had maximum grain yield (5% & 14%), straw yield (3% and 6%), net income (8% and 23%), and benefit cost ratio (4% and 12%) over Ghaznavi-98 and Inqilab-91. Among herbicides, broad-spectrum herbicide had higher grain yield (3%, 10% & 22%), straw yield (3%, 6% and 14%), harvest index (2%, 5% and 5%), net income (2%, 14% and 33%), and benefit cost ratio (1%, 6% and 14%) over broadleaf, grassy herbicides and weedy check, respectively. Within row spacing, 18 cm space had maximum grain yield (5% & 10%), straw yield (5% and 12%), harvest index (1% and 3%), net income (10% and 22%) and benefit cost ratio (6% and 13%) over 25 and 32 cm row spacing, respectively. Variety Bakhtawar-92 with broad-spectrum herbicide in 18 cm row spacings surpassed in grain yield, harvest index and net income.</p>

<p>S31MT10P04</p> <p>INFLUENCE OF WEED INTERFERENCE ON WHEAT (TRITICUM AESTIVUM L.) YIELD, NITROGEN USE EFFICIENCY AND GRAIN PROTEIN CONTENT</p> <p>Saeid Soufizadeh¹ and Escandar Zand ²</p> <p>1-Department of Agronomy and Plant Breeding, Abooreihan Campus, University of Tehran, P. O. Box 11365/4117, Tehran 39754, Iran. ssoufizadeh2004@yahoo.com.</p> <p>2-Weed Section, Plant Pest and Disease Research Institute, P. O. Box 1454, Tehran 19395, Iran. eszand@yahoo.com.</p> <p>The competitive relationship between plant species is highly dependent on many factors including crop species and the efficiency of crop in utility of available Nitrogen. So, in order to study the competitive ability of different old and modern wheat cultivars and determining their yield and Nitrogen Use Efficiency (NUE) under competitive condition, a field experiment was conducted in 2002, at the research field of Pest and Disease Research Institute using a factorial arrangement of treatments in a randomized complete block design with three replications. One of the treatments was wheat cultivars (<i>Triticum aestivum L.</i>) in 6 levels and the other one was weed treatment which had 2 levels (weedy and weed free). The weed species was wild oat (<i>Avena fatua L.</i>). Results indicated that modern cultivars had a significant superiority to old cultivars in most of the characteristic studied such as biomass and grain yields, NUE, Nitrogen Harvest Index (NHI) and Grain Harvest Index (HI), in both presence and absence of wild oat. But the grain protein content of old cultivars were higher than modern cultivars. Moreover, competition with wild oat decreased all the studied characteristics significantly except NHI. Among the studied cultivars the modern cultivar 'Qods' and the old cultivar 'Omid' had the most and the least amounts of grain yield, NUE, Nitrogen Utility Efficiency (NUT.E), NHI and HI, respectively.</p>	<p>S31MT10P05</p> <p>EFFECT OF PLANTING TECHNIQUE ON WEED DYNAMICS IN RICE (ORYZA SATIVA)-WHEAT (TRITICUM AESTIVUM) CROPPING SYSTEM IN WEST BENGAL, INDIA</p> <p>R.C.Samui¹, subhendu Mandal², Anirban Mondal³ and Debnanu Dash⁴</p> <p>Department of Agronomy, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur , Nadia , PIN-741252, West Bengal , India.</p> <p>The present investigation was conducted at the University farm of BCKV during 2000,2001 and 2002 in Randomized Block Design with four replications to study the effect planting techniques on weed dynamics in rice-wheat cropping system. The treatments consists with three cropping systems (Rice-Wheat, Rice-Rapeseed and Rice-Groundnut) and three planting techniques [flat bed, Broad bed (45cm) and furrow 22.5cm] and inter cropping]. In flat bed wheat and rapeseed were sown in 22.5cm apart and groundnut 45 cm apart. In broad bed and furrow (BBF) method three rows of wheat and rapeseed and two rows of groundnut were sown in bed. In BBF inter cropping system in between two rows of groundnut one row of wheat or rapeseed was sown. The major weeds found in rainy season rice were <i>Echinochloa colonum</i>, <i>Echinochloa crusgalli</i>, <i>Cyperus sp.</i> <i>Panicum sp.</i>, <i>Marsilia quadrifoliata</i>, and in winter season were <i>Chenopodium album</i>, <i>Melilotus indica</i>, <i>Cichorium intybus</i>, <i>Circium arvense</i>. Higher rice equivalent yield was obtained in rice-groundnut+ wheat (2:1) followed by rice- groundnut+ mustard (2:1) system. BBF method of planting recorded significantly lower weed population and weed dry weight. Nutrient uptake by weed also follow similar trend.</p>
<p>S31MT10P06</p> <p>MANIPULATING CORN COMPETITIVENESS WITH WEEDS THROUGH RATE AND METHOD OF NITROGEN APPLICATION</p> <p>M.Faravani¹, M.Bazoobandi¹, M.Hadizadeh² and M.Akhavan</p> <p>¹Khorasan Agricultural Research Center P.O.Box :91735-488 – Mashhad- Iran</p> <p>²Weed Research Department of Plant , Pest and Diseases Research Institute</p> <p>Email :faravani@yahoo.com</p> <p>Nitrogen is the major nutrient which crops and weeds compete for it . Since weeds are usually are more successful in this regard, therefore a proper fertilizing program such as splitting nitrogen over growing season could promote crop ability in competition. The present investigation was conducted to study the possibility of increasing such abilities in corn. The experiment was carried out at the farm of Khorasan Agricultural Research Center in Mashhad during growing season of 2003. It was laid out in a randomized complete design with three factors in a split plot design. Method of nitrogen application in main plot (strip and broadcasted) while rate of nitrogen fertilizer and level of control as factorial combinations in sub-plots. Urea (46%) was applied as source of nitrogen . Weeds were sampled species-wise in two different stages. Number and dry matter of them as well as crop data i.e seed , biological yield and yield components registered . Results revealed that rate and method of nitrogen application could not significantly affect seed and biological yield . Broadcasting urea significantly increased lamb quarters dry weight while no significant difference were observed in case of pig weed and common purslane number and dry weight . Same results were detected regarding rate of nitrogen. Such results is due to more nitrophilic nature of lamb quarters compare to pig weed . It may be conclude that none of rate and method of nitrogen application could change the competition on favor of corn , due to nitrophilic nature of weeds under study.</p> <p>Key words: Corn, weed and nitrogen</p>	<p>S31MT10P07</p> <p>IMPACTS OF WEEDS AND WEEDING REGIMES ON MAIZE FORAGE YIELDS AND QUALITY FOR RESOURCE POOR MAIZE-DAIRY FARMERS IN CENTRAL Kenya.</p> <p>¹A J Murdoch, ²J M Maina, ³B M Kivuva, ³M W K Mburu, ⁴J M Njuguna, ⁴D M Mwangi</p> <p>¹Department of Agriculture, The University of Reading, P O Box 237, Earley Gate, Reading RG6 6AR, UK, Email: a.j.murdoch@reading.ac.uk</p> <p>²Kenya Agricultural Research Institute, National Agricultural Research Laboratories, P O Box 14733, Nairobi, Kenya, Email:jedidahmaina@yahoo.com</p> <p>³Department of Crop Science, University of Nairobi, P O Box 30197, Nairobi, Kenya</p> <p>⁴Kenya Agricultural Research Institute, National Agricultural Research Centre, Muguga, P O Box 30148, Nairobi, Kenya</p> <p>A survey of maize-dairy farmers in the Central Kenyan Highlands showed that thinnings, green stover, dry stover and weeds from the maize crop respectively comprised 6%, 10%, 8% and 5% of the total forage. Nevertheless, most weed research of maize completely ignores the use of maize crop residues as forage. The value of weeds from the maize crop is similarly ignored in assessing the costs and benefits of weed control. The effects of maize weeding regimes on maize forage and grain yields were therefore evaluated over three growing seasons in a bimodal rainfall area (Kiambu). Weeding regimes were weed free (W1), weedy (W2), pre-emergence herbicide (W3) and hand weeding twice (W4). Edible weeds had a dry matter digestibility of 65% and 20% crude protein (CP) – higher than in the maize stover (62 and 4%, respectively). The weedy regime (W2) reduced maize forage quality: the CP was lower in maize stover and thinnings. Although weeds provided a measurable source of forage for resource poor farmers, they directly reduced grain yields and the quality and quantity of maize forage. Long-term costs and benefits were also evaluated. During the third season (short rains 2002/3), effects of applying the weeding regimes for the two previous seasons were quantified by weed emergence and hand weeding times. The weedy regime (W2) needed 81 man-days ha-1 for weeding, significantly more than W1, W3 and W4 (67, 63 and 63 man-days ha-1, respectively). Failure to control weeds thus meant that more labour was needed to hand-weed subsequent crops.</p>

<p>S31MT15P01</p> <p>Understanding key developmental processes in parasitic weeds</p> <p>G Ejeta and P. J. Rich</p> <p>Purdue University, Department of Agronomy, 915 W. State St., West Lafayette, IN 47907-2054, gejeta@purdue.edu</p> <p>Research on the biology of parasitic weeds has been underway for several decades. Recent advances in the various disciplines applied to the study of parasitic weeds have greatly expanded our knowledge base. Evidences drawn from these studies have allowed us to develop a growing understanding of the biological processes by which these unique plants grow and develop in coordination with their hosts. Generally, parasitic weed seeds have specific dormancy and environmental conditioning requirements that must be met before they germinate. Germination of weed seeds proceeds in response to signals derived from host plants. Differentiation of radicle cells into the haustorium marks the beginning of the parasitic phase of the weed's life cycle. The biological and chemical aspects of haustorial initiation have evolved to require assurance of proximity to the host with this transition. Post-attachment haustorial development allows the parasite to establish vital vascular connections as well as metabolic and osmotic linkage with the host plant. Finally, the weed matures and sets seed completing the life cycle and bringing the process full circle. This paper focuses on the shared biology of root parasites, with examples drawn mainly from <i>Striga</i> and <i>Orobanche</i> spp. We present a review of our current knowledge of the biology of parasitic weeds to offer perspectives on developmental processes in plants as well as opportunities for genetic manipulation in host plant resistance.</p>	<p>S31MT15P02</p> <p>MANIPULATING HOST DEFENSES TO ENHANCE TOBACCO RESISTANCE TO <i>OROBANCHE AEGYPTIACA</i></p> <p>E M Winston, O P Hurtado-Gonzales, C L Cramer, and J H Westwood</p> <p>Virginia Tech, Department of Plant Pathology, Physiology, and Weed Science, Blacksburg, VA 24061, westwood@vt.edu</p> <p>An intriguing question for parasitic weed control is whether a normally susceptible host plant contains the potential to defend itself from parasitism, but somehow fails to activate the most effective response. Previous research has indicated that <i>Orobanche</i> parasitism triggers its host to activate some defense responses more than others. Specifically, <i>Orobanche</i> induces defenses associated with the localized production of phytoalexins much more than those associated with salicylic acid (SA) signaling, pathogenesis-related (PR) proteins, and systemic acquired resistance. To better understand the potential for enhancing host resistance, we have tested strategies for inducing those defenses that are not normally activated by the parasite. One strategy was to engineer a parasite-triggered hypersensitive response (HR) in tobacco by expressing the TMV replicase gene under control of the <i>Orobanche</i>-inducible <i>CHS8</i> promoter. Expression of the replicase protein in plants containing the N gene leads to a gene-for-gene interaction that causes HR in leaves. When these hyper-responsive transgenic tobacco were challenged with <i>O. aegyptiaca</i>, parasitism was reduced to less than half that of wild-type plants. In addition, we have studied the levels of tobacco PR-1a protein in response to the SA analog, BTH. Treatment of plants with this compound greatly induced PR-1a production in leaves, but little in roots. Treatment of plants with BTH to stimulate SA-mediated defenses did not consistently enhance resistance to <i>O. aegyptiaca</i>. These studies suggest that host resistance capacity can be increased in susceptible hosts, but caution that the defense capabilities of plant roots differ significantly from those of leaves.</p>
<p>S31MT15P03</p> <p>EPSP-SYNTHASE PRESENCE AND ACTIVITY IN BROOMRAPE (<i>OROBANCHE AEGYPTICA</i> PERS.)</p> <p>Lilach Zygier and Baruch Rubin</p> <p>R H Smith Institute of Plant sciences and Genetics in Agriculture. Faculty of Agricultural, Food and Environmental Sciences, The Hebrew University of Jerusalem, Rehovot 76100, Israel (rahamim@agri.huji.ac.il)</p> <p>Glyphosate inhibits the biosynthesis of aromatic amino acids by inhibition of EPSP synthase, a key enzyme in the shikimate pathway, resulting in accumulation of shikimic acid in sensitive plants. The aims of this study were to examine if the Egyptian broomrape (<i>Orobanche aegyptiaca</i> Pers.) has an active EPSP synthase and its response to glyphosate. ¹⁴C-glyphosate applied to the second leaf of transgenic glyphosate-resistant (R) and – sensitive (S) tomato (<i>Lycopersicon esculentum</i>) is rapidly translocated to various host sinks (apex and roots) and to broomrape tubercles developing on the tomato roots. Broomrape tubercles accumulated more ¹⁴C-glyphosate than the apical meristem and roots of the host, indicating that broomrape is a strong sink. Glyphosate applied to the foliage of R and S tomato plants inoculated with Egyptian broomrape resulted in severe damage to the parasite. In addition, shikimate was accumulated in the apex and roots of the S plants but not in the R plants. Broomrape tubercles parasitizing both R and S tomato accumulated high levels of shikimate. The accumulation of shikimic acid in the tubercles growing on the resistant host confirms that there is an active EPSP synthase in broomrape. These results suggest that the parasite confers the capacity to synthesize aromatic amino acids independently of the host plant, raising the question why does the broomrape need this enzyme if assimilates and amino acids are supplied by the host.</p>	<p>S31MT15P04</p> <p>DETERMINATION AND QUANTIFICATION OF STRIGOLACTONES</p> <p>K Yoneyama¹, Y Takeuchi¹, D Sato¹, H Sekimoto² and T Yokota³</p> <p>¹Center for Research on Wild Plants, Utsunomiya University, 350 Mine-machi, Utsunomiya 321-8505, Japan, yoneyama@cc.utsunomiya-u.ac.jp, takeuchi@cc.utsunomiya-u.ac.jp, daisat@crwp.mine.utsunomiya-u.ac.jp; ²Faculty of Agriculture, Utsunomiya University, 350 Mine-machi, Utsunomiya 321-8505, Japan, hitoshis@cc.utsunomiya-u.ac.jp; ³Department of Biosciences, Teikyo University, 1-1-1 Toyosatodai, Utsunomiya 320-8501, Japan, yokota@nasubio.teikyo-u.ac.jp</p> <p>Seed germination of root parasitic weeds <i>Striga</i> and <i>Orobanche</i> is strongly elicited by strigolactones such as strigol, sorgolactone, aelectrol, and orobanchol. Trace amounts of these known strigolactones in root exudates can be analysed by using the high performance liquid chromatography (HPLC)-connected to tandem mass spectrometry (LC/MS/MS). So far, orobanchol produced by red clover, and strigol and strigyl acetate produced by cotton have been quantified. In both cases, young and actively growing roots were found to be major source of germination stimulants. Distributions of germination stimulation activity after reverse-phase HPLC purification of ethyl acetate extracts of root exudates indicate that there are several strigolactones whose structures are yet to be elucidated. For example, sorghum was found to produce a novel strigol isomer as well as sorgolactone and strigol. At least 4 novel strigolactones, 1 dehydro- and 3 tetrahydrostrigol isomers, were detected in tomato root exudates. These results clearly demonstrate a wide distribution of strigolactones in the plant kingdom, indicating that strigolactones may have some important biological functions in plants.</p>

<p>S31MT15P05 ENHANCING THE EFFICACY OF A FUNGAL BIOCONTROL AGENT AGAINST OROBANCHE CUMANA THROUGH COMBINATION WITH A RESISTANCE-INDUCING CHEMICAL</p> <p>D Müller-Stöver, H Buschmann and J Sauerborn</p> <p>Institute for Plant Production and Agroecology in the Tropics and Subtropics, University of Hohenheim, 70593 Stuttgart, Germany, e-mail: stoever@uni-hohenheim.de</p> <p><i>Fusarium oxysporum</i> Schlecht. f. sp. <i>orthoceras</i> (Appel & Wollenw.) Bilai was found to attack all developmental stages of the parasitic weed <i>Orobanche cumana</i> Wallr. Fungal propagules were matrix-incorporated in granules made from wheat-flour and kaolin ('Pesta') that efficiently controlled the parasitic weed in greenhouse experiments. However, in a field trial carried out in Israel, control efficacy was lower compared to the pot experiments and the soil population of the fungus decreased to less than 10 % of the initial numbers within two months. Thus, the most important objective of the present investigations is enhancing the efficacy of the biocontrol agent. In pot experiments with different sunflower cultivars, the application of <i>F. oxysporum</i> was combined with a treatment of Benzo(1,2,3)thiadiazole-7-carbothioic acid S-methyl ester (BTB) that is known to induce resistance against <i>O. cumana</i> in sunflower. The combined treatments always performed best regarding the control of <i>O. cumana</i> and resulted in a reduction of emergence of up to 100 %. In first laboratory experiments, virulence and growth of the fungus was generally not affected by the addition of BTB to the growth medium, except for a short time after incubation or after the incorporation of high dosages of BTB (30 or 90 ppm) when the growth of the fungus was reduced compared to the untreated controls. Results are presented on how to optimise the integration of the two control measures.</p>	<p>S31MT15P06 MANURE FERMENTATION REDUCES OROBANCHE INFESTATION ON TOMATO</p> <p>BE Abu-Irmaileh¹ and AM Abu-Rayyan²</p> <p><i>University of Jordan- Faculty of Agriculture, ¹Department of Plant Protection, ²Department of Horticulture and Field Crops</i> <i>Barakat@agr.ju.edu.jo</i></p> <p>Controlling <i>Orobanche</i> species in many crops has been continuing for the past decades with only limited success. Fumigants such as methyl bromide, and herbicides are the only direct control practices. However, their application requires specific technology that is beyond the capability and affordability of subsistent farmers in small farming systems. In addition, chemicals are not totally safe to the environment. In this research, fermenting <i>Orobanche</i>-contaminated manure for a period of six weeks reduced the ability of <i>Orobanche</i> seeds to infest tomato, as <i>Orobanche</i> dry weights and the total number of shoots and attachments were reduced. Air-tight covering of the soil surface of plots amended with manure for fermentation by black polyethylene sheets for six weeks reduced the ability of <i>Orobanche</i> seeds, which were buried at 15-20 cm depth, to infest tomato. All species of <i>Orobanche</i>; <i>O. ramosa</i>, <i>O. cernua</i>, or <i>O. crenata</i> responded similarly to manure fermentation. Fermentation of poultry manure was more effective than cow and sheep manures. Fermenting manure in the planting row for six weeks prior to planting was effective in reducing <i>Orobanche ramosa</i>, on tomato plants. Fermentation of manure could offer a new environmentally safe procedure to manage <i>Orobanche</i>, using farm resources and could improve the sustainability of crop management. It would also be an effective asset in organic farming.</p>
<p>S31MT15P07 EVALUATING STRATEGIES TO CONTROL THE PARASITIC WEED OROBANCHE CRENATA IN FABA BEAN – A SIMULATION STUDY USING APSIM</p> <p>J H Grenz¹, A M Manschadi² and J Sauerborn¹</p> <p>¹ Institute of Plant Production and Agroecology in the Tropics and Subtropics, University of Hohenheim, Stuttgart, Germany, jan.grenz@grmx.de; ² Agricultural Production Systems Research Unit, DPI, Toowoomba, Australia, ahmad.manschadi@dpi.qld.gov.au</p> <p>The angiosperm parasite <i>Orobanche crenata</i> inflicts considerable damage upon legume production in Mediterranean countries. No single control method has proven both effective and practicable due to the complexity of host-parasite interactions. Experimental evaluation of potential integrated control strategies would be time- and labour-consuming, yet only render location-specific results. The use of simulation models can help overcome these restrictions. The objective of our work is to provide a model that can be a useful tool in assessing the impacts of control options and strategies against parasitic weeds.</p> <p>This study reports on the development, evaluation and application of a generic module within the framework of the Agricultural Production Systems Simulator (APSIM) that allows quantification of parasitic weed impact. A mechanistic model of host-parasite interactions was calibrated with experimental data on the association faba bean-<i>O. crenata</i> from Syria and evaluated with independent data from Turkey. The evaluation showed that APSIM can realistically reproduce observed courses of growth and development of host and parasite. In order to facilitate long-term simulations, algorithms calculating seed bank dynamics and effects of control measures were added. The enhanced model was used with historic weather data to simulate effects of various sowing strategies and weeding schedules on faba bean yield and <i>O. crenata</i> seedbank. The results demonstrate that APSIM can provide the quantitative information needed to identify effective control strategies. The generic nature of the model means that it can be easily adapted to suit other host-parasite associations.</p>	<p>S31MT16P01 ORGANIC WEED MANAGEMENT: A REVIEW OF THE CURRENT UK FARMER PERSPECTIVE</p> <p>R J Turner¹, G Davies¹ and A C Grundy²</p> <p>¹HDRA, Coventry, CV23 9SS, UK, bturner@hdra.org.uk; ²HRI, Wellesbourne, Warwick, CV35 9EF, andrea.grundy@hri.ac.uk</p> <p>This paper will report on a UK government (DEFRA) funded project taking a participatory approach to organic weed management. Farmers have set the research agenda deciding that the project will focus on perennial weeds, systems approaches to weed management and knowledge collation and dissemination. Farmers who have attended stakeholder days and focus groups meetings believe other farmers may hold the key to managing weeds and would like help gathering and sharing that practical knowledge. They also feel there is poor dissemination of research trial results. The project is taking several approaches to address these issues, a review of published and 'grey' literature relating to individual weeds and weed management is being compiled. Farmer case studies and monitoring of existing farm practice are on going and simple weed management trials have been devised for farmers to try. All information is held in the public domain on a researcher maintained website www.organicweeds.org.uk. This paper focuses on one method, a semi-structured survey of organic farmers who volunteered to provide information about weed management in their system. 52 case studies in England and Wales have been undertaken to date mainly in mixed systems. The survey covered; characterising the farm, farmers attitude to weeds and current problems, strategies for management, successes and failures, how problems have changed over time, where they get information from and best sources and what would they like to see research addressing. A summary of this information will be presented. Further details on the other project approaches will also be discussed.</p>

<p>S31MT16P02 EFFECTS OF THE IMPLEMENT SETTINGS ON THE MECHANICAL ACTIONS OF A FLEXIBLE SPRING TINE DURING WEED HARROWING</p> <p>K. Duerinckx, J. Anthonis & H. Ramon</p> <p><i>K.U.Leuven, Labo Landbouwwerktuigkunde; Kasteelpark Arenberg 30; 3001 Heverlee; België kurt.duerinckx@agr.kuleuven.ac.be</i></p> <p>Understanding of the working mechanisms of the weed harrow at different tine settings is necessary to achieve optimal weed control. Therefore, the mechanical action of the weed harrow tine on the soil and the effects of changing implement settings were studied in two different soil types.</p> <p>Due to the specific requirements of the research, an exceptional experimental set-up and outline were constructed. The experiments were conducted indoors to reduce the influence of external factors and no plants were involved in the experiments in order to avoid variance due to biological differences. A commercially available flexible weed harrow tine was used.</p> <p>The movements of and forces on the tine were measured with strain gauges. Afterwhich, these measurements were analyzed firstly as the mean deflection from the tine in the soil, then as the deviations around this mean position and finally as the properties of the vibration frequency during working. In addition, a high-speed camera was used to provide a visible description of the tine penetration into the soil.</p> <p>The implement settings and their interactions with the soil type have important effects on the movements of the tine and its action on the soil. Different settings have different effects on certain response parameters of the tine. This enables to set up the weed harrow to achieve distinct and desired results as more covering, more uprooting or a more equal weeding action.</p> <p>The mechanisms that act between the tine and the soil are established. This will facilitate further mechanical research.</p>	<p>S31MT16P03 WEED SUPPRESSION USING VETCH (<i>VICIA SATIVA</i>) AS A COVER CROP IN ORGANICALLY GROWN MAIZE</p> <p>S L Poggio¹, S A Cepeda², A Andriulo³</p> <p>¹ Cátedra de Producción Vegetal, Departamento de Producción Vegetal, Facultad de Agronomía, Universidad de Buenos Aires, Av. San Martín 4453 (C1417DSE) Buenos Aires, Argentina, spoggio@agro.uba.ar; ² EEA INTA Pergamino, Ruta Provincial 32, Km 4.5, CC 31 (B2700) Pergamino, Argentina, scepeda@pergamino.inta.gov.ar; ³ EEA INTA Pergamino, Ruta Provincial 32, Km 4.5, CC 31 (B2700) Pergamino, Argentina, andriulo@pergamino.gov.ar.</p> <p>The expansion of organic agriculture in the last decades have promoted the reintroduction of leguminous cover crops as a low input strategy for weed and resource management. The effects of different maize cropping systems on weed growth, crop yield, and nitrogen and water use were studied. An experiment was carried out at Pergamino (Argentina), including maize grown with organic (mechanical weed control and vetch cover crop) and conventional management (fertilization and herbicide application), and an unfertilised weedy control. Weed biomass of organic (21.5 g m^{-2}) and conventional (29.7 g m^{-2}) systems were significantly lower ($P<0.05$) than in the control (135.2 g m^{-2}). Consequently, yields of organic (1228 g m^{-2}) and conventional (1101 g m^{-2}) crops were higher than weedy crop yield (766 g m^{-2}). Water consumed by maize did not differ among systems, suggesting that was not limitant. More nitrogen was returned as plant residuals in the organic (111 kg ha^{-1}) than in the conventional system (89 kg ha^{-1}), although nitrogen in both grain and total biomass did not differ between both systems. This could be attributed to a greater nitrogen mineralization due to soil disturbance from mechanical weed control, since the low vetch biomass (115 kg ha^{-1}) suggest little N-fixing contribution. Present results remark the importance of leguminous cover crops to manage weeds and to improve resource use efficiency of field crops in low input agricultural systems, which require more research involving ecophysiological and agronomical factors.</p>
<p>S31MT16P04 DIFFERENT MULCHING METHODS FOR WEED CONTROL IN ORGANIC GREEN BEAN AND TOMATO</p> <p>L. Radics, E. B. Székelyné, P. Pusztaí, K. Horváth</p> <p><i>Budapest University of Economic Sciences and Public Administration, Faculty of Horticulture, Department of Ecological and Sustainable Production Systems, lradics@mail.kee.hu, szekelyb@mail.kee.hu, pusztaip@mail.kee.hu, kismany@mail.kee.hu</i></p> <p>During our examinations, we have compared the effects of eight methods of mulching on the growth of the weed flora and the crop plants. Crop plants were green bean and tomato. Weedy, hoed and herbicide treated plots, respectively, were used as check plots. Mulching methods were plastic sheet, paper mulch, straw mulch with and without Phylazonit-M microbial soil conditioner, compost, and mowing regimes for grass, leguminous and weed mulches. Mulching effects were achieved by assessing soil cover of weeds and crop yield. According to our results, the weed suppressing ability of plastic sheet, paper and straw mulches were similar to effects obtained in the herbicide treated plots, (and sometimes even better). The detailed experiment showed that there are good possibilities for establishing a mulching system that is capable of suppressing weeds, preserving soil structure and moisture, and stimulating biological activity of the soil, which is desirable from both an agronomic and environmental point of view.</p>	<p>S31MT16P05 PRECROP MULCH OF ALLELOPATHIC ACTIVITY FOR WEEDS MANAGEMENT IN ORGANIC WINTER WHEAT PRODUCTION</p> <p>S.W. GAWRONSKI, W. BERNAT and H. GAWROŃSKA</p> <p><i>Department of Pomology and Basic Natural Sciences in Horticulture, Warsaw Agricultural University, Ul. Nowoursynowska 166, 02-787 Warsaw, Poland, gawronski@alpha.sggw.waw.pl</i></p> <p>In organic farming, weed management is very challenging. Pre-crop cultivation for allelopathically active mulch is considered as an alternative control method. Aim of this 3-year study was to evaluate the effects of sunflower and legumes mulches (alone and in mixtures) on weed infestation and community, winter wheat stand, soil cover, and crop yield in organic winter wheat. Lech and Ogrodowy cultivars of sunflower (best of 44 earlier tested) and field peas, garden peas and common vetch were cultivated as pre-crop for ~ 3 months, cut and shredded two days before wheat sowing and left on the surface as mulch. Wheat was sown by a disc-seeder (beginning of October). Mulching effectively reduced weed infestation, including elimination of some species, and improved soil structure. In response to mulching, wheat germination was delayed and reduced but yield, depending on year and treatment, was both higher (~ 30% resulting from productive tillering and lack of weed competition) and lower (30–50% in 2002/03 growing conditions in Poland were harsh). Results that allow distinguishing the effects of seed bed preparation and the physical barrier of mulch from its allelopathic activity will be discussed. The results suggest that allelopathic pre-crop mulching seems to be a promising alternative for weed management in organic farming and improvement in technology will be presented.</p>

<p>S31MT16P06 WEED MANAGEMENT IN ORGANIC VEGETABLE PRODUCTION</p> <p>R S Chandran</p> <p>West Virginia University, Morgantown, WV 26506-6108, U.S.A</p> <p>E-mail: RSChandran@mail.wvu.edu</p> <p>Experiments on weed management methods for organically grown vegetables were conducted in Morgantown, West Virginia, U.S.A. In 2000-2001, straw mulch (5.0, 10.0, and 20.0 cm), black plastic, and hand-cultivation treatments were evaluated in sweet pepper (<i>Capsicum annuum</i>). In 2002, hand-cultivation, plastic mulch, and 10-cm straw mulch were compared to vinegar applied at 4.5, 9.0 and 18% (vol/vol, acetic acid), and corn gluten at 9764, 19,530, and 39,059g/100 m². In 2003, vinegar (6.25 or 12.5%) applied as directed spray or as broadcast application at early, late, or early + late growth stages of potato (<i>Solanum tuberosum</i>) was evaluated. Plastic mulch increased pepper yields by 50 and 150%, compared to hand-cultivated and mulched (20 cm) plots, and by twenty times compared to control plots. Corn gluten at 39,059g/100 m² reduced weeds by 78% 3 wk after treatment but failed subsequently. Directed spray of vinegar (18%) controlled summer annuals >90% soon after application but weed counts 1 MAT recorded only 20 to 30% reductions compared to control. Potato yield analysis (USDA Grade A, Grade B, and under-sized), indicated no treatment differences for Grade A and under-sized potatoes, however, Grade B potato yields were higher in hand-cultivated plots and vinegar applied plots (early + late), compared to control plots. Hand-cultivated plots recorded highest total potato yields, resulting in 63% higher yields compared to control plots. Directed spray of vinegar (12.5%) during early growth stage, or at 6.25% during early + late growth stage resulted in 36% higher tuber yield compared to control plots.</p>	<p>S31MT16P07 WEED MANAGEMENT METHODS FOR ORGANIC CARROT</p> <p>L. Radics, I. Gál, P. Pusztai, K. Horváth</p> <p>Budapest University of Economic Sciences and Public Administration, Faculty of Horticulture, Department of Ecological and Sustainable Production Systems, lradics@mail.kee.hu, galizora@mail.kee.hu, pusztaip@mail.kee.hu, kismany@mail.kee.hu</p> <p>Fourteen combinations of mechanical and thermal weed management techniques are compared for weed management in organic carrot. Carrot was chosen for our weed management research because of its difficulties in weed management (long growing period, poor weed tolerance) and because carrot is an important crop in organic farming. Herbicide treatment was used as check – inter-row cultivator, brush weeding, hoeing, hand weeding for mechanical control and flame weeding for thermal control. Weed control effects were obtained by assessing soil cover of weeds and carrot. In 2000 under extremely dry and warm circumstances, herbicide treatment was the most effective treatment. Brush weeding was more effective than the cultivator but both implements gave satisfactorily results when treatments were applied twice. Mechanical weed control reduced cover of therophyte weeds but increased the cover of geophyte weeds. In 2001 under less dry circumstances, the most effective treatment was weeding in rows and inter-row cultivation twice according to the need for control. Brush weeding showed very bad effectiveness even when applied twice. In 2002 at the end of the growing season, the inter-row cultivator and inter-row hoeing twice gave the best results both in terms of weeding effectiveness and improving carrot yield. As an overall conclusion, we can conclude that there is no definite and unfailing method for physical weed management in organic carrot. The major goal for the farmer is to achieve weed management with high competence and accuracy that meets the requirements for control of the given crop. OTKA T 030346 funded this experiment.</p>
<p>S31MT21P01 THE DYNAMICS AND MECHANISMS OF CROP TREE COMPETITION BY WOODY AND HERBACEOUS SPECIES</p> <p>P Balandier¹, C Collet², P E Reynolds³ and S M Zedaker⁴</p> <p>¹Cemagref, Team of applied Ecology of Woodlands, Clermont-Ferrand Regional Centre, 24 avenue des Landais, BP 50085, F-63172 Aubière Cedex, France, philippe.balandier@cemagref.fr; ²INRA, Laboratoire d'Etude des Ressources Forêt-Bois, UMR INRA-ENGREF 1092, F-54 280 Champenoux, France, collet@nancy.inra.fr; ³NRCan, Canadian Forest Service, 1219 Queen St. East, Sault Ste. Marie, Ontario, P6A 2E5, Canada, prenold@nrcan.gc.ca; ⁴Department of Forestry (0324), College of Natural Resources, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA, zedaker@vt.edu</p> <p>Plant interactions can be defined as the ways plants act upon the growth, fitness, survival and reproduction of other plants, largely by modifying their environment. These interactions can be positive (facilitation) or negative (competition or exploitation). During plantation establishment or natural forest regeneration after a disturbance, high light levels and sometimes the increased availability of water and nutrients favor the development of opportunistic, fast-growing herbaceous and woody species. In most climates, this vegetation is favored and captures resources at the expense of crop trees. As a consequence, the growth and survival of crop trees can be dramatically reduced. Although the effects of this competition are well documented, the physical and physiological mechanisms of competition are not. The decreases in the availability of light, water and nutrients and the physiological responses of crop trees to resource depletion and microclimate modification are not well understood. Moreover, the competition process is never in steady state in time or space. The growth response of the crop to different competitors modifies resource availability and allocation. Changes in the intensity and orientation of competition result, and floral composition (relative dominance) can change. In addition, indirect interactions such as changes in predators, insectivores, pathogens and the rhizosphere may have significant impacts and are much less studied. Understanding these dynamics is fundamental to improve vegetation management in forests.</p>	<p>S31MT21P02 THE ROLE OF VEGETATION MANAGEMENT FOR ENHANCING PRODUCTIVITY OF THE WORLD'S FORESTS</p> <p>R G Wagner¹, K M Little², and B Richardson³</p> <p>¹ University of Maine, 5755 Nutting Hall, Orono, Maine, USA, 04469, Email: bob_wagner@umefna.maine.edu;</p> <p>² Institute for Commercial Forestry Research, PO Box 100281, Scottsville, South Africa, 3209, Email: Keith@icfr.unp.ac.za;</p> <p>³ Forest Research, Private Bag, Rotorua, New Zealand, Email: Brian.Richardson@ForestResearch.co.nz</p> <p>The management of competing vegetation has evolved with forest management over the past half century and is now an integral part of modern forestry practice in many parts of the world. Vegetation management, primarily using herbicides, has proven especially important in the establishment of high-yield forest plantations. Over the past few decades, there has been substantial research quantifying the wood yield gains associated with the management of competing vegetation. We review results from the longest-term studies in North America, South Africa, and New Zealand. Although management intensity and rotation lengths vary widely among forest types, 50% to 150% or more increases in wood volume have been found in North America and 30% to 120% or more increases found in South Africa and New Zealand. The responses appear to be relatively consistent for a wide range of tree species and site conditions.</p>

<p>S31MT21P03 Advances in modelling and decision support systems for Forest Vegetation Management</p> <p>B. Richardson¹, E.G. Mason², M.S. Watt¹, D.J Kriticos¹</p> <p>¹Forest Research, Private Bag 3020, Rotorua, New Zealand ²Forestry School, Canterbury University, Private Bag 4800, Christchurch, New Zealand</p> <p>The two most common forest vegetation management objectives are to 1) minimise resource competition, and 2) to develop methods for managing specific weed species. This paper reviews relevant models and decision support systems for assisting in achieving these objectives. The aim of reducing resource competition is to increase crop-tree growth and survival. Several modelling approaches have been applied to this problem and these generally estimate crop survival and growth benefits following some form of generalised weed control. Linkages with models of older tree crops are needed for comparing vegetation management strategies in the context of complete silvicultural regimes. More refined individual tree models use competition indices to estimate the quantity of weed vegetation within the growing space around each tree. The indices reflect resource use by the weeds and are sensitive to changes in weed growth over time and to the application of specific vegetation management treatments. Hybrid and process-based models have the potential to provide more generalised models of inter-specific competition, but their usefulness for forest practitioners has yet to be proven. Some forest vegetation management problems require a more detailed understanding of the biology and ecology of a specific species. In this case, different modelling approaches that consider overall weed population dynamics, distribution, or spread may be appropriate.</p>	<p>S31MT21P04 RECENT DEVELOPMENTS IN BIOLOGICAL CONTROL RESEARCH FOR VEGETATION MANAGEMENT IN CANADIAN FORESTS</p> <p>Simon Francis Shamoun</p> <p>Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, 506 West Burnside Road, Victoria, BC V8Z 1M5 Canada. E-mail: sshamoun@pfc.cfs.nrcan.gc.ca</p> <p><i>The growing demand for forest production and sustainability has increased the intensity of forest management practices. This requires good control of the vegetation competing with commercially planted conifer species. Mechanical, manual or chemical herbicides can control such forest vegetation (forest weeds), but are expensive and have non-target effects that are of environmental concern. The discovery and development of potential biological control agents to suppress competing forest vegetation is receiving increased attention in the management of conifer regeneration sites and utility rights-of-way. The largest groups of forest weeds in Canadian conifer regeneration sites are vigorous perennials that colonize rapidly after disturbance such as harvesting practices and fire. Among the forest weeds targeted are: big leaf maple (<i>Acer macrophyllum</i>), red alder (<i>Alnus rubra</i>), trembling aspen (<i>Populus tremuloides</i>), bramble (<i>Rubus spp.</i>), and salal (<i>Gaultheria shallon</i>). In addition, parasitic plants such as dwarf mistletoes (<i>Arceuthobium spp.</i>) are considered the most destructive parasites of conifer trees. Plant pathogens from these weeds have been isolated, identified and tested for their potential use as biological control agents. Thus far, application of <i>Chondrostereum purpureum</i> onto cut stumps of weedy hardwood species prevents sprouting. Treatments of <i>Rubus spectabilis</i> with <i>Phoma</i> sp. (<i>Didymella applanata</i>) caused severe damage to the target weed, the use of the foliar pathogens, <i>Valdensinia heterodoxa</i> and <i>Phoma</i> sp. for control of salal are showing promise, and the potential use of <i>Colletotrichum gloeosporioides</i> and <i>Neonectria neomacrospora</i> rapidly destroys the shoots and berries of the dwarf mistletoes. The latest results of these pathosystems will be discussed in detail.</i></p>
<p>S33MT7P00 WEED CONTROL EFFICACY AND SELECTIVITY OF MON14445 ON ROUNDUP READY® COTTON (Event 1445) IN BRAZIL</p> <p>A Ferreira Neto¹, D Camposilvan¹, F Ferreira¹, G Berger¹, I Kawaguchi¹, M Montezuma¹, R Miranda¹</p> <p>¹Monsanto do Brasil Ltda, Av. das Nações Unidas 12901, São Paulo, SP, Brazil, Corresponding author: antonio.ferreira@monsanto.com</p> <p>The weed control efficacy of the MON14445 glyphosate formulation (720 g. ae. Kg⁻¹) was studied in several Roundup Ready® cotton cultivars in Brazil. This glyphosate formulation was tested against several conventional herbicide programs in Santa Cruz das Palmeiras (SP), Santa Helena de Goiás (GO) and Sorriso (MT) from 1999 to 2003. The MON14445 herbicide rates ranged from 0.5 to 4.0 Kg. ha⁻¹. Single and sequential applications were tested in different timings after crop emergence. The Roundup Ready® cotton tolerance to MON14445 was evaluated based on visual ratings. The weed species evaluated were <i>Bidens pilosa</i>, <i>Commelina benghalensis</i>, <i>Euphorbia heterophylla</i>, <i>Ipomoea</i> spp., <i>Sida rhombifolia</i>, <i>Brachiaria plantaginea</i>, <i>Cenchrus echinatus</i> e <i>Digitaria horizontalis</i>. None of the genotypes tested demonstrated any MON14445 herbicide injury in applications until the V4 stage. The combined analysis of these studies demonstrated that the most adequate MON14445 application rate for Roundup Ready® cotton in Brazil was 1.5 Kg.ha⁻¹ until the V4 stage followed by an intra-row application of 1.0 Kg. ha⁻¹ 20 to 30 days after the first application.</p>	<p>S33MT7P00 WEED CONTROL EFFICACY AND SELECTIVITY OF MON14445 ON ROUNDUP READY® COTTON (Event 1445) IN BRAZIL</p> <p>A Ferreira Neto¹, D Camposilvan¹, F Ferreira¹, G Berger¹, I Kawaguchi¹, M Montezuma¹, R Miranda¹</p> <p>¹Monsanto do Brasil Ltda, Av. das Nações Unidas 12901, São Paulo, SP, Brazil, Corresponding author: antonio.ferreira@monsanto.com</p> <p>The weed control efficacy of the MON14445 glyphosate formulation (720 g. ae. Kg⁻¹) was studied in several Roundup Ready® cotton cultivars in Brazil. This glyphosate formulation was tested against several conventional herbicide programs in Santa Cruz das Palmeiras (SP), Santa Helena de Goiás (GO) and Sorriso (MT) from 1999 to 2003. The MON14445 herbicide rates ranged from 0.5 to 4.0 Kg. ha⁻¹. Single and sequential applications were tested in different timings after crop emergence. The Roundup Ready® cotton tolerance to MON14445 was evaluated based on visual ratings. The weed species evaluated were <i>Bidens pilosa</i>, <i>Commelina benghalensis</i>, <i>Euphorbia heterophylla</i>, <i>Ipomoea</i> spp., <i>Sida rhombifolia</i>, <i>Brachiaria plantaginea</i>, <i>Cenchrus echinatus</i> e <i>Digitaria horizontalis</i>. None of the genotypes tested demonstrated any MON14445 herbicide injury in applications until the V4 stage. The combined analysis of these studies demonstrated that the most adequate MON14445 application rate for Roundup Ready® cotton in Brazil was 1.5 Kg.ha⁻¹ until the V4 stage followed by an intra-row application of 1.0 Kg. ha⁻¹ 20 to 30 days after the first application.</p>

S33MT7P00**WEED CONTROL EFFICACY AND SELECTIVITY OF MON 77280 ON ROUNDUP READY® SOYBEAN (Event GTS 40-3-2) IN BRAZIL**

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Several studies were conducted to evaluate the weed control efficacy and crop tolerance of several Brazilian Roundup Ready® soybean cultivars (Event GTS 40-3-2) to the MON77280 glyphosate formulation (480 g. ae. L⁻¹). These studies were conducted in several tropical and sub-tropical environments from 1998 to 2003. The experimental sites comprised the following locations: Nāo Me Toque (RS), Ponta Grossa (PR), Rolândia (PR), Santa Cruz das Palmeiras (SP), Santa Helena de Goiás (GO), and Sorriso (MT). The MON77280 weed control efficacy was compared to combinations of conventional herbicides used in the regions tested. The MON77280 rates ranged from 0.5 to 4.0 L.ha⁻¹ in single and sequential applications. The Roundup Ready® soybean cultivar tolerance to MON77280 was evaluated based on visual ratings. The weed species evaluated were *Amaranthus viridis*, *Bidens pilosa*, *Commelina benghalensis*, *Euphorbia heterophylla*, *Galinsoga parviflora*, *Ipomoea* spp, *Portulaca oleracea*, *Raphanus raphanistrum*, *Richardia brasiliensis*, *Sida rhombifolia*, *Spermacoce latifolia*, *Brachiaria plantaginea*, *Brachiaria decumbens*, *Cenchrus echinatus*, *Digitaria horizontalis* and *Eleusine indica*. Areas containing *Commelina benghalensis* and/or heavy weed infestation require MON77280 application until 20 days after emergence. A sequential application could be required. None of the cultivars tested showed any MON77280 injury. The combined analysis of these studies revealed that the most adequate MON77280 application rate was 2.0 L.ha⁻¹ 20 to 30 days after emergence.

S33MT7P00**WEED CONTROL EFFICACY AND SELECTIVITY OF MON 14445 ON ROUNDUP READY® CORN (Event NK603) IN BRAZIL**

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The MON14445 glyphosate formulation (720 g. ae.Kg⁻¹) was subjected to weed control evaluation in Roundup Ready® corn (NK603) in Brazil. This glyphosate formulation was compared to several conventional herbicide programs. The testing sites were Nāo-Me-Toque (RS), Ponta Grossa (PR), Rolândia (PR), Santa Cruz das Palmeiras (SP), Santa Helena de Goiás (GO) and Sorriso (MT) from 1999 to 2003. The MON14445 rates ranged from 0.5 to 5.0 Kg.ha⁻¹ in single and sequential applications. Several application timings and herbicide combinations were also tested. The Roundup Ready® corn tolerance to MON14445 was evaluated based on visual ratings. The weed species evaluated were *Amaranthus viridis*, *Bidens pilosa*, *Commelina benghalensis*, *Euphorbia heterophylla*, *Galinsoga parviflora*, *Ipomoea* spp, *Portulaca oleracea*, *Raphanus raphanistrum*, *Richardia brasiliensis*, *Sida rhombifolia*, *Spermacoce latifolia*, *Brachiaria plantaginea*, *Brachiaria decumbens*, *Cenchrus echinatus*, *Digitaria horizontalis* and *Eleusine indica*. Areas containing *Commelina benghalensis* and/or heavy weed infestation require MON14445 application until 20 days after emergence. A sequential application or herbicide combination could also be required. None of the Roundup Ready® corn genotypes tested showed any injury in MON14445 applications. The combined analysis of these studies revealed that the most adequate MON14445 application rate was 2.0 Kg.ha⁻¹ 20 to 30 days after emergence.

S33MT7P00**EFFECT OF GLUFOSINATE-RESISTANT CORN POPULATION AND ROW SPACING ON LIGHT INTERCEPTION, CORN YIELD, AND COMMON LAMBSQUARTERS (*CHENOPODIUM ALBUM*) GROWTH**

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Management of maize row spacings and populations has been used for many years to increase maize productivity. In 2002 and 2003, non irrigated maize was grown in 38-, 56-, and 76-cm row spacings at populations averaging 59 300, 72 900, and 83 900 plants/ha in Gurdaspur District, India. Glufosinate at 0.29 kg/ha was applied to common lambsquarters (*Chenopodium album*) averaging 5 cm in height in each plot. Maize population and row spacing did not influence weed emergence following application of glufosinate. Common lambsquarters biomass and seed production were reduced when grown under canopies of maize planted in populations exceeding 72 900 plants/ha. Common lambsquarters biomass was reduced as maize row spacings were reduced from 76 to 38 cm. Early-season interception of photosynthetically active radiation (PAR) by maize canopies increased as row spacings decreased, but differences were not apparent later in the season. Interception of PAR was similar throughout the season when maize populations exceeded 72 900 plants/ha. Maize yields were not affected by row spacing, but they were increased with maize populations of 72 900 plants/ha or higher.

S33MT7P00**NEMATODE AND MICROBIAL COMMUNITIES RESPONSE TO GLYPHOSATE-RESISTANT CROPPING SYSTEM.**

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Field experiments were conducted in 2001, 2002, and 2003 at Manhattan and Hays, Kansas to study the effect of glyphosate-resistant cropping system on soil nematode and microbial communities in both conventional and no-tillage environments. Crop rotation schedules were soybean-corn-soybean and corn-soybean-soybean at Manhattan and Hays, respectively. Herbicide treatments were conventional herbicide, glyphosate applied when weeds were 10 cm or 20 cm tall at a rate of 1.12 kg ha⁻¹. Soil samples for nematode assessment and microbial functional diversity measurement were taken in spring and fall of each year. Soil microbial biomass carbon was measured monthly throughout the growing season. Overall nematode community was not altered by glyphosate-resistant cropping system when compared to conventional herbicide system at both locations. In both 2002 and 2003 growing seasons, the nematode communities were higher in conventional tillage than in no-tillage at Manhattan. Both soil microbial biomass carbon and functional diversity were not altered by glyphosate-resistant cropping system when compared to conventional herbicide system. The study clearly showed that nematode and microbial communities response to glyphosate-resistant cropping system was similar to that of conventional herbicide system.

S33MT7P00

AMINOMETHYLPHOSPHONIC ACID, A METABOLITE OF GLYPHOSATE, CAUSES INJURY IN GLYPHOSATE-TREATED, GLYPHOSATE-RESISTANT SOYBEAN

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Application of glyphosate to glyphosate-resistant (GR) soybean results in significant injury under certain conditions. We hypothesized that if GR soybean is completely resistant to glyphosate, injury could be caused by a metabolite of glyphosate, aminomethylphosphonic acid (AMPA), a known phytotoxin. We examined glyphosate and AMPA effects on one- to two-trifoliolate leaf stage (16- to 18-d old) GR and conventional soybean in the greenhouse. In GR soybean, single applications of glyphosate-isopropylammonium (1.12 to 13.44 kg/ha) reduced chlorophyll content of the second trifoliolate leaf by 4 to 14% at 7 d after treatment (DAT) and shoot dry weight by 7 to 16% at 14 DAT. A single application of AMPA (0.12 to 8.0 kg/ha) reduced chlorophyll content of the second trifoliolate leaf by 16 to 69% at 4 DAT and shoot fresh weight by 4 to 49% at 14 DAT in both GR and conventional soybeans. AMPA at 0.25 kg/ha produced chlorotic effects in both GR and conventional soybean similar to those caused by glyphosate-isopropylammonium at 13.44 kg/ha in GR soybean. AMPA levels found in AMPA-treated soybeans of both types and in glyphosate-treated GR soybeans correlated similarly with phytotoxicity. These results suggest that soybean injury to GR soybean from glyphosate is due to AMPA formed from glyphosate degradation.

S33MT7P00

HAS THE USE OF HERBICIDE-TOLERANT CANOLA CROPS ALTERED WEED DIVERSITY IN WESTERN CANADA?

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Herbicide-tolerant canola, introduced in 1996, was rapidly adopted in Western Canada and now occupies >90% of the 4.6 million ha seeded annually. To determine the impact of the new technology, we compared residual weed abundance and diversity in canola fields. Weed surveys were conducted in 495 random selected fields in 1995-1997 and in 674 fields in 2001-2003. Individual weeds were counted prior to harvest in 20 quadrats per field and species identified. Average weed density declined from 43 to 27 plants m⁻². This drop occurred in annual broad-leaved, facultative winter annual and perennial life forms but grassy species increased. Data were summarized and ranked using a relative abundance index. The change in rank of the top 30 species was used to identify shifts occurring between the two survey periods. Species, such as *Thlaspi arvense* L., not previously well controlled, have decreased in relative abundance while *Setaria viridis* L., *Avena fatua* L. and volunteer crops increased in relative abundance. Diversity as measured by species richness, dominance, and evenness indices declined significantly. Only three of the 34 most abundance species are native and none are classed as endangered. The significance of the decline in these alien invasive species to overall biodiversity has yet to be assessed in Western Canadian agro-ecosystems. It is difficult to attribute weed shifts to a specific factor because the adoption of this technology included changes from narrow- to wide-spectrum products, including glyphosate, glufosinate and imidazolinone herbicides, and changes in varieties, time of application, and tillage regime.

S33MT10P00

Evaluation of some eco-safety herbicides for in-time weed management in transplanted summer rice (*Oryza sativa* L.0)

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Weed infestation restricting the rice production to the tune of 20%. Costly hand weeding is now gradually replaced by some alternative chemicals weed management practices. But considering the effect of these chemicals on environmental pollution, the eco-safer herbicides are most desirable.

The field experiment conducted during summer season' 2002-03 in the farmer's field at Kalyani, India. The treatments comprised five different doses of IR 5878 50 G (60,75,100,125, and 150 g ha⁻¹) applied as post-emergence at 25 DAT in the standing water of 3 cm, Butachlor 50 EC at 1250 g ha⁻¹ applied PE at 3 DAT, Anilofos 30 EC at 400 g ha⁻¹ applied pre-emergence at 3 DAT, Pyrazosulfuron - ethyl 10 WP at 30 g ha⁻¹ applied as EPE emergence at 7 DAT.

The experiment revealed that Pyrazosulfuron - ethyl recorded the lowest dry weight of weeds, which was statistically at par with all the tested herbicides except IR 5878 at 60 gha⁻¹. With the increase in the dose of IR 5878, the dry weight of weeds decreased gradually. The highest grain yield of 4.75 t ha⁻¹ was recorded under IR 5878 at 125 gha⁻¹ which was closely followed by IR 5878 at 100 and 150 gha⁻¹. No phytotoxicity was recorded by these tested herbicides to the crop. IR 5878 recorded the lowest chlorophyll content of *Echinochola* spp., *Cyperus* spp. and *Ludwigia* spp. at 125 and 150 g ha⁻¹ closely followed by Pyrazosulfuron-ethyl.

It can be concluded that IR 5878 can be used for eco-safety in-time weed management in rice.

S33MT10P00

POSTEMERGENCE CONTROL OF SPEARGRASS [*IMPERATA CYLINDRICA* (L.) RAEUSCHEL] IN MAIZE USING NICOSULFURON

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Speargrass is a dominant and competitive weed, threatening crop productivity in the moist savanna of West Africa. An integrated approach that includes chemical control is recommended for sustainable control of speargrass. There are no herbicides recommended for the postemergence control of speargrass in maize in West Africa. Field studies were conducted in 2001 and 2002 at Ilorin in the Southern Guinea savanna zone of Nigeria, to evaluate the effect of nicosulfuron rates (35, 70 and 105 g a.i. ha⁻¹) on the control of speargrass in maize. Control treatments were hand-weeded and unweeded plots. The maize cultivars used were Low-N-Pool and Oba Super 1. At maize harvest, all nicosulfuron treated plots had significantly lower speargrass shoot and rhizome dry matter than the unweeded control plots in both years. The weeded control had the lowest speargrass shoot and rhizome dry matter in both years. Maize grain yield from plots that received nicosulfuron was 1.4 to 1.6 times higher than that from the unweeded control plots in both years. The weeded control had maize grain yield similar to plots that received nicosulfuron at 105 g a.i. ha⁻¹. Maize cultivars were not affected by nicosulfuron. Speargrass shoot and rhizome dry matter accounted for 96 and 67% variation respectively, in maize grain yield in both years. This study concludes that nicosulfuron applied at 105 g a.i. ha⁻¹ is effective for the postemergence control of speargrass in maize in the moist savanna of Nigeria.

<p>S33MT10P00 PREDICTION OF RICE YIELD LOSS AS A RESULT OF RICE-WEED COMPETITION IN DIFFERENT RICE CULTIVATION METHODS</p> <p>Byeong-Chul Moon¹⁾, O D Kwon²⁾, S H Cho³⁾, S G Lee⁴⁾, J G Won⁵⁾, S W Han⁶⁾, S M Oh¹⁾, D S Kim⁷⁾</p> <p><i>Department of Crop Protection, National Institute of Agricultural Science and Technology, RDA, Suwon 441-707, Korea, moonbc@rda.go.kr, 2) Junnam Agricultural Research and Extension Services, odkwon@jares.go.kr, 3) Junbuk Agricultural Research and Extension Services, shcho0360@hanmail.net, 4) Chungnam Agricultural Research and Extension Services, lsoong4@hanmail.net, 5) Kyongbuk Agricultural Research and Extension Services, jg-won@hanmail.net, 6) Kyonggi Agricultural Research and Extension Services, han5340@hanmail.net 7) LG Life Sciences Ltd, dosoonkim@lgls.co.kr</i></p> <p>Field experiments were conducted to predict rice yield losses caused by barnyardgrass (<i>Echinochloa crus-galli</i>) and pickerelweed (<i>Monochoria vaginalis</i>) at a range of plant densities under different rice cultivations in Korea in 2003, and to determine its economic threshold levels (ET). All data were fitted to Cousens' rectangular hyperbola to estimate parameters for predicting rice yield loss. The competitiveness represented by parameter β, whose reciprocal ($1/\beta$) is a weed density reducing crop yield by 50%, of barnyardgrass were 0.094, 0.055, 0.035, 0.0072, and 0.094 in normal-season machine transplanting of 10 (10 NMT), 20 (20 NMT), and 30 days old seedling (30 NMT), late-season machine transplanting of 30 days old seedling after barley harvest (30 LMT), and dry direct-seeding (DDS), respectively. This result indicates that in normal-season transplanting, the older the rice seedling when transplanted, the less the yield loss caused by barnyardgrass is, and the competition effect of barnyardgrass is greater in early rice transplanting than late one. Economic thresholds calculated using Cousens' equation were 5, 5, 7, 49, and 4 plants of barnyardgrass per 10 m^2 for 10 NMT, 20 NMT, 30 NMT, 30 LMT, and DDS, respectively. The competitiveness of pickerelweed were 0.0018, 0.00096, and 0.00146 in 10 NMT, 20 NMT, and 30 LMT, respectively, and its corresponding ETs were 129, 290, and 207 plants of pickerelweed per 10 m^2, respectively</p>	<p>S33MT10P00 EFFECT OF PREVIOUS CROP AND WEED CONTROL ON WHEAT YIELD AND WEED GROWTH</p> <p>J. R. Moyer¹, R. E. Blackshaw¹, R. Doram¹, H. C. Huang¹</p> <p><i>¹Agriculture and Agri-Food Canada, Lethbridge Research Centre, 5401-1st Ave. S., P. O. Box 3000, Lethbridge, Alberta, Canada, T1J 4B1, moyer@agr.gc.ca, blackshaw@agr.gc.ca, doram@agr.gc.ca, huangh@agr.gc.ca</i></p> <p>Crop rotations have an important effect on weed populations and crop yields. However, the relative importance of herbicide rotation that accompanies crop rotation compared to crop rotation alone in managing weeds is not known. To determine the effect of crop and herbicide treatment on following crop yield and weed growth, eight crops were grown with and without herbicide application. Winter and spring wheat were grown the following year without herbicide application for weed control. Herbicide treatments in lentils and fallow increased overall (spring and winter) wheat yield whereas wheat yields following herbicide and no herbicide treatments were similar for mustard, canola, barley, spring wheat and oat. Maximum spring and winter wheat yields occurred after lentils and minimum yields occurred after mustard. Overall weed densities in spring and winter wheat were 37% and 28% greater after no herbicide than after recommended herbicide treatments, respectively. In the no herbicide treatment, mean weed densities were twice as large in spring and winter wheat after fallow and mustard as after barley. In winter wheat after annual crops with no herbicide treatment, there was no correlation between weed biomasses in the previous annual spring seeded crop and the biomasses of weeds in mature wheat. However, biomasses of weeds such as wild oat and green foxtail in spring wheat were correlated with their biomasses in the previous crops. Therefore, in this study weed growth and wheat yield were affected as much or more by crop sequence as by herbicide application.</p>
<p>S33MT10P00 LITTER ANALYSIS OF <i>PROSOPIS JULIFLORA</i>. DC; A SPECIES FOR WASTELAND DEVELOPMENT</p> <p>B. R. Pandit and Sailesh Prajapati</p> <p><i>Ecology division, Department of life sciences, Bhavnagar University, Bhavnagar - 364 002 [India]</i></p> <p>Macronutrient concentrations (Na, K, Ca, Mg, N, P) of leaflitter and other litter fragments (twigs and bole) were studied. Leaflitter contained greatest amount of nutrient concentrations. Effectiveness of plant as a wasteland development species is appraised. The present data emphasizes that <i>P. juliflora</i> can be successfully utilized for the reclamation of coastal saline and alkaline wastelands of Bhavnagar districts, by improving the soil fertility. The plant easily establish even in the nutrient poor and highly saline soils. The high nutrient content of the litter produced will be change in the soil nutrient chemistry over long period of growth of <i>Prosopis</i> stands, provided in litter produced is not removed. This can be avoided by making earthen bounds around the plantation area. By avoiding addition of chemical measures and gypsum as in the traditional wasteland improvement techniques, the practice of <i>P. juliflora</i> cultivation enhances the sustainable exploration of land and bio resources.</p> <p>Key words: <i>Prosopis juliflora</i>, minerals in litter, wastelands.</p>	<p>S33MT10P00 BIO-EFFICACY OF TANK MIX COMBINATIONS OF FENOXAPOP-METHYL AND CLODINAPOP-PROPARGYL WITH BROADLEAF HERBICIDES FOR BROAD SPECTRUM WEED CONTROL IN WHEAT (<i>TRITICUM AESTIVUM</i> L.)</p> <p>S.S.Punia, R.K.Malik and Parvinder Shoeran</p> <p>Department of Agronomy <i>Chaudhary Charan Singh Haryana Agricultural University, Hisar- 125 004 (Haryana)</i></p> <p>To evaluate the efficacy of fenoxaprop-ethyl and clodinafop-propargyl as tank mixed with metsulfuron or 2,4-D(ester) against complex weed flora in wheat, two field experiments were conducted during the rabi (winter) season of 2001-02 and 2002-03 at CCS Haryana Agricultural University, Hisar. The experimental soil in both the years was sandy loam with 61% sand, 22.1% silt and 19.1% clay, medium in fertility with 0.29% O.C. and pH of 8.2. Experimental field was infested with both grassy as well as broadleaf weeds. Wheat variety PBW-343 was drilled in 22.5 cm wide rows using a seed rate of 100 kg/ha on November 2, 2001 and October 28, 2002. Tank mixtures of fenoxaprop and clodinafop with metsulfuron-methyl and 2,4-D in various ratios were applied at 35-40 days after sowing. Dominant grassy weeds viz. <i>Avena ludoviciana</i>, <i>Phalaris minor</i> Retz. and broadleaf weeds like <i>Chenopodium album</i> L., <i>Melilotus indica</i> All. and <i>Rumex retroflexus</i> L. were effectively controlled by tank mix application of fenoxaprop + metsulfuron (30:1 or 40:1) at 120 g ha^{-1} or clodinafop + metsulfuron (20:1) at 50 or 60 g ha^{-1} applied at 30DAS. Tank mix combinations of 2, 4-D with either clodinafop or fenoxaprop were antagonistic resulting to poor control of grassy weeds and lower grain yield of wheat. Based on the results of above trials, it can be summarized that tank mix application of metsulfuron either with fenoxaprop or clodinafop-propargyl at 30-35 DAS is needed to manage the complex weed flora in wheat. 2, 4-D should not be used as tank mixture with clodinafop or fenoxaprop.</p>

S33MT10P00**SUSTAINABLE MANAGEMENT OF DIVERSE WEED FLORA IN RICE –RICE SYSTEM****D.J.Rajkhowa¹**

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The poor productivity of rice-rice system is mainly attributed to severe weed infestation. Manual removal is expensive, time consuming and often limited by paucity of labours. Herbicide alone, fails to provide effective control of weeds. The study was therefore, undertaken to evaluate an appropriate integrated weed management practice for this system. The study was conducted during summer and rainy seasons of 2001 and 2002 at the research farm of the university, Jorhat. The acid inceptisol (pH 5.4) of the experimental site had 248, 6.3 and 102 kg ha⁻¹ of N, P and K respectively. Treatments consist of stale seedbed + hand weeding, conventional seedbed + hand weeding, butachlor 1.0 kg ha⁻¹ + dry land weeder, butachlor 1.0 kg ha⁻¹ and anilofos 0.4 kg ha⁻¹ imposed to the direct seeded rice during summer season while, two treatments viz., no weeding and rotary weeder (20 and 40 days after transplanting) were imposed to the succeeding rice. Appropriate statistical method was adopted. Butachlor 1.0 kg ha⁻¹ with dry land weeder at 25 days after emergence was effective in direct seeded rice and was at par with the treatment involving stale seedbed technique with one hand weeding. In the succeeding rainy season rice use of rotary weeder at 20 and 40 DAT was effective. Study concludes that pre-emergence application of butachlor 1.0 kg ha⁻¹ followed by the use of dry land weeder at 25 DAE to the direct seeded rice and rotary weeder twice (20 and 40 DAT) to the succeeding transplanted rice is effective.

S33MT10P00**EFFICACY OF HERBICIDES ON POPULATION AND DRY WEIGHT OF WEEDS AND YIELD OF TRANSPLANTED RICE AND THEIR SUBSEQUENT RESIDUAL EFFECT ON SUMMER RICE****R.C. Samui¹, Anirban Mondal² and Subhendu Mandal³**

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Rice-rice is the major cropping system in the state of West Bengal, India. Continuous cultivation of rice leads to dominance of some weeds particularly *Echinochloa* sp. Farmers have to incur sizable amount of money for controlling the weeds in rice field. The objective of this experiment was to test the efficacy of different herbicides and to evaluate the correct dose and methods of application for weed control in rice and their residual effect on succeeding crop. The present investigation was laid out during rainy season 2002 at university farm, Bidhan Chandra Krishi Viswavidyalaya, India in randomised block design with 10 treatments (i.e. acetachlor @ 150,200 and 300 g.a.i./ha applied as spray and acetachlor @ 150 and 200 g.a.i./ha as sand mix , almix @ 4 g.a.i./ha, pretilachlor @ 750 g.a.i./ha and butachlor @ 1250 g.a.i./ha applied as spray) applied at 3 DAT and another treatment with two hand weeding at 25 & 40 DAT and unweeded control. Weed population (27.0/m²), biomass (5.35g/m²) and weed index (2.75) were significantly reduced due to application of acetachlor@ 200 g.a.i. /ha. This treatment also significantly increased grain (3330 kg/ha) and straw (5067 kg/ha) yields over unweeded control where yields were 2426 and 4646 kg/ha, respectively. There were no residual effect of herbicides on weed population and biomass at 30 DAT and grain and straw yield of summer rice. Acetachlor @ 200 g.a.i./ha applied at 3 DAT with sand mix was the best herbicides during rainy season transplanted rice in rice-rice cropping sequence.

S33MT10P00**EFFECT OF DIFFERENT HERBICIDES ON WEED DYNAMICS, YIELD AND NUTRIENT UPTAKE OF RICE-RAPESEED SEQUENCE OF CROPPING IN WEST BENGAL, INDIA****R.C.Samui¹, Anirban Mondal² and A. Roy³**

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The transplanted rice in West Bengal is grown in rainy season in waterlogged soil and rapeseed is grown in winter season in aerated soil. The main objective was to evaluate the low dose high efficiency herbicides for weed management in rainy season rice and on succeeding rapeseed crop. This field experiment was conducted in the rainy season of 2002 and 2003 at university farm, Bidhan Chandra Krishi Viswavidyalaya, India in randomised block design with 13 treatments involving different herbicides applied at 3 DAT along with two hand weeding at 25 & 40 DAT and unweeded control. Acetachlor @ 200 g.a.i. /ha applied as sand mix significantly reduces the weed population, biomass at 30 DAT and nutrient uptake by weeds at harvest over the control. Grain and straw yields and nutrient uptake by rice also significantly increased due to application of acetachlor @200 g.a.i./ha over weedy check. There was no residual effect on weed dynamics and growth of rapeseed crop. So, acetachlor @ 200 g.a.i./ha applied with sand mix at 3 DAT was the best herbicides during rainy season transplanted rice in rice-rapeseed sequence.

S33MT10P00**MANAGEMENT OF CYPERUS ROTUNDUS WITH TRIFLOXYSULFURON IN GREEN SUGARCANE IN BRAZIL****Soares, J. E.¹, Braz, B.A.¹, Howard, S.²**

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Cyperus rotundus is a very competitive and allelopathic species that can significantly reduce the productivity and longevity of conventional and green sugarcane in Brazil. Therefore, it is imperative to reduce *Cyperus rotundus* populations to a level that ensures the economic viability of sugarcane production. Trifloxysulfuron is a novel sulfonylurea herbicide from Syngenta that is formulated as a 75WG ready mixture with ametryn (18.5 g trifloxysulfuron + 731.5 g ametryn/kg) to provide a unique product for selective, broad-spectrum weed control in sugarcane. A well-established benefit of trifloxysulfuron use in conventional sugarcane production includes suppression of *Cyperus rotundus* in one-shot application, as measured by reduced tuber production and viability. The objective of this research was to determine whether trifloxysulfuron in a 3-year application programme would be as effective in reducing *Cyperus rotundus* populations in green cane as it is in conventional sugarcane production. Three trials were established in 2002 (macroplots with 5 replicates) comprised of these treatments (rates in g ai/ha): untreated, trifloxysulfuron (22.5), trifloxysulfuron + ametryn (37+1463), sulfentrazone (900), and imazapic (122.5). Treatments containing trifloxysulfuron included a non-ionic adjuvant and were applied post-emergence to the sugarcane and *Cyperus rotundus*. Sulfentrazone and imazapic were applied in pre-emergence. Visual control assessments, tubers counts and sugarcane yield assessment were made. Results from the second year of the three-year program demonstrate that trifloxysulfuron significantly decreased the number of viable *Cyperus rotundus* tubers, by 70 % in means and increased yields. Trifloxysulfuron can be used as an excellent tool to manage *Cyperus* populations in green sugarcane production.

S33MT10P00**INFLUENCE OF DURATION OF WEED INTERFERENCE
ON COTTON (*GOSSYPIUM HIRSUTUM L.*) YIELD
COMPONENTS AND LINT QUALITY****Asadollah Hejazi¹ and Saeid Soufizadeh¹**

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The low competitive ability and growth rate of cotton at the beginning of growth season affect it negatively by weeds which are the most important factors in limiting yield and product quality. In order to determine the effects of different periods of weeds interference on yield, yield components and lint quality in cotton a field experiment was conducted at the research field of Abooreihan Campus, University of Tehran in 2002. A complete randomized block design with three replications and naturally occurring of weeds were used. Seven chronological treatments including weeds interference till 0 (season long weed-free control), 2, 4, 6, 8, 10, 12 weeks after emergence and other seven chronological treatments including weed-free till the same periods were used. The dominant weed in all the experiment period was Johnson grass. Results indicated that there was a significant reduction in yield components due to continuity of weeds interference. Among the yield components, the most important one which was affected by competition was number of boll per plant which was reduced by 98 percent in season-long weedy control. Also by an increase in weeds interference period by more than two weeks there was a significant loss in yield of cotton. On the other hand continuing thinning after the 10th week could not cause a significant increase in cotton yield. Among the qualitative characteristics which were studied, lint fineness was affected significantly by weeds competition after the 10th week (beginning of bolling) in comparison with the season long weed-free control.

S33MT10P00**LUCERNE – A PERENNIAL WEED PROBLEM
NOW SOLVED****A M Storrie¹ and A S Cook²**

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The successful removal of lucerne prior to cropping in Australia has been unsuccessful until recently, with 30 to 40% of plants surviving into the crop phase. Australian farmers try a wide range of herbicides and adjuvants to control lucerne, in attempt to store soil moisture prior to cropping. Poor initial control can lead to low crop yields due to poor moisture conservation and over-cultivation.

A series of replicated small plot trials were conducted in northern NSW to find the factors influencing lucerne control. This paper reviews the herbicide and adjuvant component. Glyphosate at 1350 to 1800 g a.i. ha⁻¹ gave 68 to 89% control, metsulfuron methyl at 12 g a.i. ha⁻¹ resulted in 9.5% control, while auxin-type herbicides gave superior control. Different formulations of 2,4-D at 1000 g a.i. ha⁻¹ resulted in 93 to 100% control, while MCPA at 1000 g a.i. ha⁻¹, MCPA + clopyralid at 500 + 75 g a.i. ha⁻¹ and dicamba at 560 g a.i. ha⁻¹ gave 68%, 79% and 25% control respectively. Further trials showed that triclopyr + picloram at 150 + 50 g a.i. ha⁻¹ consistently gave control above 93%.

Trials were also conducted to investigate improving the efficacy of 2,4-D amine formulations. When using 2,4-D d.m.a. at a sub-lethal rate non ionic and buffering surfactants gave an increased control of 25% while paraffinic oil and organosilicone penetrant gave 29% and 24% improvement respectively. In NSW triclopyr + picloram is now registered and 2,4-D amine formulations "permitted" for the removal of lucerne.

S33MT15P00**INDUCED RESISTANCE: AN EFFECTIVE METHOD FOR THE CONTROL OF PARASITIC WEEDS?****H Buschmann and J Sauerborn**

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Parasitic weeds of the genera *Orobanche* and *Striga* are serious pests and cause significant yield losses in various crops. Because of their life strategies that are intimately coupled with the development of the host plant these weeds are difficult to control by means of e.g. herbicides. Hence there is a need for the development of efficient control strategies. In recent years methods based on induced resistance (IR) had been successfully developed in order to control bacterial, fungal or viral plant pathogens. IR is based on the activation and strengthening of natural resistance mechanisms in crops by either salicylic acid like chemicals (systemic acquired resistance, SAR) or plant growth promoting rhizobacteria (induced systemic resistance, ISR). We could show that IR is protecting crops efficiently against infestation with parasitic weeds. Application of IR inducing chemicals or microorganisms reduced the infestation of sunflower with *O. cumana* to 98% as well as the infestation of tobacco and tomato with *O. ramosa* to 84% and 80% respectively. Especially analogs of salicylic acid proved to be efficient resistance inducing agents and can be used either on their own or in combination with other control methods in an integrated *Orobanche* management strategy. However, induced resistance stimulated with the evaluated products is not effective to control *Striga hermonthica* in maize or sorghum.

S33MT15P00**WATER RELATIONS AND DEVELOPMENT OF THE EUROPEAN MISTLETOE *VISCUM ALBUM* L.****M De Mol¹ and A Heller¹**

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Viscum album L. is a hemiparasitic flowering plant. The development of its endophytic system has not been described in detail until now. Classical light microscopical methods and high resolution 3D X-ray computed tomography were used on poplar (*Populus x canadensis* Moench, Salicaceae) infected with mistletoe (*Viscum album* L., Viscaceae) to understand water flow and development of the endophytic system. Short, broad xylem elements in the haustorium of the mistletoe form direct vessel-vessel connections at the interface host-mistletoe. They facilitate water transport to narrow xylem elements, which transport water longitudinally, before bending radially outwards and forming a central cord to the aerial parts of the mistletoe. The position of the meristematic area depends on the developmental phase the haustorium is in. The mistletoe develops the central cord of xylem elements in direction of the hosts wood. When it reaches the vascular cambium of the host, the intercalary meristem merges with the meristematic tissue forming this central cord. In this way it connects, in older mistletoes, the vascular cambium of the host with that of the mistletoe. Therefore, it does not only enable longitudinal, but also radial growth of the haustorium. Three dimensional reconstructions were made to visualize the endophytic system. Plans for further research are described.

<p>S33MT15P00 GERMINATION ECOLOGY, EMERGENCE AND EARLY HOST PARASITIZATION OF CUSCUTA CAMPESTRIS YUNCKER</p> <p>S. Benventi¹, A. Bonetti², and G. Dinelli²</p> <p>¹Dipartimento di Agronomia e Gestione dell'Agroecosistema, Università di Pisa, Via S.Michele, 2 - 56124, Pisa, Italy, sbenve@agr.unipi.it; ²Dipartimento di Scienze e Tecnologie Agroambientali, Università di Bologna, V.le Fanin, 44- 40127 Bologna, Italy, gdinelli@agrscli.unibo.it</p> <p><i>Cuscuta campestris</i> Yuncker is a parasitic weed belonging to Convolvulaceae family and is widespread both in temperate and sub-tropical ecosystems. As concerns the ecology of this parasitic weed, several aspects are still unclear such as maximum host-weed distance for parasitization, role of phenological stage of host, criteria of host choice and longevity of seeds. The aim of the present work was to investigate either germination and dormancy ecology of <i>C. campestris</i> Y. seeds and physiological mechanisms involved in early parasitization of sugarbeet seedlings. The parasitic weed is characterized by an evident primary dormancy which is removed by scarification. Germination was negligible at 10°C and optimal at 30°C, while it was not influenced by light. Seed burial induced a cycling of induction and breaking of secondary dormancy. The emergence was inversely proportional to the depth of burial. The emergence was observed only for seed buried within the first 5 cm of soil profile. The number of weed plants reaching the host was exclusively influenced by the distance between weed and crop and was independent on host phenological stage. Weed tropism towards host was due to the perception of light (far-red) transmitted by green parts of sugarbeet plants. On the contrary, the parasitization of the hosts (emission of haustoria by <i>C. campestris</i>) was heavily influenced by host phenological stage. The results suggested that <i>Cuscuta</i> preferably parasitized hosts with high chlorophyll content. Finally, the germination of <i>Cuscuta</i> seeds after a 12 years was approximately 15%, evidencing the persistence of this parasitic weed.</p>	<p>S33MT15P00 GROWING DEGREE DAYS - A PREDICTIVE TOOL FOR OROBANCHE SPP. PARASITISM IN CERTAIN CROPS</p> <p>H Eizenberg¹, J B Colquhoun², C A Mallory-Smith², J Hershenhorn¹, T Lande¹, G Achdari¹ and D Plakhin¹</p> <p>¹Department of Weed Research, Newe Ya'ar Research Center, P.O. Box 1021 Ramat Yishay, Israel, eizenber@volcani.agri.gov.il; ²Deaprtment of C and SS, Oregon State University, Corvallis, Oregon, USA Jed.Colquhoun@oregonstate.edu</p> <p>Temperature is strongly related to the dynamics of <i>Orobanche</i> spp. parasitism on its hosts. In previous studies, we have described the relationship between temperature and the parasitism process of <i>O. aegyptiaca</i>, <i>O. minor</i>, and <i>O. cumana</i>, in tomato, red clover, and sunflower, respectively. Temperature data collected from studies conducted under controlled conditions and in the field were converted to growing degree days (GDD). Reanalysis of the data from those studies enabled us to develop a predictive model for the parasitism dynamics based on GDD for <i>O. aegyptiaca</i>, <i>O. minor</i>, and <i>O. cumana</i>, in tomato, red clover, and sunflower, respectively. <i>Orobanche</i> development was classified into stages according to the sizes: S1 - 1 to 2 mm; S2 - 3 to 4 mm; S3 - 5 to 10 mm and S4 - greater than 10 mm including shoots. The predictive models were developed independently for each host based on the temperature range that reflects climatic conditions during the crop season. The model predicts lag, log and maximum phase for the four parasitism stages in relation to GDD in all the three crops. The model was validated and confirmed in field experiments. In future related studies, the proposed predictive models might benefit us as base models that will be used to optimize chemical control of the parasite and to alter sowing dates in order to avoid or reduce parasitism rate.</p>
<p>S33MT15P00 INTEGRATED MANAGEMENT OF OROBANCHE MINOR IN TRIFOLIUM PRATENSE</p> <p>C A Mallory-Smith¹, J B Colquhoun¹, R D Lins¹ and H Eizenberg²</p> <p>¹Department of Crop and Soil Science, Oregon State University, USA, Carol.Mallory-Smith@oregonstate.edu; ²Newe Ya'ar Research Center, P. O. Box 1021 Ramat Yishay, Israel</p> <p>Since the discovery of <i>Orobanche minor</i> in red clover (<i>Trifolium pratense</i>) fields in the USA in 1998, there has been a concerted effort to develop an integrated management system for its control. The biology of <i>O. minor</i> prevents the use of only one weed control tactic; therefore, biological based practices were combined with chemical weed control. Wheat (<i>Triticum aestivum</i>) was found to be a false host that stimulated germination of <i>O. minor</i> seed; however, <i>O. minor</i> does not attach and develop on wheat. Therefore, wheat can be used to reduce the <i>O. minor</i> seed bank. Imazamox herbicide provided effective <i>O. minor</i> control with sufficient crop safety. Optimal herbicide application timing is difficult given that <i>O. minor</i> attached to red clover remains below ground for several months prior to emergence. Consequently, a growing degree day model for <i>O. minor</i> development was constructed and will be used to determine the optimum herbicide application timing based on <i>O. minor</i> attachment and early growth. The commercialization of imazamox resistant wheat provided another possible control option. Imazamox resistant wheat was interseeded with red clover with the expectation that the wheat will cause suicidal germination of the <i>O. minor</i>. In addition, imazamox can be sprayed over the wheat and red clover without killing either crop but would control any <i>O. minor</i> that had attached to the red clover. The integrated <i>O. minor</i> management system will improve <i>O. minor</i> control and maintain a viable cropping system for red clover producers.</p>	<p>S33MT15P00 VARIATION IN THE RESPONSE OF RESISTANT SUNFLOWER TO OROBANCHE CUMANA POPULATIONS IN ISRAEL</p> <p>D Plakhine, H Eizenberg, T Lande, G Achdari, Y Hershenhorn, and DM Joel</p> <p><i>Orobanche cumana</i> parasitizes sunflower in Israel. In recent years, several resistant sunflower varieties were bred in Israel and reduced the damage caused by <i>O. cumana</i>. No differences in <i>O. cumana</i> response to the resistant sunflower varieties was identified until 1999. Studies indicated that only race C was present in Israel, with very low inter-and intra-specific diversity. However, in 2000 <i>O. cumana</i> infected the resistant sunflower 'Ambar' in two fields in the northern part of Israel. In 2001 and in 2002, <i>O. cumana</i> parasitized resistant sunflowers in three more fields. In order to determine the virulence of <i>O. cumana</i> toward the resistant sunflower varieties under controlled conditions, five populations of the parasite were collected from fields in which resistance was broken. Another <i>O. cumana</i> seed lot, which was collected on susceptible sunflower in Alonim in 1997 and that does not infect the resistant sunflower varieties served as a reference. The resistant Sunflower cultivar 'Ambar' and the susceptible cultivar 'D.Y.3' were separately planted in pots that were pre-inoculated with seeds of the various <i>O. cumana</i> populations. <i>O. cumana</i> from Alonim (our reference) failed to attack the resistant sunflower in all pots. However, three virulence levels were found for the three <i>O. cumana</i> population originating from the other fields. In the current note we report for the first time on the occurrences of a new virulent race(s) of <i>O. cumana</i> in Israel.</p>

S33MT15P00**A STUDY ON GERMINATION OF SEEDS OF RHAMPHICARPA FISTULOSA (HOCHST.) BENTH. A NEW PEST OF RICE****Gualbert Gbèhounou¹ and Paulin Assigbe²**

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Rhamphicarpa fistulosa, from the family Scrophulariaceae is a facultative root hemiparasitic weed, which has recently become a primary pest of lowland rice in several countries in West Africa, where rice production is encouraged for food security and to limit importation. In 1996, *R. fistulosa* was identified by farmers in the Republic of Bénin as a new pest, which hampers rice production, inflicting 40 to 100% yield loss. Being considered in general as a secondary pest, biology and ecology of *Rhamphicarpa* species have received little attention from researchers. In order to help define a management strategy of the new pest, germination studies were conducted *in vitro* on seed populations collected from two inland valleys in 1999 and 2001. Seeds were surface sterilized, using sodium hypochlorite, and submitted to germination tests on filter paper imbibed with distilled water or water soluble root exudates of rice seedlings. Germination patterns of the seed populations were studied using regression analysis. The results indicated that root exudates of the readily parasitized rice variety *Farox* 304-4-1-2 did not stimulate germination of the seeds. At room temperature (28-30 °C), when exposed to daylight, seeds of *R. fistulosa* require a conditioning period of two to three weeks on moist filter paper before they will germinate. Maximum germination level reached is increased if seeds are hidden from light during the conditioning period. Seeds of *R. fistulosa* are short lived, with a longevity of approximately one year. These three findings, which are of practical importance, were not reported before.

Key words: *Rhamphicarpa fistulosa*, germination and rice

S33MT15P00**UTILIZING HERBICIDE-RESISTANT TOMATO TO MANAGE OROBANCHE AEGYPTIACA****Y Goldwasser and B Rubin**

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Orobanche aegyptiaca is one of the most serious hindrances in tomato production throughout the Mediterranean region. Previous studies have shown that glyphosate applied onto a host crop effectively controls *Orobanche* spp. by rapid translocation and accumulation in the root-attached parasite. However, susceptibility of host crops to glyphosate has been an obstacle in application of this approach. Preliminary studies were conducted with tomato line 1232, engineered with the plasmid pMON894, encoding a glyphosate-tolerant form of the enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS). A single foliar treatment of glyphosate (540 g ae/ha) was applied on glyphosate-resistant tomato (GRT) plants 14, 24 or 34 days after planting (DAP). Glyphosate applied at 14 DAP caused severe damage to tomato flowers and prevented fruit set but did not control late *O. aegyptiaca* inflorescences development. Glyphosate applied at 24 DAP controlled 98% of *O. aegyptiaca* but caused damage to tomato plants and flowers, resulting in 39% reduction in tomato fruit yield compared to the non-treated control. The late treatment (34 DAP) caused only slight damage to tomato plants and completely controlled *O. aegyptiaca*, resulting in a two-fold increase in tomato fruit yield over the non-treated control. This study exhibits the potential of timely applied glyphosate in GRT for effective *Orobanche* control. Further studies are in progress to determine effective application rates and timing.

S33MT15P00**PARASITIC WEEDS AND THEIR CONTROL/MANAGEMENT IN NORTH-EASTERN NIGERIA****N A GWORGWOR¹ and W B NDAHI²**

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In 1999, a field survey was carried out in the North-eastern region of Nigeria to assess the various parasitic plants, their distribution and degree of infestation on economic crops in the region. There were a total of 65 locations, where 135 farms/natural vegetations were observed during the course of the survey. The survey revealed that 4 families of parasitic plants are represented in the region with 7 genera and 10 species. The Scrophulariaceae family was represented by 4 genera – *Alectra*, *Buchnera*, *Rhamphicarpa* and *Striga*. *Striga* has the highest number of species – *S. aspera*, *S. densiflora*, *S. gesnerioides* and *S. hermonthica*, while *B. hispida*, *R. fistulosa* and *A. vogelii* are the only species of their genus. The Convolvulaceae, Lauraceae and Loranthaceae families had one species each in the region – *Cuscuta campestris*, *Cassytha filiformis* and *Tapinanthus oleifolius*, respectively. There is an observed prominence of *C. campestris*, *R. fistulosa*, *B. hispida* and *T. Oleifolius* infestation and their agronomic importance could aggravate the already existing menace of *Striga* species in the region. Efforts to control/manage the parasitic weeds, especially *S. hermonthica* in sorghum and millet have shown that trap cropping with sesame (*Sesame indicum* L.) and bambara groundnut (*Vigna subterranea* (L.) Verdc.) and the use of Sodium chloride (NaCl) have proved very successful and promising.

S33MT15P00**THE EFFECT OF ARBUSCULAR MYCORRHIZA (AM) FUNGI ON THE CONTROL/MANAGEMENT OF *Striga hermonthica* IN SORGHUM****N A GWORGWOR¹ and H. Chr. WEBER²**

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In a pot experiment, the effect of arbuscular mycorrhiza (AM) fungi species was investigated for the potency of various fungi for the control of *Striga hermonthica* (Del.) Benth. in sorghum (*Sorghum bicolor* (L.) Moench). There were five AM fungi species tested – *Glomus intraradice*, *G. albidum*, *G. mosseae*, *G. fasciculatum* and *G. etunicatum*, which were infested with *S. hermonthica* seed plus without AM fungi + *Striga* seed and without both AM fungi and *Striga* seed as check and control treatments, respectively. A tolerant sorghum variety – War-warbashi was used. These treatments were laid out in a randomized complete block design (RCBD) replicated 6 times, which were kept in a conditioned growth chamber. The results showed that *Striga* emergence on sorghum was significantly reduced by *G. mosseae* and the growth and total dry matter yield of sorghum were increased compared with the rest of the AM fungi species, but comparable to the control treatment. This study indicates that AM fungi have the potential to reduce damage by *S. hermonthica* on sorghum. The results are therefore potentially important for soil management, as perhaps the breeding for resistance to *S. hermonthica* could have consequences for mycorrhizal responsiveness of sorghum. It could be necessary to compare various sorghum cultivars that differ in *Striga* tolerance for mycorrhizal responsiveness.

<p>S33MT15P00 BLUE LIGHT INDUCED CHANGES IN INOSITOL 1,4,5-TRISPHOSPHATE IN DODDER (<i>CUSCUTA CAMPESTRIS</i>) SEEDLINGS</p> <p>M A Haidar¹, C-Y Hung², I Y Perera² and W F Boss²</p>	<p>S33MT15P00 INFLUENCE OF SALINITY ON THE INTERACTION BETWEEN TOMATO AND <i>OROBANCHE CERNUA</i></p> <p>W. M. Al-Khateeb¹, K. M. Hameed², and R. A. Shibli²</p>
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<p>Dodder (<i>Cuscuta</i> spp.) is one of the most dangerous and fastest spreading parasite in potato and tomato producing areas of Lebanon and in several Middle Eastern countries. Being an obligate stem parasite, young dodder seedlings use the light environment to detect and parasitize leaves and stems of various herbaceous dicots, where they develop haustoria that are essential for survival. Previous studies revealed that blue light stimulates and red light inhibits prehaustoria development in young dodder seedlings. In this study, evidence was obtained for the involvement of inositol 1,4,5-trisphosphate (IP₃) in the mediation of prehaustoria development, prior to host attachment, to blue light. Blue light induced a significant increase in the level of IP₃, with a peak at about 30 min. Thereafter, the level of IP₃ declined to the resting value after 3 hours of blue light. Irradiation with 10 min red light pulse applied directly at the end of 0.5-4 h blue light significantly reduced IP₃, while high levels of IP₃ were observed after 10 min far-red pulse. These studies are the first in vivo demonstration of a possible role for IP₃ as a second messenger in the blue light signal transduction process in prehaustoria development in dodder. At a more applied level, our results suggest that identifying the light signal transduction(s) of prehaustoria development may provide novel targets for weed scientists through altering or knocking out this pathway.</p>	<p>Tomato seedlings (20- days old) were transplanted to <i>Orobanche cernua</i> infested and non-infested soils. All plants were maintained under 0, 25, 50 and 75 mM NaCl soil salinity levels throughout their growing period under greenhouse conditions. Plants grown in <i>O. cernua</i> infested soil and under 0, 25, and 50 mM NaCl salinity regimes showed significant reduction in their growth and their total soluble carbohydrate and protein contents in contrast with those grown in non-infested soil. However, under 75 mM NaCl salinity level all plants showed similar growth values whether they were grown in <i>O. cernua</i> infested or non-infested soil. Starting at the fifth and through out the eightieth week after transplantation there was a significant increase in plant height in the control, 25 and 50 mM NaCl irrigated plants over other treatments. Irrigation with either tap water (control) or 25 mM NaCl solution didn't significantly affect the number of <i>O. cernua</i> shoots (4.8 and 5.2 shoots) and number of attachments (11.2, 11.0 attachments). However, irrigation with 50 mM NaCl significantly reduced the emergence of <i>O. cernua</i> (2/plant) and the number of attachments (4.4 attachments). Furthermore, irrigation with 75 mM NaCl resulted in complete elimination of <i>O. cernua</i> emergence.</p> <p>Keywords : <i>Orobanche cernua</i>, Tomato, Salinity.</p>
<p>S33MT15P00 OROBANCHE AEGYPTIACA CONTROL IN PROCEEDING TOMATO</p> <p>T Lande, G Achdari, H Eizenberg, and J Hershenhorn</p> <p><i>Department of Weed Research, Newe Ya'ar Research Center, P.O. Box 1021 Ramat Yishay, Israel, josephhe@volcani.agri.gov.il</i></p> <p><i>Orobanche aegyptiaca</i> is the most troublesome weed on processing tomato in Israel. Recently, <i>O. aegyptiaca</i> parasitism in tomato was reported from other Mediterranean countries such as Turkey, Greece and Italy. Studies conducted in pots under greenhouse conditions indicated that three foliar applications of MON 37500 (sulfosulfuron 75%) at 50 or 100 g/ha control effectively and selectively <i>O. aegyptiaca</i> parasitizing tomato. It was also determined that foliar applications must be followed by upper irrigation in order to activate the herbicide. In the present study we tested the efficacy of MON37500 to control <i>O. aegyptiaca</i> on tomatoes in the field. Additionally, the efficacy of activating the herbicide by sprinkler or moving pivot irrigation methods was compared. Experiments were conducted in 5 locations with various levels of <i>O. aegyptiaca</i> natural-infested fields. Three sequential treatments of 80 g/ha sulfosulfuron 14 and 28 days after tomato seedlings establishment, resulted in excellent control of the parasite. <i>O. aegyptiaca</i> shoots decreased from 21 shoots/m², in the non-treated control to 0.8/m² in the treated plots. Tomato yield decreased accordingly, from 94 tons/ha in the treated plots to 56 tons/ha in the non-treated control. The same control efficacy was achieved when the herbicide was activated with sprinkler irrigation or moving pivot.</p>	<p>S33MT15P00 IS HOST RANGE POTENTIAL RELATED TO GENETIC DIVERSITY IN OROBANCHE ?</p> <p>D Gidoni¹, V H Portnoy², I Paran¹, D M Joel²</p> <p>¹Agricultural Research Organization, The Volcani Center, P.O. Box 6, Bet Dagan 50250, Israel, E-mail : gidoni@volcani.agri.gov.il; ²Agricultural Research Organization, Newe Ya'ar Research Center, P.O. Box 1021 Ramat Yishay 30095, Israel, E-mail : dmjoel@volcani.agri.gov.il</p> <p>In previous reports we demonstrated significant and consistent inter-specific variations among the five major broomrape species in Israel. RAPD-based analysis was used to evaluate the magnitude of intra-specific genetic variability within <i>Orobanche</i> species with relation to inter-specific genetic distances. When summing up all data collected from RAPD analysis using numerous different primers we found out that only 5% of the bands were polymorphic in <i>O. cumana</i> grown on sunflower, compared to 11% in <i>O. cernua</i> grown on tomato. The intra-specific genetic distance rates found for <i>O. cumana</i> and <i>O. cernua</i> were however significantly lower than those found for <i>O. crenata</i> and <i>O. aegyptiaca</i>. Additionally, most of the genetic diversity within the latter two species was found among individuals rather than between geographically distant populations of each species. Whereas sunflower is almost the only host for <i>O. cumana</i>, and <i>O. cernua</i> only attacks three plant species (tomato, eggplant, potato), <i>O. aegyptiaca</i> and <i>O. crenata</i> are known to attack a large variety of host plants from different plant families. Accordingly, a correlation was found to exist between the intra-specific genetic diversities and host-range potentials in the weedy species of <i>Orobanche</i>.</p>

<p>S33MT15P00 CEREAL-LEGUME ROTATION TO CONTROL STRIGA AND IMPROVE ON-FARM YIELD OF MAIZE IN NORTHERN GUINEA SAVANNA: I. EFFECTS OF ONE-YEAR ROTATION</p> <p style="text-align: center;">• A.Y. Kamara¹, I. Kureh^{2*} and B.D Tarfa²</p> <p>¹<i>International Institute of Tropical Agriculture (IITA), P.M.B. 5320, Ibadan, Nigeria</i></p> <p>²<i>Department of Plant Science, Institute for Agricultural Research (IAR), Ahmadu Bello University (ABU), P.M.B. 1044, Zaria, Nigeria</i></p> <p>On-farm trials were conducted in 2001 and 2002 in the northern Guinea savanna of Nigeria to evaluate integrated <i>Striga hermonthica</i> control measures under farmer-managed conditions. These included intercropping a <i>Striga</i>-resistant maize variety with cowpea and also cropping this maize in rotation with legume trap crops – soybean and cowpea. Intercropping <i>Striga</i>-tolerant maize variety, Acr. 97TZL Comp. 1-W, with cowpea (<i>Vigna unguiculata</i> L.) or rotating it with the soybean (<i>Glycine max</i> (L) Merr.) cultivar TGX1448-2E or cowpea cultivar IT93K452-1 proved effective in reducing <i>Striga</i> incidence and infestation compared with two years of continuously cropped maize as control. However, maize grain yield was considerably reduced when intercropped with cowpea, probably due to competition effects from the cowpea crop. Maize grown after soybean had increased grain yield of 28% compared with the control. After cowpea, the yield increase was 22%. This was due to a reduction in <i>Striga</i> infestation and damage, and increased N supply to the subsequent maize crop.</p> <p>Keywords: Maize; soybean; cowpea; cereal-legume rotation; intercropping; <i>Striga</i>.</p>	<p>S33MT15P00 CEREAL-LEGUME ROTATION TO CONTROL STRIGA AND IMPROVE ON-FARM YIELD OF MAIZE IN NORTHERN GUINEA SAVANNA: I. EFFECTS OF ONE-YEAR ROTATION</p> <p style="text-align: center;">• A.Y. Kamara¹, I. Kureh^{2*} and B.D Tarfa²</p> <p>¹<i>International Institute of Tropical Agriculture (IITA), P.M.B. 5320, Ibadan, Nigeria</i></p> <p>²<i>Department of Plant Science, Institute for Agricultural Research (IAR), Ahmadu Bello University (ABU), P.M.B. 1044, Zaria, Nigeria</i></p> <p>On-farm trials were conducted in 2001 and 2002 in the northern Guinea savanna of Nigeria to evaluate integrated <i>Striga hermonthica</i> control measures under farmer-managed conditions. These included intercropping a <i>Striga</i>-resistant maize variety with cowpea and also cropping this maize in rotation with legume trap crops – soybean and cowpea. Intercropping <i>Striga</i>-tolerant maize variety, Acr. 97TZL Comp. 1-W, with cowpea (<i>Vigna unguiculata</i> L.) or rotating it with the soybean (<i>Glycine max</i> (L) Merr.) cultivar TGX1448-2E or cowpea cultivar IT93K452-1 proved effective in reducing <i>Striga</i> incidence and infestation compared with two years of continuously cropped maize as control. However, maize grain yield was considerably reduced when intercropped with cowpea, probably due to competition effects from the cowpea crop. Maize grown after soybean had increased grain yield of 28% compared with the control. After cowpea, the yield increase was 22%. This was due to a reduction in <i>Striga</i> infestation and damage, and increased N supply to the subsequent maize crop.</p> <p>Keywords: Maize; soybean; cowpea; cereal-legume rotation; intercropping; <i>Striga</i>.</p>
<p>S33MT15P00 FLORAL DEVELOPMENT IN HYDNORA</p> <p style="text-align: center;">Erika Maass</p> <p><i>Department of Biology, University of Namibia, Windhoek; emaass@unam.na</i></p> <p>The Hydnoraceae is an extremely small family of holoparasitic root parasites with three of the four species currently recognized, occurring in Namibia. They spend most of their life cycle under the soil and the only parts of the plant that develop above the soil surface, are the flowers and fruits, although in the case of <i>H. triceps</i>, both flowers and fruits remain subterraneous. Very little information exists on the pollination strategies of these furtive plants. In an effort to understand their floral biology, floral development was studied in <i>H. africana</i>, <i>H. triceps</i> and <i>H. abyssinica</i>. Flowers and buds at different development stages were compared during field studies over a period of four years. The antheral ring changes during anthesis as well as the position and structure of the osmophore were studied. Great similarities were found in the floral structure and development of <i>H. africana</i> and <i>H. triceps</i>, where there are strong indications of dichogamy. The opening in the center of the antheral ring that allows entrance to the female part of the flower becomes constricted after the pollen have been shed, thereby preventing pollinators from reaching the stigma. This seems to be less pronounced in <i>H. abyssinica</i> where the antheral ring stays open. Distinct differences were also observed between the structure of the osmophore in the three species. The differences in habitat and hosts between <i>H. africana</i> and <i>H. triceps</i> on the one hand, and <i>H. abyssinica</i> on the other, may provide some answers to the observed differences in the floral biology of the three species.</p>	<p>S33MT15P00 MANAGEMENT OF CUSCUTA IN TOMATO WITH RESISTANT VARIETIES AND HERBICIDES</p> <p style="text-align: center;">W. Thomas Lanini¹, Mario Miranda-Sazo¹, and Yaakov Goldwasser²</p> <p>¹<i>University of California, 216 Robbins Hall, Davis, CA 95616, USA, lanini@vegmail.ucdavis.edu;</i> ²<i>Institute of Plant Science & Genetics, Faculty of Agriculture, Food & Environmental Sciences, The Hebrew University of Jerusalem, Rehovot 76100, Israel, gold@agri.huji.ac.il</i></p> <p>Cuscuta (dodder) is a parasite that attacks a wide range of host species, including tomatoes. The dodder seedling coils around the host stem, penetrates its tissue and vascular system, and exploits the host by withdrawing nutrients and water. Thus, the vigor of the host is lowered and tomato production is reduced from 25 to 75%. The objectives of this study were to evaluate several tomato varieties for tolerance to field dodder (<i>Cuscuta pentagona</i>) and to test three sulfonylurea herbicides for selective post-attachment control of dodder in tomatoes. Several tomato varieties have been observed to have some level of dodder resistance. Greenhouse and field studies were conducted to compare growth and yield of these varieties along with known susceptible varieties. Additionally, tomatoes with attached dodder, was treated with various rates of rimsulfuron, halosulfuron, or sulfosulfuron, to assess selective dodder control. Four tomato varieties were confirmed as having resistance to dodder – H9492, H9553, H9992, and H9888 – all from Heinz Seed company. Dodder was observed to coil around these varieties, but attachment was either not successful or very poor as indicated by poor dodder growth. In field trials, dodder growth in these varieties was very limited and dodder seed production was reduced by over 90%. Sulfosulfuron treatment at 60 g/ha resulted in over 70% dodder control at harvest, while halosulfuron and rimsulfuron were not effective. The combination of resistant tomato varieties and sulfosulfuron treatment resulted in over 95% field dodder control, with no loss in crop yield.</p>

S33MT15P00**USE OF INBREEDING AS A TOOL TO IMPROVE RESISTANCE TO STRIGA**

A. Menkir, J.G. Kling, B. Badu-Apraku, C.G. Yallou and O. Ibikunle

International Institute of Tropical Agriculture

Striga hermonthica (Del.) Benth is the most widespread species affecting maize and other cereals in Africa. Most tropical maize varieties are susceptible to this parasite and may suffer 100% yield loss under heavy infestation. IITA has used inbreeding as a tool for improving resistance to *Striga* in tropical maize and generated several resistant inbred lines. Some of these lines evaluated for three years exhibited significant differences in the number of *Striga* plants attached to the roots in pots and in the number of emerged *Striga* plants on ridges in the screen house. The number of *Striga* plants attached to the roots in pots was positively correlated with *Striga* damage symptom rating ($r=0.51-0.61$, $p<0.01$) and number of emerged *Striga* plants ($r=0.76-0.79$, $p<0.0001$) in the field. The number of emerged *Striga* plants in the screen house was also positively correlated with the number of emerged *Striga* plants ($r=0.82-0.85$, $p<0.0001$) in the field. We found some inbred lines with many *Striga* plants attached to the roots supporting few emerged *Striga* plants. Diallel crosses of selected resistant inbred lines tested in Nigeria and Benin Republic also found some inbred lines that combined positive GCA effects for grain yield with negative GCA effects for damage symptom rating and number of emerged *Striga* plants. In a recent study, synthetic varieties formed from *Striga* resistant inbred lines supported fewer emerged *Striga* plants and produced higher grain yield under *Striga* infestation. These results suggest that inbreeding is effective in fixing alleles for resistance to *S. hermonthica* in maize.

S33MT15P00**CHARACTERIZATION OF PHOTORECEPTORS FROM OROBANCHE MINOR SM.****A Okazawa¹, C Trakulnaleamsai¹, H Hiramatsu¹, E Fukusaki¹, K Yoneyama², T Yasutomo² and A Kobayashi¹**

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Holoparasitic plants, including *Orobanche* spp., had lost the photosynthetic ability and the photosynthetic genes have been lost or altered dramatically in some species. Light is not only used as energy for photosynthesis but also as signal to regulate plant development. Whether the photoperception systems are intact or not in the holoparasitic plants is not clear. Since light affects the conditioning and germination of *Orobanche minor*¹, part of the photoperception systems seems to still remain in *O. minor*. There are three families of signal-transducing photoreceptors; red/far-red light-absorbing phytochromes and UV-A/blue light-absorbing cryptochromes and phototropins in higher plants. We cloned the phytochrome and cryptochrome homologous cDNA from *O. minor* and designated as *OmPHYA* and *OmCRY1*, respectively. Both of the deduced amino acid sequences of *OmPHYA* and *OmCRY1* showed about 70% sequence identity with those of the photosynthetic plants. From the Southern blot analysis, it was shown that either gene is a single copy in the genome of *O. minor*. The expression of the mRNAs of those photoreceptors was quantified by real-time RT-PCR under dark- and light-conditions. It was revealed that light affects those mRNA expression levels. *OmPHYA* fused with sGFP (*OmPHYA:sGFP*) was expressed in the protoplasts of *Arabidopsis thaliana* and onion epidermal cells to observe their subcellular localization. *OmPHYA:sGFP* was in the cytoplasm under the dark condition and moved to nucleus after irradiation of far-red light. These results indicate that those photoreceptors still have some functions in *O. minor*.

Chae, SH et al., *Plant Physiol.*, **120**, 328-37, 2004**S33MT15P00****IDENTIFICATION OF RESISTANCE MECHANISMS OF SOME SORGHUM VARIETIES TOWARDS STRIGA HERMONTHICA****Umar OUEDRAOGO¹, Doulaye TRAORE¹, Sériba Ousmane KATILE² and Harro BOOMEESTER³**

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The integrated control of *Striga* recommends several components of which notably the use of resistant varieties. A fundamental question remains always unresolved: which is the demonstration of the resistance? It is then crucial to identify the resistance mechanisms of some varieties in order to improve the breeding outputs. The objective of the study is to rule on the behavior of some sorghum varieties towards *S. hermonthica* by identifying the mechanisms of resistance. The method of in vitro culture, Lane et al. (1991) was used to appreciate the behavior of every variety under artificial infestation of *Striga*. This method consists in growing host plants in oblong culture boxes containing GF/A paper and the nourishing solution. The method of outdoors culture in jars containing sterile soil mixed with sorghum and *S. hermonthica* seeds, confirms the results already obtained with the culture in vitro. Varieties CMDT-45, 97-SB-F5D5-63 and Ntenimissa gave for the test in vitro *Striga* which stayed in stages of forming haustorium and endophyte. The highest rate of necrosis, 39%, is obtained with Malisor-84-1. The test of opened air culture reveals that *S. hermonthica* makes a late emergence, 67 days after sowing with variety CMDT-45 and 97-SB-F5D5-63. The study reveals CMDT-45 and 97-SB-F5D5-63 as the most resistant varieties towards *S. hermonthica*. In addition, varieties CMDT-45, 97-SB-F5D5-63, Ntenimissa and Malisor-84-1 can be used in breeding program with the aim of the use of their various mechanisms of resistance to *S. hermonthica* in the creation of new varieties of sorghum.

Keywords: Sorghum, varieties, resistance, mechanisms, *Striga hermonthica*, in vitro, open air.

S33MT15P00**HOST RANGE OF BRANCHED BROOMRAPE (OROBANCHE RAMOSA L.) AMONG SOME CULTIVATED AND WILD GROWN PLANT SPECIES****JR Qasem and C L Foy**

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Studies on the host range of *Orobanche ramosa* L. through screening different summer and winter crops, medicinal herbs, and a large number of weed species, for their possible attack by the parasite revealed great variation among species in their abilities to stimulate *Orobanche* seed germination and allow parasite attachment. *Datura metel*, *Ferula communis*, *Solanum incanum*, and *Rumex acetosella* were heavily infested weeds. Most attacked crops and medicinal herbs were *Cucurbita moschata*, *Apium graveolens*, *Carum carvi*, *Petroselinum sativum*, *Carthamus tinctorius*, *Capsicum frutescens*, *Capsicum annuum*, *Trigonella foenum-graecum*, *Brassica oleracea* var. *Capitata*, *Brassica caulorapa* and *Trachyspermum ammi*. In contrast, weeds including *Convolvulus arvensis*, *Antirrhinum orontium*, *Carduus pycnocephalus*, *Diplotaxis erucoides*, *Papaver rhoeas*, *Polygonum aviculare*, *Ranunculus arvensis*, *Solanum conora*, *Solanum nigrum*, *Spergula arvensis*, *Urtica pileifera* and *Urtica urens* showed extremely low infestation. Among crops, *Cochrorus olitorius*, *Cucumis melo* var. *flexosus*, *Ammi visnaga*, *Brassica nigra*, *Brassica oleracea* var. *Botrytis*, *Daucus carota*, *Linum usitatissimum*, *Lupinus alba* and *Raphanus sativus* were the least infested. Results showed that *L. usitatissimum* can be considered as a trap crop, while *T. ammi* is a real catch species. However, many of the plant species tested were not attacked, suggesting different mechanism of resistance or lack of seed germination stimulants. Considering the number and size of *Orobanche* shoots great variations between species were found. Some of the reported trapping crops (e.g. *L. usitatissimum*, *C. frutescens*, *C. annuum*, *T. foenum-graecum*, *Coriandrum sativum*, and *Brassica campestris*) were attacked. *L. usitatissimum* showed an extremely low infestation but other species were highly infested.

S33MT15P00**OSYRIS ALBA OCCURENCE IN JORDAN: NEW HOSTS AND IMPORTANCE**

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A field survey carried out during the period from 2002 to 2003 revealed the presence of *Osyris alba* L. a root hemi-parasitic weed of Santalaceae on 23 plant species belong to 14 botanical families in the central part of Jordan. Host plants including perennial woody herbs, shrubs, forest and fruit trees of high economic importance. New host species were added to our existing knowledge on host list of this parasite. Among the most affected fruit trees are olives (*Olea europaea* L.), grapes (*Vitis vinifera* L.), almonds (*Prunus amygdalus* L.) and figs (*Ficus carica* L.), and of forest trees are cypress (*Cupressus sempervirens* L.), stink herb (*Acacia cyanophylla* Lindl), Aleppo pine (*Pinus halepensis* Mill.) and Australian pine (*Casuarina equisetifolia* L.). The distribution of the parasite and its intensity of infestation on different hosts were also recorded. The work present the first record on this parasite and its hosts in the country, and reflects the parasite physiological tolerance and adaptability to different host plants differ in growth habit and physiology, among which certain common weeds or wild species such as thorny burnet [*Sarcopoterium spinosum* (L.) Spach.] may be considered as a potentially high candidates in increasing the infested area in the country. The work casts a lot of doubt on the local farmers awareness of the problem.

S33MT15P00**SENSITIVITY OF SORGHUM VARIETIES TOWARDS STRIGA ASIATICA AS INFLUENCED BY NITROGEN, POTASSIUM AND MOISTURE REGIMES**N Tesfamichael¹, C F Reinhardt¹ and S De Meillon²

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Striga asiatica (L.) Kuntze has the potential to reduce *Sorghum bicolor* (L.) Moench yields by up to 100%. Sorghum varieties that are resistant towards both *Striga* and moisture stress is of prime interest in sorghum production. The objectives of this study were: (1) to screen selected sorghum varieties for *Striga* resistance, and (2) to assess varietal responses to *Striga* in relation to soil moisture regime, N and K supply. Following screening in a pot experiment, employing a soil naturally infested with *Striga*, the nine sorghum varieties were categorized as resistant, tolerant or susceptible. One variety representing each of these categories was employed in subsequent pot experiments to determine the influence of soil moisture (field capacity and 50% f.c.), nitrogen (0 and 200 kg/ha) and potassium (0 and 200 kg/ha) on *Striga* parasitism of sorghum. A completely randomized design was used in these factorial pot experiments conducted under controlled conditions. Significant sorghum yield loss occurred due to the combined effect of moisture stress and *Striga*. Application of N significantly reduced the parasite population, in contrast to K application, which significantly increased *Striga* density. At 100% f.c., *Striga* density and its effect on sorghum were significantly less than at 50% f.c. These findings should be validated under field conditions, and the mechanism through which K increases parasite density should be researched.

S33MT15P00**NATURAL TOLERANCE OF CUSCUTA spp. TO HERBICIDES INHIBITING AMINO ACID BIOSYNTHESIS**T Nadler-Hassar¹; DL Shaner²; B Rubin³; S Nissen¹

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Cuscuta spp. are non-specific above-ground holoparasites that can cause significant yield reductions. Control of this parasite is difficult, but herbicide resistant crops might be used to manage *Cuscuta* spp. Assays with isolated *C. campestris* segments indicate that two key enzymes in the biosynthesis of amino acids (acetolactate synthase and 5-enolpyruvylshikimate-3-phosphate synthase) are present in the parasite. Dose response assays on *Cuscuta* spp seedlings in the absence of a host showed that *C. campestris*, *C. gronovii* and *C. subenclusa* were much more tolerant to glyphosate than the seedlings of sorghum and RR canola. *C. campestris* seedlings were also tolerant to imazamox but not to glufosinate. In the greenhouse *C. campestris* was unaffected by glufosinate while growing on glufosinate resistant canola but glyphosate and imazamox inhibited the growth of the parasite growing on glyphosate and imidazolinone resistant canola. However, the parasite recovered after 3 weeks, suggesting that it is tolerant to these herbicides.

S33MT15P00**EFFECT OF GROWTH MEDIUM AND METHOD OF APPLICATION OF FUSARIUM OXYSPORUM ON INFESTATION OF SORGHUM BY STRIGA HERMONTHICA IN BURKINA FASO**D. Yonli¹, H. Traoré¹, D.E. Hess², A.A. Abbasher³, and I.J.Boussim⁴

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Striga hermonthica is an important constraint in sorghum, the major crop of Burkina Faso. A two-year (1997-1998) study was conducted at Kouaré, Burkina Faso, to investigate effect of growth medium and application method of *Fusarium oxysporum* isolate 4-3-B to control *Striga hermonthica*. In 1997, growth medium and isolate 4-3-B delayed striga emergence by nine days. Isolate 4-3-B reduced emerged striga number by 33% compared to treatments without *Fusarium*. In 1998, striga emergence was delayed by 13 days by growth medium and *Fusarium*. The fungus reduced the number of emerged striga by 27 % and, as a result, sorghum straw and grain yields were significantly improved by 10% and 38% respectively. *F. oxysporum* isolate 4-3-B could contribute to more effective integrated striga management in the West African Sahel.

Key words: *Striga hermonthica*, bio-control, *Fusarium oxysporum*, inoculum, application method.

S33MT15P00**EFFECTS OF NUTRIENTS ON THE PRODUCTION OF GERMINATION STIMULANTS**

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Broomrapes (*Orobanche* spp.) are root holoparasites causing enormous damage to agricultural production in large parts of the world. Seeds of broomrapes germinate only when they perceive germination stimulants produced by and released from the host and non-host roots. Broomrapes prevail on nutrient-deficient soils and their emergence is suppressed by the application of fertilizers. In fact, we have shown that nutrients did affect germination stimulation activity of root exudates of red clover (*Trifolium pratense* L.), a host of clover broomrape (*O. minor* Sm.). However, nutrients may affect the production of germination inhibitors as well. In the present study, effects of nutrients (N, P, K, Ca, and Mg) on stimulant production were examined with red clover plants grown hydroponically. Among the stimulants produced by red clover, orobanchol was quantified using the HPLC / tandem mass spectrometry (LC/MS/MS).

S33MT15P00**SMICRONYX CYANEUS GYLL.
(COLEOPTERA: CURCULIONIDAE): A NEGLECTED NATURAL ENNEMY OF THE PARASITIC WEED OROBANCHE**

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Natural enemies of *Orobanche* spp. have received an increasing attention in recent decades and extensive studies on their occurrence and their potential as biocontrol agents have been conducted. However, very scarce information is available regarding the weevil *Smicronyx cyaneus* GYLL. (Coleoptera: Curculionidae) although its importance as *Orobanche* stem/seed feeder. In attempts to fill this knowledge gap, investigations on the weevils' occurrence and distribution, its behaviour and impact under natural conditions have been carried out in faba bean production in northern Algeria and Tunisia. Studies on the weevil's behaviour were accomplished by regular monitoring and observations of broomrape plants in the field as well as in the laboratory. Collections of *O. crenata* samples around the capital Algiers have been done in 1996. Further, extensive field surveys were carried out in 2001 in Northern Tunisia. Stems and spikes of the sampled *Orobanche* plants were examined separately for the presence of the weevil. In Tunisia, *S. cyaneus* was found in 19 out of 21 surveyed locations. Of 315 broomrape plants examined 50.3% were infested with predominance of stem infestation. Infestation of capsules ranged from 0 to 19.3%, however, the level can be much higher since it was difficult to attribute infestation to *Smicronyx* or to *Phytomyza orobanchia* Kalt. (Diptera: Agromyzidae) when larvae have already left the seed capsules. In Algeria, 52% of the examined broomrapes were attacked with an average of 16.1% of capsules infested per plant. *S. cyaneus* reduced the seed production of *O. crenata* by 14.3% and significantly decreased the growth of the infested broomrapes compared to healthy plants. The present study provided useful information aimed to improving knowledge on the potential use of *S. cyaneus* as biocontrol agent for *Orobanche* spp.

S33MT15P00**CALLUS PRODUCTION OF PARASITIC WEED OROBANCHE AND ITS NOVEL ASEPTIC INFECTION ON HOST ROOTS**

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Root parasites of the genus *Orobanche* are serious weeds in agriculture. This paper describes the development of an *in vitro* culture system and completely aseptic infection of host roots using calli of *O. ramosa*, *O. aegyptiaca* and *O. minor*. Better callus inductions were obtained from B5 culture media with 3.6% PDA, vitamins, 3% sucrose, 600 mg/L casein, 5% coconut water, and various hormones. GA₃ increased the percentage of callus formation. With 2,4-D more calli were induced after adding kinetin, but all media containing 2,4-D induced the soft undifferentiated calli. Hard and much differentiated calli with root-like protrusions developed after adding NAA to kinetin containing medium. Shoot meristem initiated at the distal end of *O. ramosa* callus on MS medium containing GA₃. A requirement for infection was the differentiation of root-like protrusions from the callus, which were developed under the influence of 0.5-1.0 mg/L IAA, and of 0.2 mg/L NAA with 5.0 mg/L kinetin. These protocols produced root protrusions and pad-like structures that resembled attachment organs of *Orobanche*, and proved effective in parasitizing host roots. Direct contact with the medium inhibited haustorium development and prevented infection. To overcome this problem we isolated certain root portions from the medium by inserting thin glass plates under the host roots. Calli were then placed on the raised root portions and successfully infected the roots, leading to the development of young *Orobanche* plants with normal vascular systems that directly connected to the host.

S33MT15P00**CHANGES IN GERMINATION OF OROBANCHE SEEDS IN RESPONSE TO CONDITIONING TEMPERATURE AND PGR TREATMENTS**

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Broomrapes (*Orobanche* spp.) cause great damage to crop production, and their seeds have special germination requirements including pre-treatment in a warm moist environment for several days (conditioning) prior to the exposure to germination stimulants (GR₂₄ etc.). Experiments were conducted to investigate the germination response and viability of parasitic *Orobanche* seeds subjected to the treatments of various temperatures (13, 18, 23 and 28 °C) and plant growth regulators during seed conditioning. The highest germination percentages (64.7%, 77.9% and 53.1%) were observed respectively in *O. aegyptiaca*, *O. minor* and *O. ramosa* seeds conditioned at 18 °C for 7 days following terminally germinated at constant 18 °C in the dark. GA₃ (30-100 mg/L), norflurazon and fluridone (10-100 mg/L), and brassinolide (0.5-1.0 mg/L) increased seed germination, while uniconazole low as 0.01 mg/L significantly reduced germination rates of three *Orobanche* spp. The promotive effect of GA₃ and norflurazon (10-50 mg/L) and inhibitory effect of uniconazole (0.05 mg/L) were evident even when they were treated for 3 days. Germination of *Orobanche* seeds was much lower when the unconditioned seeds immediately exposed to 10⁻⁶ M GR₂₄. This GR₂₄ induced inhibition, however, was alleviated or even eliminated by the inclusion of GA₃ or norflurazon (10-50 mg/L). On the other hand, the inclusion of uniconazole could aggravate this inhibition, particularly in the case of *O. ramosa* where no seeds were germinated when applied with 0.1 mg/L uniconazole.

<p>S33MT21P00 THE DYNAMICS AND MECHANISMS OF CROP TREE COMPETITION BY WOODY AND HERBACEOUS SPECIES</p> <p>P Balandier¹, C Collet², P E Reynolds³ and S M Zedacker⁴</p> <p>¹Cemagref, Team of applied Ecology of Woodlands, Clermont-Ferrand Regional Centre, 24 avenue des Landais, BP 50085, F-63172 Aubière Cedex, France, philippe.balandier@cemagref.fr;</p> <p>²INRA, Laboratoire d'Etude des Ressources Forêt-Bois, UMR INRA-ENGREF 1092, F-54 280 Champenoux, France, collet@nancy.inra.fr; ³NRCAN, Canadian Forest Service, 1219 Queen St. East, Sault Ste. Marie, Ontario, P6A 2E5, Canada, preynold@nrcan.gc.ca; ⁴Department of Forestry (0324), College of Natural Resources, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA, zedaker@vt.edu</p> <p>Plant interactions can be defined as the ways plants act upon the growth, fitness, survival and reproduction of other plants, largely by modifying their environment. These interactions can be positive (facilitation) or negative (competition or exploitation). During plantation establishment or natural forest regeneration after a disturbance, high light levels and sometimes the increased availability of water and nutrients favor the development of opportunistic, fast-growing herbaceous and woody species. In most climates, this vegetation is favored and captures resources at the expense of crop trees. As a consequence, the growth and survival of crop trees can be dramatically reduced. Although the effects of this competition are well documented, the physical and physiological mechanisms of competition are not. The decreases in the availability of light, water and nutrients and the physiological responses of crop trees to resource depletion and microclimate modification are not well understood. Moreover, the competition process is never in steady state in time or space. The growth response of the crop to different competitors modifies resource availability and allocation. Changes in the intensity and orientation of competition result, and floral composition (relative dominance) can change. In addition, indirect interactions such as changes in predators, insectivores, pathogens and the rhizosphere may have significant impacts and are much less studied. Understanding these dynamics is fundamental to improve vegetation management in forests.</p>	<p>S33MT21P00 IMPROVED FOREST VEGETATION MANAGEMENT USING VMAN</p> <p>Brian Richardson¹, Wayne Schou¹, Mark Kimberley¹ and Stefan Gous²</p> <p>¹NZ Forest Research Institute Ltd., Private Bag 3020, Rotorua, New Zealand Email: stefan.gous@forestreresearch.co.nz</p> <p>Minimisation of pesticide use in New Zealand's plantation forests is critical to meet green certification requirements and public expectations in relation to environmental impacts and human health effects. With an increasing number of companies seeking or achieving Forest Stewardship Council (FSC) certification, this issue is of critical importance to the New Zealand forestry industry. VMAN is a decision support system that can help to minimise herbicide rates on moist, fertile sites in the Central North Island of New Zealand. VMAN uses a stochastic simulation model. It combines models of weed and tree growth, weed and tree competition and herbicide / weed dose-response, to estimate weed height and cover and tree height and diameter through time. It requires the user to input some basic forest establishment, tree growth and weed growth parameters. VMAN then allows the user to compare different weed control regimes based on tree growth and financial estimates, to assist in deciding on which vegetation control options should be used.</p> <p>Key words: decision support system</p>
<p>S33MT21P00 EARLY PLANT COMPETITION CONTROL EFFECTS ON WOOD QUALITY OF 15 YEAR OLD LOBLOLLY PINE IN THE SOUTHERN U.S.A.</p> <p>Alexander Clark III¹, Richard F. Daniels², and James H. Miller³</p> <p>¹USDA Forest Service, Southern Research Station, Athens, Georgia 30602-2044, aclark@fs.fed.us; ²Warnell School of Forest Resources, University of Georgia, Athens, Georgia, Athens 30602-2152, ddaniels@forestry.uga.edu; ³USDA Forest Service, Southern Research Station, Auburn, Alabama 36849-5418, jmiller01@fs.fed.us</p> <p>Forest plantations in many parts of the world are established increasingly using herbaceous and woody vegetation control to enhance growth, while little is known about the effects on wood quality. A factorial study was installed at 13 southern U.S.A. locations in 1984 to examine growth, wood properties, and stand dynamics of loblolly pine (<i>Pinus taeda</i> L.) plantations established with complete control of woody and/or herbaceous competition during the first 3 to 5 years as compared to no control. After 15 years, the most intensive treatment of woody-plus-herbaceous control increased pine merchantable volume per hectare by an average of 30-148% compared to no competition control. Increment cores, 12-mm in diameter, were collected in year 15 from 36 trees in each of the four treatments from each of the 13 locations. X-ray densitometry was used to determine annual growth, proportion of latewood, and specific gravity (SG) of the earlywood, latewood, and annual ring. Woody-plus-herbaceous control did not significantly reduce SG of earlywood or latewood, and did not significantly affect the proportion of latewood in the annual ring. Overall, wood volume was increased while SG of ring components were unchanged. The significant increases in growth from competition control mainly occurred during juvenile wood formation in years 1-5 and thus increased the diameter of the juvenile wood core by an average of 24%. As a result of the increased juvenile core, the basal area weighted proportion of latewood decreased 10% and weighted SG decreased 4%. Growth gains substantially offset these per tree decreases.</p>	<p>S33MT21P00 EFFECTS OF SOME ENVIRONMENTAL FACTORS ON THE GERMINATION OF <i>SIL YBUM MARIANUM GAERTNER</i> SEEDS</p> <p>P. Montemurro¹, V. Cavallaro¹, M. Fracchiolla¹ and P. Vigliani²</p> <p>¹Dipartimento di Scienze delle Produzioni Vegetali -University of Bari (Italy), Via Amendola n. 165/A – Bari (Italy), p.montemurro@agr.uniba.it; ²Dipartimento di Scienze e Tecnologie Agroambientali – University of Bologna (BA), V. Le Fanin, 44 Bologna (Italy)</p> <p><i>Silybum Marianum</i> Gaertner is spreading in many crops of Southern Italy. There are few herbicides effective against this weed. Information about its biology are very important to set up control strategies. Three trials on the germination of <i>S. Marianum</i> seeds, harvested in Southern Italy, were carried out. In two trials seeds were placed in an incubator to determine the effects of light and osmotic stress on the germination. In the first trial the effects of different temperature (15°C and 25 °C constant, 15°C x 8 h/25°C x 16 h and 15°C x 16 h/25° C x 8 h) and light (darkness or light per 16 hours) conditions were tested. In the second one, the seeds were exposed to different osmotic stresses (0; -0.2;-0.4; -0.6; -0.8 and -1 MPa) obtained using PEG 8000 water solutions. In the third trial seeds were placed in pots filled with sandy soil and buried at increasing depth (0 – 3 – 6 – 9 and 15 cm). The results show that germination:</p> <ul style="list-style-type: none"> a) was the highest with constant temperatures of 25°C or 30°C and with alternate temperatures of 25°/15°C for 8 and 16 hours respectively; b) was affected by light; c) decreased significantly just at -0.2 Mpa and was completely inhibited at -0.8 Mpa. <p>The emergence was reduced when seeds were buried at more than 6 cm. These first results could suggest integrated control practices: false sowing combined with irrigation could decrease the soil seed bank; ploughings deeper than 10 cm to inhibit seed emergence.</p>

<p>S33MT21P00 SpraySafe Manager 2 – A GIS-based Decision Support system for optimising and evaluating Aerial Herbicide spray Applications</p> <p>B. Richardson¹, W.C. Schou¹, H.W. Thistle² and M.E. Teske³</p> <p>¹<i>Forest Research, Private Bag 3020, Rotorua, New Zealand, brian.richardson@forestresearch.co.nz</i></p> <p>² <i>USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505, USA, hthistle@fs.fed.us</i></p> <p>³ <i>Continuum Dynamics, Inc. 34 Lexington Avenue, Ewing, NJ 08618, USA, milt@continuum-dynamics.com</i></p> <p>Herbicides are a commonly used forest vegetation management tool, but off-target spray deposition and drift are significant environmental concerns. Therefore, it is essential that herbicides be applied in a responsible manner, with a clear understanding of how the selected application methods affect the environment and influence efficacy and operational efficiency. SpraySafe Manager (SSM) is an aerial application decision support system designed to meet these needs. It can link predictions of spray deposition and drift with biological response models. Version 2 of SSM (SSM2) is run from within Arc View, a geographic information system (GIS). For a given set of inputs that describe the aircraft, the application characteristics and the prevailing meteorology, the system predicts spray deposition within the target area and drift beyond the spray block boundaries. The system can be used for a variety of applications. For example, in a pre-spray analysis and for a given set of operating conditions, SSM2 can define the proportion of the spray block that can be sprayed without causing significant offsite drift. In a post-spray analysis, SSM2 uses information on the actual aircraft position, taken from a global positioning system, and actual weather and operating conditions to calculate deposition inside and outside of the target area. The GIS interface enables easy interpretation of results with different levels of deposition or critical thresholds identified using separate colours or contours.</p>	<p>S33MT21P00 DOES COMPETITION FOR NUTRIENTS LIMIT THE GROWTH OF PINE TREES IN THE SUMMER RAINFALL REGION OF SOUTH AFRICA?</p> <p>C A Rolando and K M Little</p> <p><i>Institute for Commercial Forestry Research, PO Box 100281, Scottsville, 3209, South Africa, E-mail; carol@icfr.unp.ac.za, keith@icfr.unp.ac.za</i></p> <p>Since vegetation management is a costly operation, competition removal should be applied only to the degree required to give optimal tree growth gains. This can only be done through an understanding of the interaction between the trees and vegetation across different regions. Four pine vegetation management trials were implemented across the summer rainfall region of South Africa to determine the effect of intensive (weedfree), selective (herbaceous versus woody control) and zero (weedy) vegetation control on pine tree growth. Tree growth data, soil and foliar nutrient data, collected during the third and fourth growing season, were used to determine whether competition for nutrients caused tree growth suppression. Chemical analyses indicated that the levels of soil and foliar P, K and Mg were low at most sites. Relative to the weedfree check, competition induced tree growth suppression occurred at three of the sites where there was a high level of woody vegetation. Foliar macro-nutrient concentrations were generally higher where tree growth suppression occurred, even where nutrient levels had been identified as sub-optimal. Significant differences were only detected between the weedfree and weedy checks for foliar N and/or K at two of the sites. Vector analysis indicated a decrease in nutrient content in the trees in the weedy check relative to the weedfree check, suggesting that tree growth was inhibited by reduced moisture or light availability. The results indicate that, when adequate moisture is available, growth suppression in the presence of competitive vegetation is most likely due to availability of light.</p>
<p>S33MT21P00 THE INTERACTION BETWEEN SITE PREPARATION AND VEGETATION CONTROL ON THE RE-ESTABLISHMENT OF <i>PINUS PATULA</i> IN SOUTH AFRICA</p> <p>C A Rolando and K M Little</p> <p><i>Institute for Commercial Forestry Research, PO Box 100281, Scottsville, 3209, South Africa, E-mail; carol@icfr.unp.ac.za, keith@icfr.unp.ac.za</i></p> <p>Methods of soil tillage and harvest residue management (site preparation) that reduce the development of competitive vegetation have the potential to lower vegetation control costs. The objectives of this trial were to study the interaction between site preparation and vegetation growth and the influence of these interactions on early survival and growth of <i>Pinus patula</i>. Eight site preparation treatments were tested in combination with or without vegetation control. The site preparation treatments included ripping, chopper-rolling, ripping and chopper-rolling, and pitting in residues which were either burned or not burned. Tree survival and growth, vegetation abundance and soil and foliar nutrient levels were recorded. At four years, none of the different methods of site preparation had a significant effect on any of the measured parameters. Vegetation control had a significant effect on tree growth from the end of the first growing season. Differences in foliar nutrient levels were only detected between the weedfree and weedy treatments. Vector analysis indicated that nutrient content, rather than concentration had decreased in the weedy treatment, suggesting that growth in these treatments was most likely inhibited as a result of limited moisture availability and its effect on nutrient uptake. These results suggest that irrespective of the method of site preparation, vegetation control is critical for the successful re-establishment of pine plantations.</p>	<p>S33MT21P00 COLLECTING AND IDENTIFICATION OF WEEDS (FLORA) IN FOREST NURSERIES IN FARNS PROVINCE, IRAN</p> <p>S. H. Saadati</p> <p><i>Research Center of Agriculture & Natural Resources of Fars Province, Iran. P.O.BOX.71555-617,SHIRAZ,IRAN. Saadati@farsagres.ir.</i></p> <p>One of the limiting factors in producing forest plant seedlings is proliferation of weed growth. In a two – year period (1999-2001), the dominant and non- dominant weeds of forestry broadleaves and coniferous nurseries seedling were collected in Fars province . A quadrate of 50 by 50 cm was used for sampling. Results showed that 42 weed species, belong to 20 families, exist in forest nurseries of Fars Province. <i>Amaranthus retroflexus</i> L., <i>Chenopodium album</i> L., <i>Convolvulus arvensis</i> L., <i>Conyza canadensis</i> L., <i>Cynodon dactylon</i> (L.) Pers, <i>Lactuca serriola</i> L., <i>Portulaca oleracea</i> L., <i>Cardaria draba</i> (L.) Desv, <i>Malva neglecta</i> wallr. And <i>Physalis Alkekengi</i> were among dominant weeds.Based on the survey carried out in forest nurseries of northern parts of Iran, 76 weed species belong to 30 plants families were collected. The frequency of <i>convolvulus arvensis</i> L., <i>cynodon dactylon</i> (L)Pers.and <i>Physalis alkekengi</i> L. in all studied broadleaves and coniferous nurseries were more than 50 percent. It seems that three weed species (<i>Cynodon dactylon</i> Pers, <i>Convolvulus arvensis</i> L. and <i>Physalis alkekengi</i> L)are being more important weeds of forest nurseries in both Northern and Southeast parts of Iran and should be considered in all weed management programs in forest nurseries.</p>

S33MT21P00

Collecting and identifying of weeds (flora) in *Pistacia Atlantica* seedling nursery of Arsanjan , Iran.

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For the developing of forest region of Arsanjan a number of seedlings of *Pistacia atlantica* are produced in Arsanjan nursery every year. To determine the importance of weeds in this nursery, weeds were collected by a quadrate of 50 by 50 cm in two successive years (1998-99). Weed samplings were randomly done six times in each plot. The collecting weeds were primarily identified, counted and canopy of them were determined. The collected weeds were as follows:

Species	Family
<i>Amaranthus retroflexus</i> L.	Amaranthaceae
<i>Taraxacum officinal</i> Weber.	Asteraceae
<i>Cardaria draba</i> (L.) Desv.	Brassicaceae
<i>Raphanus rapanistrum</i> L.	Brassicaceae
<i>Chenopodium album</i> L.	Chenopodiaceae
<i>Convolvulus arvensis</i> L.	Convolvulaceae
<i>Cyperus</i> sp.	Cyperaceae
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae
<i>Malva neglecta</i> Wallr.	Malvaceae
<i>Avena ludoviciana</i> Durieu.	Poaceae
<i>Cynodon dactylon</i> L.	Poaceae
<i>Portulaca oleracea</i> L.	Portulacaceae

Result showed that 12 weed species which belong to 10 families existed in *Pistacia atlantica* nursery of Arsenjan. Three of these species, *Taraxacum officinal*, *Convolvulus arvensis* L. and *Portulaca oleracea* L. containing more than 50 percent coverage were the prevailing weeds. The result showed that the weed species of Asteraceae family which grow in *Pistacia* nursery are as important as those of other regions and have conformity with distribution of the Asteraceae family through the world. This may show a relation between the seedlings and the growth of weeds.

S35MT10P02**INTEGRATION OF CROPPING PRACTICES AND HERBICIDES FOR SUSTAINABLE WEED MANAGEMENT**

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Agronomic practices have been studied individually for their effects on weed populations and crop yield. However, few studies have determined the potential benefits of simultaneous use of several desirable crop production practices especially when combined with timely herbicide use. A four-year field experiment was conducted under zero-till conditions at three sites in Canada to determine the combined effects of seed date (early or normal), seed rate (1X or 1.5X), fertilizer timing (fall- or spring-banded), and in-crop herbicide rate (0.5X or 1X) on weed management and crop yield. These factorial treatments were applied to a wheat-canola rotation at two sites and to a barley-field pea rotation at one site. An increase in crop seed rate was the most consistent positive agronomic practice in terms of weed management and crop yield. Delayed seeding often resulted in lower in-crop weed densities due to more weeds being killed with preseed glyphosate. However, crop yields were rarely higher, and sometimes lower, with delayed seeding in our short growing season environment. Fall- compared with spring-applied fertilizer sometimes increased weed densities but overall differences were small. Weed control and crop yields were often similar with 0.5X and 1X rates of in-crop herbicides. Weed seedbank data taken at the conclusion of the four-year study indicated that weed seed numbers were not greater with the 0.5X than with the 1X herbicide rate when applied within a competitive cropping system. This study demonstrates the potential to effectively manage weeds and maintain high crop yields by combining several good agronomic production practices with timely but limited herbicide use.

S35MT10P01**WEED MANAGEMENT IN GRAIN SORGHUM – CURRENT PRACTICES AND NEW RESEARCH IN AUSTRALIA**

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Grain sorghum is the most important summer dryland crop in the sub-tropical zone of north-east Australia, where approximately 600000ha is grown annually. Since weeds were estimated to cost growers about \$150/ha, a postal survey of weeds, management practices and their effectiveness was undertaken in 2001 to provide direction and research priorities for improved weed management. The main weeds were *Echinochloa* spp., *Urochloa panicoides*, *Ipomoea* spp., *Xanthium* spp., *Tribulus* spp., and *Sonchus oleraceus*, although the relative importance of these species and the flora differed across the region. Very few growers used tillage (0-17%) or crop competition (0-11%) to manage the weeds. Although most used either pre-emergent (34-95%) and/or post-emergent herbicides (22-57%), the majority did not consistently achieve effective weed control particularly for the grasses. The most common herbicides were atrazine, metolachlor and fluoroxypr, applied alone or mixed, as well as some use of 2,4-D amine and glyphosate, which was applied with a shielded sprayer. Research is currently investigating options to improve weed control by focusing on crop competition and herbicide efficacy. The relative and spatial impacts of weed suppression are being determined for different sorghum row spacing, density, and crop characteristics, such as seedling vigour, tillering, staygreen, and maturity. Efficacy of atrazine is being compared for different application times, with and without mechanical and rain incorporation, and for various mixtures. Strategies will then be developed to optimise herbicide performance and minimise return of weed seed to the soil.

S35MT10P03**COMPARING COMMON METHODS OF WEED CONTROL WITH FLAMING IN ONION FIELDS**

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Area under cultivation of onions in Iran totals over 47000 ha., and it is grown in all provinces. Up to 97% yield reduction has been observed in onions if weeds were not controlled, thus showing their vulnerability to weeds. 3-4 hand weedings are needed per season to escape damaging effects of weeds. Chemical weed control reduces number of hand weedings to one. Flaming has been reported to control weeds successfully in various crops, eg. Potatoes, onions etc. Trials were conducted in E. Azarbaijan during the years 1999 and 2000 to compare burning weeds with a flamer, and common chemical methods. Treatments included : 1 - ioxinil (22.5% EC) @3l/ha post+sethoxydim (12.5% OEC) @ 3l/ha post; 2 - chlorthal dimethyl (75% WP) @ 12kg/ha pre; 3 - use of flamer at the 5-leaf stage of onions (0.25m²/sec.); 4 - paraquat (20% SL) @ 3l/ha post at 5-leaf stage of onions; 5,6,7 and 8 - same treatments as above + one hand weeding; 9 and 10 - weedy & weedless controls. The dominant weed during both years of experiment was *Chenopodium album* L. Other weeds included *Amaranthus* spp., and *Echinochloa crus-galli*. Results showed that all chemical or flame treatments + one hand weeding, controlled weeds satisfactorily and resulted in significantly higher yields compared to weedy control plots. Considering the environmentally friendly nature of flame, and that it does not have to be imported (like chemicals), this method is strongly recommended in onion fields of Iran.

<p>S35MT10P04 LOW-RATE SPLIT-APPLIED (MICRO-RATE) HERBICIDE TREATMENT CONCEPT TO OPTIMIZE WEED CONTROL</p> <p>A G DEXTER¹, C G MESSERSMITH¹ and K A HOWATT¹</p> <p>¹<i>Department of Plant Sciences, North Dakota State Univ., Fargo, ND 58105-5051, cal.messersmith@ndsu.nodak.edu</i></p> <p>The low-rate split-applied (micro-rate) herbicide treatment concept is based on multiple treatments of small weeds to minimize weed competition and economic inputs for weed control. Some principles of the micro-rate concept are: a) start with a weed-free seedbed, apply the first herbicide treatment to newly emerged weeds, and apply subsequent treatments when new seedlings are emerging after the previous treatment; b) utilize the most effective herbicide available on each target weed at one-eighth to one-third of the full registered use rate; c) mix herbicides with different modes of action to provide broadspectrum weed control and reduce the risk of selecting for resistant biotypes; d) use the best available adjuvant to optimize efficacy of all herbicides applied, and e) optimize the timing and spray coverage to attain maximum efficacy from the low herbicide rates. This concept was pioneered for weed control in sugarbeet in Minnesota and North Dakota, USA, and currently can include up to six herbicides applied concurrently, including clethodim, clopyralid, ethofumesate, desmedipham, phenmedipham, and triflusulfuron, and a methylated seed oil adjuvant, which are applied three to five times. The micro-rate concept is most likely to fail when weeds are too large at first treatment or the time interval between sequential treatments is too long. The low-rate split-applied concept also has been used for wild oat (<i>Avena fatua</i> L.) control in wheat, which enhanced both weed control and wheat yield, and nightshade (<i>Solanum</i> spp.) control in soybean.</p>	<p>S35MT10P05 COMBINING UREA AND HERBICIDE SPRAY AND ITS CONSEQUENTS ON WHEAT YIELD QUALITY AND QUANTITY</p> <p>M.Akhavan , M.Bazoobandi and M.Faravani</p> <p>Khorasan Agricultural Research Center P.O.Box :91735-488 – Mashhad- Iran Email :majid_akhavan2003@yahoo.com</p> <p>Combining spray practices where herbicides and liquid fertilizer are two main components, may result in lower production costs and higher quality. In order to study the possibility of combining urea and some conventional herbicides in wheat crop, the present investigation was carried out at the farm of Khorasan Agricultural Research Center during growing season of 1999-2001. The experiment were laid out in randomized complete blocks design with two factors, A:method of urea top-dress application (liquid spray and granule) and B:herbicides at nine level i.e. different graminicides and broad leaf killers. Wheat local variety of Falat was used. 100 Kg.ha⁻¹ out of 300 Kg. ha⁻¹ Urea, which was recommended, based on soil analysis were applied at the sowing time and the rest was applied as top dress. All eighteen treatments were replicated thrice. Yield and yield components as well as number and dry matter of weeds species-wise were registered. Results revealed that number of <i>Fumaria</i> sp., <i>Convolvulus arvensis</i>, <i>Polygonum</i>, <i>Salvia</i> Sp. and <i>Chenopodium album</i> were significantly decreased by herbicide application while combining urea and herbicides could significantly increase biological yield, yield and protein percentage about 2.05 ton.ha⁻¹, 1 ton.ha⁻¹ and 1.14% respectively. It may be concluded that rapid absorption of nitrogen coinciding weed damping through herbicides could decline competition while increasing quality of yield.</p> <p>Key words: Weed , nitrogen and wheat</p>
<p>S35MT10P06 STUDIES ON POST-EMERGENT CHEMICAL WEED CONTROL IN WHEAT (<i>Triticum aestivum</i> L.).</p> <p><u>Muhammad Ishfaq Khan, Gul Hassan, Ijaz Ahmad Khan and Imtiaz Khan</u> <i>Department of Weed Science, NWFP Agricultural University, Peshawar (Pakistan) 25130 Cupids_wazir@yahoo.com</i></p> <p>For the efficacy of different herbicides for controlling weeds in wheat, an experiment was conducted at Malkandher Research Farm, NWFP Agricultural University Peshawar, during Rabi season 2002-03. The experiment was laid out in randomized complete block design with 5 replications. The experiment comprised of 8 herbicides and a weedy check. The herbicidal treatments were post-emergence applications of Rocket + Tribenuron-methyl @ 0.27 + 0.27 kg a.i ha⁻¹, Rocket 75 WDG + Tribenuron-methyl 75 WDG @ 0.37+0.37 kg a.i ha⁻¹, Rocket 75 WDG + Isoproturon 50 WP @ 0.046 + 0.741 kg a.i ha⁻¹ Tribenuron-methyl 75 WDG + Isoproturon 50 WP @ 0.046 + 0.741kg a.i ha⁻¹, Aim 40 WP @ 0.296 kg a.i ha⁻¹, Logran Extra 64 WDG @ 0.158 kg a.i ha⁻¹, Buctril-M 40EC @ 0.494 kg a.i ha⁻¹ and Affinity 50 WDG @ 0.016 kg a.i ha⁻¹. Ghaznavi-98 variety of wheat was seeded in a plot size of 6 x 2 m² during third week of October 2002. The data were recorded on tillers plant⁻¹, 1000 grains weight (g), biological yield (t ha⁻¹), and grains yield (t ha⁻¹). For controlling weeds Affinity proved to be the best, giving only 13.80 as compared to 253.0 weeds m⁻² in weedy check plots. Similarly, the maximum grain yield (4.6 t ha⁻¹) was recorded in Affinity 50WDG. It was followed by plots receiving Buctril-M 40EC and Logran Extra 64 WDG with grain yield of 4.2 and 4.0 t ha⁻¹, respectively. Minimum yield 2.8 t ha⁻¹ was recorded in weedy check plots.</p> <p>Key words: Chemicals, weeds, wheat</p>	<p>S35MT10P07 ASSESSMENT OF YIELD LOSSES DUE TO CROP-WEED COMPETITION IN PEANUT (<i>Arachis hypogaea</i>) IN EASTERN CENTRAL INDIA</p> <p>S.R. Patel¹, N. Lal² and D.S. Thakur³</p> <p>¹<i>Dept. of Agrometeorology, Indira Gandhi Agricultural University, Raipur- 492 006 (C.G.) India. Email-srpatelsr@yahoo.com</i> ²<i>Sub Divisional Officer, Dept. of Agriculture, Jagdalpur 494 001(C.G.) India</i> ³<i>S.G. College of Agriculture and Research Station, Jagdalpur 494 005(C.G.) India</i></p> <p>Peanut (<i>Arachis hypogaea</i> L.) is an important oilseed crop grown during rainy season in eastern part of Central India under rainfed condition. Among different agronomic practices, weed infestation is one of the major limiting factors influencing the productivity of peanut. First 4-5 weeks are most important in peanut and many workers have reported yield loss up to 76 per cent due to crop-weed competition. During the rainy season timely weeding is a tedious job due to continuous rains and scarcity of labourers. Pre-emergence application of herbicides proved their usefulness to reduce the crop-weed competition at early stage, but the second flush of weeds emerged and competes with the crop. Under such situation the concept of integrated weed management has immense scope in peanut production. In view if this experiments were carried out to assess the yield losses due to crop-weed competition. The predominant weed species observed in the experimental field were <i>Celosia argentea</i>, <i>Echinochloa colonum</i>, <i>Echinochloa crusgalli</i>, <i>Cynodon dactylon</i> and <i>Cyperus</i> sp. It was observed that the pre-emergence application of oxyfluorfen @ 0.40 kg/ha appreciably reduced the crop weed competition and showed maximum weed control efficiency (87.9%) however it was similar with its dose of 0.20 kg/ha. Fluchloralin and pendimethalin 1.0 kg/ha showed lower weed control efficiency than that of oxyfluorfen. Maximum pod yield was harvested in weed free plots followed by oxyfluorfen @ 0.20 kg/ha whereas the minimum yield was obtained in weedy check. Uncontrolled weed growth reduced peanut yield to the tune of 50 per cent.</p>

<p>S35MT15P01 WAYS TO MANAGE STRIGA INFESTATIONS WITHOUT HERBICIDES IN WEST AND CENTRAL AFRICA</p> <p>A.M. Emechebe <i>International Institute of Tropical Agriculture(IITA)</i> Dry Savannah Station, Kano, Nigeria</p> <p>The obligate root-parasitic flowering plants, <i>Striga</i> spp., are a major constraint to crop production in sub-Saharan Africa. <i>Striga hermonthica</i> constitutes the most important biological constraint to the production of maize, sorghum, pearl millet, and, more recently, upland rice in the savanna agroecological zones of West and Central Africa (WCA). <i>S. gesnerioides</i> is an important pathogen of cowpea, especially in the northern Guinea and Sudan savannas and the Sahel. Farmers in WCA traditionally manage <i>Striga</i> infestations by physical destruction (hoe-weeding and hand-pulling), long fallow periods, crop rotation, mixed cropping and application of organic and inorganic fertilizers. The IITA and its partners in WCA are developing and promoting an integrated <i>Striga</i> management (ISM) programme. Important components of the programme include, planting <i>Striga</i> – free host crop seeds; rotating non-host trap crop cultivars (specifically selected for efficacy to stimulate suicidal germination of seeds of the <i>Striga</i> strain prevalent in the area of intended use) with host crop cultivars; growing <i>Striga</i>-resistant/tolerant host crop cultivars; late weeding to destroy <i>Striga</i> before seed set; appropriate use of fertilizers (especially those that enhance soil suppressiveness); and biological control with fungal pathogens of <i>Striga</i>, rhizobacteria pathogenic to seeds or suppress their germination, and ethylene-producing bacteria. In promoting farmers' adoption of technology components acceptable to them, IITA and its partners are adopting farmer-participatory learning approach, including training farmers on <i>Striga</i> biology/ecology, testing of control options in farmer – managed trials and demonstration plots, and stakeholder participatory scaling out and up processes.</p>	<p>S35MT15P02 ARRESTING THE SCOURGE OF <i>STRIGA</i> ON SORGHUM IN AFRICA BY COMBINING THE STRENGTHS OF MARKER-ASSISTED BACKCROSSING AND Farmer-Participatory Selection</p> <p><u>BIG Haussmann</u>¹, DE Hess², GO Omany³, RT Folkertsma⁴ and HH Geiger¹</p> <p>¹University of Hohenheim, Institute of Plant Breeding, Seed Science, and Population Genetics, 70593 Stuttgart, Germany; E-mail: haussb@uni-hohenheim.de</p> <p>²Purdue University, Agronomy Department, West Lafayette, IN 47907, USA</p> <p>³ICRISAT-Niamey, B.P. 12404, Niamey, Niger</p> <p>⁴ICRISAT-Nairobi, Box 39063, Nairobi, Kenya</p> <p>Molecular markers for resistance of sorghum (<i>Sorghum bicolor</i>) to <i>Striga hermonthica</i> were mapped in a population of F_{3:5} lines developed from the cross N13 × E36-1. The resistant sorghum line N13 is characterized by "mechanical" resistance. The genetic map spanned 1599 cM, with 157 markers distributed over 11 linkage groups. To evaluate striga resistance, the mapping population was divided into Set 1 (116 lines tested in 1997) and Set 2 (110 lines evaluated in 1998). Field trials were conducted in five environments year⁻¹ in Mali and Kenya. Heritability estimates for Area under the Striga Number Progress Curve (ASNPC) in Sets 1 and 2, respectively, were 0.81 and 0.82. Across sites, composite interval mapping detected 11 and 9 QTL in Sets 1 and 2, explaining 79 and 82% of the genetic variance for ASNPC, respectively. Five QTL were common to both sets, with the resistance alleles deriving from N13. Since their effects were validated across environments, years and independent genotype samples, these QTL are excellent candidates for marker-assisted selection. In a new project (years 2004-2007), striga resistance of farmer-preferred sorghum varieties in Eritrea, Kenya, Mali and Sudan will be enhanced through a combination of marker-assisted backcrossing and farmer-participatory selection. A simultaneous socio-economic study of the sorghum seed supply systems in these countries will be undertaken to guide the design of effective seed interventions by partner institutions so that improved materials efficiently reach farmers. Linkage with technology exchange will boost promotion of the improved varieties as component of integrated <i>Striga</i> control.</p>
<p>S35MT15P03 YIELDING ABILITY, RESISTANCE AND TOLERANCE AS INDEPENDENT SELECTION CRITERIA FOR BREEDING AGAINST <i>STRIGA</i></p> <p>J. Rodenburg¹, L. Bastiaans¹, E. Weltzien Rattunde², D. E. Hess³</p> <p>¹ Department of Plant Sciences, Wageningen University & Research Centre, P.O. Box 430, 6700 AK, Wageningen, The Netherlands, jonne.rodenburg@wur.nl; lammert.bastiaans@wur.nl</p> <p>² International Crops Research Institute of the Semi Arid Tropics, B.P. 320, Bamako, Mali, e.weltzien@icrisatml.org</p> <p>³ Agronomy Department, Purdue University, West Lafayette, IN 47907, USA, dhess@purdue.edu</p> <p>The hemi-parasitic weed <i>Striga hermonthica</i> causes serious yield losses to susceptible cereals in the semi-arid tropics. Yield under <i>Striga</i> infestation depends on yielding ability and levels of resistance and tolerance of the crop genotype. Selection of the best genotypes for breeding requires suitable measures for each characteristic. Objective of this research was to find practical selection measures that are representative, discriminative and consistent over years. Ten sorghum genotypes were studied. Resistance to unemerged stages of the parasite was studied in agar-gel assays and pot trials. Yielding ability, tolerance and above-ground expression of resistance were evaluated in the field. Sorghum was grown with and without <i>Striga</i> infestation in a split-plot design in three successive years (2001-2003) characterised by different <i>Striga</i> infestation levels. Yield under <i>Striga</i>-free conditions provides an estimate of yielding ability. <i>Striga</i> number at harvest was not as fair, discriminative and consistent over years as other resistance measures, particularly number of <i>Striga</i> infection days (ASNPC) and maximum emerged <i>Striga</i> number. The latter is less laborious than ASNPC and corresponded reasonably well with below-ground observations. Relative yield loss was not an unambiguous measure of tolerance as it is influenced by infection level and therefore confounded with resistance. A linear correction for infection level was found to be unsatisfactory. Screening for yielding ability and tolerance requires <i>Striga</i>-free plots adjacent to infested plots. For yielding ability and resistance, suitable selection measures were identified. Development of a selection measure for tolerance will require additional information on the relation between yield loss and infection level. Keywords: Sorghum bicolor, <i>Striga</i> Hermonthica, Screening methodologies</p>	<p>S35MT15P04 DEVELOPMENT OF A SYSTEMS APPROACH FOR ECOLOGICAL MANAGEMENT OF <i>Striga</i> IN CEREAL BASED CROPPING SYSTEMS IN NORTHERN NIGERIA</p> <p>N A Gworgwor</p> <p>Department of Crop Production, Faculty of Agriculture, University of Maiduguri, P.M.B. 1069, Maiduguri, Borno state, Nigeria. E-mail: ngworgwor@yahoo.com</p> <p>In a series of field trials conducted between 1995 and 1998 at the University of Maiduguri, Nigeria, trap crops (groundnut, bambara-groundnut and sesame) and seed dressing with brine (NaCl) were used to investigate the effectiveness of these materials on the management/control of <i>Striga hermonthica</i> in sorghum and millet. In the sorghum-groundnut trial, the results show that the intercropping of sorghum with groundnut significantly reduce <i>Striga</i> infestation up to 50% in sorghum in both years, but without significant increase in yield. In the sorghum-bambara trial, alternating stands of sorghum and bambara groundnut within the same row reduced <i>Striga</i> shoot count in all the varieties with a range of 51 – 91% reduction than in alternate rows or sole sorghum of each variety significant increase in yield in all the varieties compared with their soles. In the millet-sesame trial, the 1:1 alternate stand on the same row cropping pattern significantly reduced <i>Striga</i> infestation more than the millet:sesame same stand cropping pattern, especially with ICSV-IS-91116 variety in both years where zero <i>Striga</i> emergence was observed. In the seed dressing trial, with brine, it shows that irrespective of the sorghum variety, the use of brine at 1.5 M was found optimal for controlling <i>Striga</i> emergence resulting in increased crop growth and grain yield. In conclusion, it is evident that the farmers in this dried semi-arid ecological zone of Nigeria have a choice of any option of a control strategy to achieve a good degree of <i>Striga</i> management/control in their sorghum or millet based cropping system. Such options also offer a long term effect of depleting <i>Striga</i> seed bank in the soil and such options are ecologically sound and accessible to the farmers.</p>

<p>S35MT15P05</p> <p>PROSPECTS AND LIMITATIONS FOR <i>STRIGA ASIATICA</i> CONTROL IN SORGHUM/DESMODIUM INTERCROP</p> <p>N Tesfamichael¹, C F Reinhardt¹ and S. De Meillon²</p> <p>¹Department of Plant Production and Soil Science, University of Pretoria, Pretoria 0002, South Africa, E-mail s21275212@tuks.co.za</p> <p>¹Department of Plant Production and Soil Science, University of Pretoria, Pretoria 0002, South Africa, E-mail c.reinhardt@bioagric.up.ac.za</p> <p>²Department of Botany, University of Pretoria, Pretoria 0002, South Africa, E-mail fanie@postino.up.ac.za</p> <p>Sorghum bicolor (L.) Moench is often severely restricted by <i>Striga asiatica</i> (L.) Kuntze parasitism, and successful management of the weed requires integrated control practices. Objectives: to investigate the influence of <i>Desmodium intortum</i> exudates on <i>Striga</i> seed germination, and to determine optimum timing of <i>Desmodium</i> establishment, and population density, for effective control of <i>Striga</i> in a sorghum/<i>Desmodium</i> intercrop system. In a pot experiment, treatment combinations of three sorghum varieties; three transplanting dates for <i>Desmodium</i>; in the presence or absence of <i>Striga</i>, were employed. In the second pot experiment, four sorghum/<i>Desmodium</i> intercropping ratios and three sorghum varieties were used. In the laboratory, the effects of different plant parts, leachates and extracts of <i>Desmodium</i> were tested on <i>Striga</i> seed germination. Pot experiment results showed that <i>Striga</i> population varied significantly among sorghum varieties, sorghum / <i>Desmodium</i> intercropping ratios, <i>Desmodium</i> establishment date, and their interactions. <i>Desmodium</i> reduced <i>Striga</i> emergence in sorghum by 100% when intercropped at 1:3 sorghum:<i>Desmodium</i> ratios, and with <i>Desmodium</i> transplanted 30 days prior to sorghum sowing. However, this treatment combination also caused significant reductions in sorghum yield. Compatibility between sorghum and <i>Desmodium</i> was evident at the 1:1 plant ratio. Laboratory results showed that exudates of <i>Desmodium intortum</i> induce suicidal germination of <i>Striga</i>. Segments of <i>Desmodium</i> roots, leachate from live plants, and leachate extracts induced germination of <i>Striga</i> seeds. Findings apparently explain why the practice of <i>Desmodium</i>/sorghum intercropping is effective for controlling <i>Striga asiatica</i>. Further research, especially on the metabolites and mechanisms involved, is warranted.</p>	<p>S35MT15P06</p> <p>FIELD INOCULATION WITH ARBUSCULAR MYCORRHIZAL FUNGI REDUCES <i>STRIGA</i> PERFORMANCE ON CEREAL CROPS AND HAS THE POTENTIAL TO INCREASE CEREAL PRODUCTION</p> <p>V.W. Lendzemo¹, Th. W. Kuyper², M.J. Kropff² and A. van Ast²</p> <p>¹Institute of Agricultural Research for Development, P.O. Box 33 Maroua, Cameroon vlendzemo@hotmail.com</p> <p>²Wageningen University and Research Centre, The Netherlands thom.kuyper@wur.nl martin.kropff@wur.nl aad.vanast@wur.nl</p> <p>The witchweed <i>Striga hermonthica</i> seriously affects cereal production in Africa. Severity and intensity of <i>Striga</i> correlate negatively with soil fertility status. Arbuscular mycorrhizal (AM) fungi have been observed to negatively influence <i>Striga</i> performance in pot experiments. The objective of this study was to validate results of the tripartite interactions AM fungi, cereals and <i>Striga</i> obtained under controlled conditions, in the field. Maize and sorghum were grown in the field in north Cameroon during the cropping seasons of 2000 for maize, 2001 and 2002 for sorghum. Both cereals were grown in the presence or absence of <i>Striga</i> seeds, with or without inoculation using a mixed soil inoculum of AM fungi. Infection of maize by <i>Striga</i> resulted in a 20% cob yield reduction. In 2001, <i>Striga</i> infection of sorghum led to a reduction of only 7% of panicle yield whereas in 2002 a significant 26% reduction of panicle yield was obtained. With AM fungi inoculation, a significant reduction (30% and over 50% on maize and sorghum, respectively) in number of <i>Striga</i> shoots was noted. Harvested and dried <i>Striga</i> shoots from AM inoculated plots weighed significantly less: 40% reduction on maize, 46% and 63% reduction on sorghum in 2001 and 2002, respectively. Negative performance of <i>Striga</i> with AM fungi inoculation did not result in significant increase in cereal yield suggesting presence of effective AM propagules that needed boosting early in the cropping season in those fallow fields. Managing AM is an option in integrated management of <i>Striga</i> on cereals for sustainability.</p>
<p>S35MT15P07</p> <p>PATHOGENICITY OF <i>FUSARIUM</i> spp ISOLATES AND METABOLITES TO <i>STRIGA HERMONTICA</i> IN BURKINA FASO</p> <p>D. YONLI¹, H. TRAORÉ¹, D.E. HESS², O. OUÉDRAOGO¹, P. SEREMÉ¹</p> <p>¹Institut de l'Environnement et de Recherches Agricoles, 04 B.P. 8645 Ouagadougou 04, Burkina Faso, htraore@hotmail.com; ²Agronomy Department, Purdue University, W. Lafayette, IN, USA, dhess@purdue.edu.</p> <p><i>Striga hermonthica</i> is an important constraint in cereal crops, mainly sorghum, the major crop of Burkina Faso. The objectives of this study were to identify <i>Fusarium</i> spp isolates effective against <i>S. hermonthica</i>, to evaluate their pathogenicity and to determine methods of application. Of 51 <i>Fusarium</i> spp isolates evaluated <i>in vitro</i>, 14 were effective to control <i>S. hermonthica</i>. These 14 isolates were evaluated for their effects on <i>Striga</i> germination and their effectiveness to control <i>Striga</i>. Application of spores of <i>Fusarium</i> spp isolates 150a-M, 5-Kou, 31-Kou, 6-Fa, 34-Fo, 32-Or and 125b-Za reduced <i>Striga</i> germination by 78.06% to 87.62% compared to the control. The study showed that at the rate of 33 mg mL⁻¹, metabolites of isolates 5-Kou, 6-Fa, 34-Fo and 125b-Za were effective to prevent <i>Striga</i> germination. However, isolates 141b-O, 150a-M and 32-Or expressed their effectiveness at 67 mg mL⁻¹. <i>Striga</i> death rates ranged from 17% to 37% between 14 and 28 days after inoculation of spores of <i>Fusarium</i> spp isolates 34-Fo and 5-Kou. Isolates 5-Kou and 34-Fo showed a reduction of <i>Striga</i> biomass by 77.65% and 83.58% respectively. Sorghum yield was improved by 84.23% and 98.88% respectively with isolates 6-Fa and 34-Fo in comparison with the control without <i>Striga</i>. This study showed the importance to identify toxins responsible of <i>Striga</i> death. Seeds coating with <i>Fusarium</i> isolates could be a biological component in the integrated striga management in West Africa.</p> <p>Key words: Biological control, <i>Striga hermonthica</i>, pathogenicity, germination, inhibition.</p>	<p>S35MT15P08</p> <p>Linking laboratory and field studies of dormancy in <i>Striga hermonthica</i>: Is delayed planting an option for integrated control?</p> <p>Alistair J. Murdoch and Israel K. Dzomeku</p> <p>Department of Agriculture, The University of Reading, Earley Gate, Reading RG6 6AR, UK Email: a.j.murdoch@reading.ac.uk</p> <p>Dormancy is an important attribute associated with the ability of seeds in the soil seed bank to germinate and emerge in response to favourable environmental conditions. A Sudanese seedlot of <i>Striga hermonthica</i> was subjected to prolonged conditioning (up to 19 weeks) at a wide range of temperatures (17.5°C to 35) and water potentials (0 to -2.25 MPa) and urea concentrations (0 to 3.16 mM). The non-linear empirical mathematical modelling approaches used by Kebreab & Murdoch to describe responses of <i>Orobanche</i> were tested on these data. Being a much more extensive data set than that available for <i>Orobanche</i>, the hypothesis that loss of primary dormancy is independent from induction of secondary dormancy could be tested for the first time and was rejected. Implications will be discussed. These models were then applied to seeds of the same Sudanese seedlot subjected to conditioning in the soil in a glasshouse, providing a reasonable fit. The final validation was a comparison with the behaviour of a naturally-occurring seedbank in the soil of Northern Ghana. With calibration, the effect of delayed planting on emergence of <i>S. hermonthica</i> could be modelled. While the modelling exercise contributes usefully to our understanding of the biology and population dynamics of the weed, it is also true that the rate of induction of secondary dormancy was too slow for delayed slowing to be a viable option for small-scale farmers.</p>

<p>S35MT21P01 INVASIVE PERENNIAL PLANTS IN EASTERN U.S. FORESTS: UNIQUE MANAGEMENT PROBLEMS AND SOLUTIONS</p> <p>S. M. Zedaker¹, P. L. Burch², M. Blair¹ and C. Langdon³</p> <p>¹Department of Forestry (0324), Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA, zedaker@vt.edu and mblair@vt.edu; ²DowAgro Sciences, 3425 Elk Creek, Christiansburg, VA 24073, USA, plburch@dow.com; ³Department of Environmental Science and Policy, George Mason University, Fairfax, VA 22030, USA, clangdon@gmu.edu</p> <p>Exotic perennial invasive plants present unique problems for forest land managers in the eastern United States. Their rapid growth rates and their tolerance to disturbance, poor soil conditions, and low light levels exacerbate control and management efforts. Significant decreases in native plant diversity and ecosystem functions result from exotic dominance. This research focuses on three "model" exotic perennials: <i>Ailanthus altissima</i>, an intolerant fast-growing tree; <i>Cytisus scoparius</i>, a rapidly spreading persistent shrub; and <i>Akebia quinata</i>, a shade-tolerant perennial vine. Each of these species presents unique management problems in the ecological setting of the invasion because of their growth habits and interactions with the native plants they displace. The physiological attributes of the tree, shrub and vine are reviewed, as are the ecological settings for their invasion in protected and domesticated forests. The results of several experiments to control the three species are presented, as are other options for management. In each case, the objective was to control the exotic while facilitating the reestablishment of native plant communities. These perennial exotics were, and can be, effectively controlled; however, special precautions and control techniques must be used to preserve the protected and valued native plants in eastern U.S. forests.</p>	<p>S35MT21P02 Dose response for herbicides applied to weeds in kinleith forest – central north island, new zealand</p> <p>S F Gous¹, M O Kimberley¹ and B Richardson¹</p> <p>NZ Forest Research Institute Ltd., Private Bag 3020, Rotorua, New Zealand Email: stefan.gous@forestreresearch.co.nz</p> <p>Over the past few years there have been a number of studies in New Zealand to develop dose-response relationships between particular herbicides and weeds. While results from these trials implied that herbicide rates could be significantly decreased without adversely affecting efficacy, this idea has had limited field validation. Validation would require field studies to measure weed response to different herbicide rates. If this idea is to have practical value it is also important to consider effects of plant size and seasonal influences on dose-response relationships. This paper describes results from a field trial designed to evaluate the effect of reduced herbicide rates on efficacy against weeds at a forest site in Kinleith Forest. This trial investigated the effects of two herbicides (glyphosate and a terbutylazine/hexazinone mixture), each at six rates (including an untreated control), on broom and buddleia. Treatments were applied to plots laid out using a randomised block design replicated five times. Survival and height of individual weeds was assessed every three months for one year following treatment. The analysis demonstrated that reduced herbicide rates can significantly suppress the height growth of both buddleia and broom, indicating that rates could potentially be reduced without adversely affecting efficacy. It would appear that glyphosate not only acts faster than the mixture, but at the rates used is much more damaging to the weeds.</p>
<p>S35MT21P03 EFFECTS OF POST-PLANTING VEGETATION CONTROL ON SURVIVAL AND GROWTH OF <i>BETULA PENDULA</i> PLANTED ON FORMER AGRICULTURAL LAND</p> <p>Jyrki Hytönen and Paula Jylhä</p> <p><i>Finnish Forest Research Institute, Kannus Research Station, P.O. Box 44, FIN-69101 Kannus, Finland, E-mail: paula.jylha@metla.fi</i></p> <p>Field afforestation is considered to be more difficult than reforestation of clear-cut forests, and many failures have been reported. Decades of agriculture have affected considerably the physical and chemical properties of the soil, as well as vegetation composition. In a field experiment established in southern Finland effects of various weed control treatments on the survival, height and volume growth of Silver birch (<i>Betula pendula</i>) were compared during 11 post-planting years. Mulch (piece of particle board disc), cover crop (clover) and various herbicides (terbutylazine, chlorthiamid, sethoxydim, pendimethalin and dichlobenil) were compared with untreated control plots in a randomised block design with three replications. Weed cover percentage correlated linearly and negatively with seedlings' height growth. Mortality started to increase only when weed coverage reached 70-80%. The shading effect of weed vegetation on each seedling proved to be an easily measurable variable with good indication on the seedling's further development. All seedlings assessed in the second growing season at least ¼ shaded were dead at the end of the 6th growing season, and growth of the seedlings decreased with increase in shading. All methods reducing weed cover and shading also increased seedling growth and survival. Cover crop and mulch proved to be ineffective weed control methods. Herbicide treatments gave birch seedlings 149-222 cm height advantage over the control seedlings in 11 years. In terms of volume growth the best herbicide (chlorthiamid) increased silver birch growth by 195% compared to control.</p>	<p>S35MT21P04 Age-shift analysis: A method of evaluating growth responses to silvicultural treatments in forestry field trials</p> <p>M O Kimberley¹, S Gous¹ and B Richardson¹</p> <p>NZ Forest Research Institute Ltd., Private Bag 3020, Rotorua, New Zealand Email: mark.kimberley@forestreresearch.co.nz</p> <p>It is often difficult to evaluate economic responses to forest silvicultural treatments such as weed control on the basis of early experimental results. A simple analysis of growth increments can often lead to misleading conclusions about the longevity of a treatment response because of associations between growth rates and tree size. To avoid this, treatments can be compared on the basis of equal size rather than equal age. A method of analyzing trials using an "age-shift" approach is presented. This method makes it possible to determine both the extent and longevity of any growth response. It also provides a straightforward economic analysis based on the assumption that an age shift earlier in the rotation can be translated into a reduction in rotation length while maintaining the same volume at harvest. An example of this analysis approach is presented using a weed-control trial in a young <i>Pinus radiata</i> stand in the Central North Island of New Zealand. The trial contains treatments in which herbicide is spot-sprayed around each tree at establishment. A control treatment and a range of spot-spray diameters maintained for varying durations are compared. The analysis demonstrates that weed control benefited tree growth for the first one to two years, and that there was no advantage in maintaining weed control beyond this. The best treatment provided a total gain of about one year's growth over the control. An economic evaluation of the benefits of weed control on this site based on these results is also presented.</p>

<p>S35MT21P05 DETERMINING THE AGE-SHIFT RESPONSE FROM HERBACEOUS WEED CONTROL IN PINUS TAEDA STANDS IN THE SOUTHERN UNITED STATES</p> <p>David B. South¹, Mark O. Kimberley², James H. Miller³ and Curtis L. VanderSchaaf⁴</p> <p>¹<i>School of Forestry and Wildlife Sciences, Auburn University, AL, 36849 USA. southdb@auburn.edu</i> ²<i>New Zealand Forest Research Institute Ltd, Private Bag 3020 Rotorua, NZ. mark.kimberley@forestresearch.co.nz</i> ³<i>USDA Forest Service, Southern Research Station, 520 DeVall Drive, Auburn, AL, 36849 USA. jmiller01@fs.fed.us</i> ⁴<i>College of Natural Resources, Virginia Tech University, Blacksburg, VA 24061 USA. cvanders@vt.edu</i></p> <p>Volume gains from suppression of herbaceous competition in <i>Pinus taeda</i> L. plantations are sometimes expressed as "percent gains." However, since these percentages decline over time, economists have difficulty in projecting revenues from percentage-gain values. The "age-shift" method (i.e. quantifying year advancements in growth due to herbicide applications) is a better approach since it is relatively independent of stand age. From an economic perspective, the best method of estimating the "age-shift" is by analyzing gains in merchantable volume. Age-shifts based on height or basal area measurements do not exactly equate to those based on merchantable volume.</p> <p>Data from 11 COMProject studies across the southern U.S. were graphed in terms of both percentage and age-shift gains. From ages 8 to 15 years, the age-shift estimates were relatively stable while the percentage gains dropped appreciably. In the presence of minor hardwood competition (basal area at 15 yr = 0.4 m²/ha; n=11), the age-shift gain (due to 3 to 5 years of herbaceous control) averaged 2.6 years but varied by site (low = 1.6; high = 3.8). In the presence of low hardwood competition (basal area = 1.9 m²/ha; n=4), the age-shift gain to herbaceous control was 1.9 years and in the presence of high hardwood competition (basal area = 5.8 m²/ha; n=7), the age-shift was 1.0 years. Although there were a few exceptions, the age-shift advantage due to reducing herbaceous competition tended to decline as hardwood competition increased. On three sites, there was no age-shift gain when woody competition was high.</p>	<p>S35MT21P06 EVALUATION OF ANNUAL WEED DAMAGE IN ALMOND NURSERIES OF FARS PROVINCE,IRAN</p> <p>S.H.Saadati</p> <p><i>Research center of Agriculture & natural resource of Fars Province,Iran. P.O.BOX.71555-617,SHIRAZ,IRAN. Saadati@farsagres.ir.</i></p> <p>Each year, a lot of Walnut and Almond seedlings are produced in forestry nurseries of Fars Province . The most important problem in these nurseries is controlling of weeds. In an experiment with 6 treatments in 4 replications in a RCBD design the losses due to annual grassy and broadleaved weeds in <i>amygdalus communis</i> L. were evaluated. The treatments were : (1) weedy (2) one hand – weeding (3) two hand – weeding (4) three hand - weeding (5) four hand – weeding (6) weekly weeding. The dominant species were about 40% broadleaved weeds and 60% grassy weeds.</p> <p>The results showed that weeding has a great effect on the growth of Almond seedlings. There were significant differences in the parameters of growth such as diameters of stems, lengths of plants and fresh weights of significant difference between two hand – weeding and three hand – weeding plots.</p> <p>Its seemed that two hand – weeding during active growth period gives satisfactory control of weeds.</p>
<p>S35MT21P07 EVALUATION OF ANNUAL WEED DAMAGE IN ALMOND NURSERIES OF FARS PROVINCE,IRAN</p> <p>S.H.Saadati</p> <p><i>Research center of Agriculture & natural resource of Fars Province,Iran. P.O.BOX.71555-617,SHIRAZ,IRAN. Saadati@farsagres.ir.</i></p> <p>Each year, a lot of Walnut and Almond seedlings are produced in forestry nurseries of Fars Province . The most important problem in these nurseries is controlling of weeds. In an experiment with 6 treatments in 4 replications in a RCBD design the losses due to annual grassy and broadleaved weeds in <i>amygdalus communis</i> L. were evaluated. The treatments were : (1) weedy (2) one hand – weeding (3) two hand – weeding (4) three hand - weeding (5) four hand – weeding (6) weekly weeding. The dominant species were about 40% broadleaved weeds and 60% grassy weeds.</p> <p>The results showed that weeding has a great effect on the growth of Almond seedlings. There were significant differences in the parameters of growth such as diameters of stems, lengths of plants and fresh weights of significant difference between two hand – weeding and three hand – weeding plots.</p> <p>Its seemed that two hand – weeding during active growth period gives satisfactory control of weeds.</p>	<p>S35MT21P08 FRACTAL PATTERNS IN SPECIES DISTRIBUTIONS OF SOME BRITISH SCARCE PLANTS</p> <p>¹<i>Georges Herbert, CHEKUIMO TAGNE, ²Kunin, Williams Edwards ²Pocock, Michael ²Aston, Rebecca</i></p> <p>¹ ²</p> <p>The analysis, measurement, and management of species abundance is central to ecology and conservation biology, but it has proved difficult to find a single index that adequately reflects the commonness or rarity of species across a range of spatial scales. The spatial distribution and fractal structure of two British scarce plants, <i>Lobelia urens</i> (heath lobelia) and <i>Phyteuma orbiculare</i> (round-headed rampion), have been examined at several different scales. The two species have similar degrees of local patchiness at scale coarser than 50 km and have contrasting coarse-scale between 50 km and 1 km scales, but differed consistently in the slopes of their scale-occupancy curves distributions at scale finer than 1 km. The slope of the log-log plot of <i>L. urens</i> is not constant, but varies systematically with spatial scale, and from habitat to habitat at the same spatial scale. Abundance estimates suggest that the species <i>P. orbiculare</i> is found to be clumped at all scales, whereas <i>L. urens</i> is dispersed at intermediate scale. Fractal dimension analysis suggests that this changes through scale. The distribution varied in their pattern from highly clumped to randomly dispersed. Fairly predictions of <i>L. urens</i> can be made from 50 m and 200 m.</p>