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less than effective by itself. This research was conducted to evaluate interactions between hairy vetch residue on the surface of soil and the herbicide metolachlor. Metolachlor was applied and incorporated with simulated rainfall before residue placement, residue was applied to the soil surface at precise rates, and potentially confounding variables such as nitrogen and soil moisture were controlled in a greenhouse experiment. Emphasis was placed on using sub-optimal rates of both residue and metolachlor to explore the potential synergistic interactions between these factors. Deviation from a multiplicative model that included a quadratic response to hairy vetch residue and a log-logistic response to metolachlor was used to demonstrate the presence or absence of synergism. This model effectively showed that emergence of smooth pigweed, common lambsquarters, giant foxtail, and velvetleaf and early growth of smooth pigweed and common lambsquarters were reduced synergistically by the combination of hairy vetch residue and metolachlor. For example, smooth pigweed emergence was reduced 13% by 500 g m^{-2} of hairy vetch residue, alone, and was reduced 16% by 10 g ha^{-1} of metolachlor, alone, but together they reduced smooth pigweed emergence by 86%. This research suggests that the synergistic combination of cover crop residue plus low rates of phytotoxins requiring metabolic detoxification could provide an effective biologically based system. (179)

Update on major weeds of tropical and sub-tropical areas. Labrada, R.E.[1] [1]viale delle Terme di Caracalla, Rome, Italy. The global list of major tropical and subtropical weeds has changed slightly during the last decade. Aquatic floating plants *Eichhornia crassipes* and *Salvinia molesta* remain major constraints to fishing and navigation in large water bodies. *E. crassipes*, due to problems of effective control, can be considered the world's worst weed of tropical areas. Parasitic *Striga* spp. prevail in cereals in the Sahel, as do *Orobanche* spp. in North African and Near Eastern countries, infesting various dicot. crops. *O. crenata* spread recently in Sudan and Ethiopia with the import of weed seed-contaminated faba beans. The increased shift from transplanting to direct-seeding rice has provoked high weedy/red rice infestations, difficult to control with a single strategy. Herbicide use in rice has created resistant *Echinochloa colona, E. crus-galli* and *Sphenoclea zeylanica* biotypes. Despite biological control of some species, *Chromolaena odorata* in Africa and *Parthenium hysterophorus* in Ethiopia and Southern Asia remain important, while the introduced shrub *Prosopis juliflora* is rapidly spreading to fertile areas of the Near East, and East and Southern Africa, causing serious problems to livestock. Isoproturon-resistant *Phalaris minor* is still a major problem in North India, and is also becoming resistant to various aryloxyphenoxypropionate herbicides. *Cyperus rotundus* remains a constant problem in areas repeatedly treated with soil-acting herbicides. Although *Imperata cylindrica* and *Rottboellia cochinchinensis* are still constraints to agricultural production in Africa South of the Sahara and Central America, respectively, new effective control procedures have been developed. *Cynodon dactylon*, considered an important weed in orchards, is less threatening due to better control. (180)

Effect of method and time of buckthorn management on seedling establishment and resprouting ability of established buckthorn saplings. Bisikwa, J.[1], Becker, R.L.[1], Jordan, N.R.[1], Biesboer, D.D.[1], Katovich, S.A.[1] and Forcella, F.[2] [1]Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN, [2]USDA-ARS, Morris, MN. European buckthorn is an exotic invasive woody species displacing native plants and is an agricultural pest that acts an alternative host for soybean aphid and oat rust fungus in Minnesota. Our goal of this study was to develop control strategies to minimize the negative effects of buckthorn on the natural ecosystems and also control buckthorn as an agricultural pest. The main objective of this study was to determine the most effective management strategy of minimizing the negative effects of buckthorn on the natural ecosystem. The study was located at Eagle Lake and Battle Creek Regional Parks Minnesota, U.S.A. The results show that there was higher buckthorn seedling density, resprouting ability, and species richness in 2002 than in 2003 regardless of location and method of control due to drought conditions in 2003. The cut-stump plus triclopyr treatment resulted in higher buckthorn seedling densities and higher densities of other species the season following treatment compared to cutting only without herbicide use. Spring management season resulted in the lowest seedling density the season following treatment for both buckthorn and other species. Among spring control treatments, those that included herbicide and burning combination resulted in higher buckthorn seedling densities and higher species richness than treatments without burning. Therefore, among the spring control treatments, the treatment including both herbicide application and burning was the best management strategy for spring buckthorn control since it suppressed buckthorn regrowth and increased plant species richness. However, follow-up prescribed burning conducted in spring 2003 reduced native species richness. Our findings support our prediction that integrating more than one control technique would increase species diversity despite the fact that buckthorn seedling emergence also increased. This indicates that other follow-up treatments such as use of foliar sprays in addition to prescribed burns should be planned for long-term control of buckthorn seedling establishment. (181)

Emerging technologies for physical weed control in row crops in Europe. Melander, B.[1,]* and v.d. Weide, R.[2] [1]Danish Institute of Agricultural Sciences, Research Center Flakkebjerg, Slagelse, Denmark, [2]Applied Plant Research Wageningen University and Research Center, Lelystad, The Netherlands. European research on physical weed control methods has largely been driven by concerns about pesticide usage in conjunction with an increasing conversion to organic farming. This paper reviews the major results with mechanical and thermal weed control in row crops (e.g. corn, sugar beet, onion, and carrot) and highlights examples of emerging technologies for improving physical weed control in row crops. Row crops present two different situations for direct physical weed control of entirely different difficulty. Interrow weeds can be removed by ordinary interrow cultivation relatively easily, now with automated guidance systems to ease the steering