Proceedings

of the

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of the

Northeastern Weed Science Society

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HISTORY OF THE NORTHEASTERN WEED SCIENCE SOCIETY (1947-2006). T.E. Dutt, Consultant, Fogelsville, PA, R.D. Sweet, Cornell Univ., Ithaca, NY, and J.F. Derr, Virginia Tech, Virginia Beach.

ABSTRACT

A group of individuals from the northeastern U.S. who were interested in the study of weeds met on the Cornell campus, Ithaca, NY, in February of 1947. They formed an organization of weed scientists during the first day; it was initially named the Northeastern Weed Control Conference (NEWCC). The name was changed to the Northeastern Weed Science Society (NEWSS) in 1970. The first officers were G. H. Ahlgren, Chairman; B.H Grigsby, Vice-Chairman; and R.D. Sweet, Secretary-Treasurer. The 2nd meeting was held at the Hotel Commodore in New York 1948 and the annual meetings (1949-1973) were also held in New York City. The fiftieth meeting of NEWSS was held in Williamsburg, VA in 1996 and the sixtieth annual meeting will be held in Providence, RI in 2006. The organization also hosted the first annual meeting of the Weed Society of America (WSA), now known as WSSA) in New York City in 1956. Guiding principles of NEWSS when it was formed, and still applicable today, were to facilitate the rapid exchange of information, have membership and voting rights open to everyone interested in weeds, and to have a close working relationship between the public and private sectors. The position of Vice-President alternates between the public and private sectors, ensuring this close working arrangement.

Annual meetings have been traditionally held in early January; 84 people attended the first annual meeting. Meeting attendance and membership grew rapidly during the early years, peaking at 767 in 1965. Attendance has declined steadily over the last 40 years to ca. 200 members in 2005. Nearly 6,000 scientific papers, abstracts, and articles have been published in the society's proceedings. NEWSS also had a publication called "Response of Crops and Weeds to Herbicides" which was discontinued in 1974. In 1955, NEWSS began recognizing outstanding papers at the annual meeting. Currently the society honors outstanding student papers and posters and conducts a photo contest. The society started the Award of Merit in 1971 to recognize a long career in weed science and participation in NEWSS. The society currently presents the Award of Merit, Distinguished Member, Outstanding Researcher, and Outstanding Educator awards. Starting in the 1960's, members met during the annual meeting to develop a schedule of field days and this practice continues today. Starting in 1983, NEWSS has held a Northeastern Collegiate Weed Contest for undergraduate and graduate students within the northeast, with additional teams from nearby states also competing in some years. Contest components include sprayer calibration, weed ID, herbicide symptomology, and grower problem solving. NEWSS has been meeting with other scientific organizations since 1999. The affairs and business of NEWSS have been managed entirely by volunteers, with an executive committee of elected officers and committee chairpersons comprised from the membership.

WEEDS OF THE CONTAINER NURSERIES -- A NEW WEED IDENTIFICATION GUIDE. J.C. Neal, North Carolina State Univ., Raleigh and J.F. Derr, Virginia Tech, Virginia Beach.

ABSTRACT

Weed control can be the most costly input in the production of container-grown nursery crops. Any control program begins with correct identification of the weeds present, along with an understanding of their life cycles and modes of reproduction and spread. A new weed identification manual has been published that specifically targets weeds of container nursery crops. This manual provides information on 46 species of common and newly introduced weeds of container nurseries. The list of species includes: liverwort and algae, other monocots (doveweed, sedges and grasses), 13 Asteraceae (including groundsel, inula, horseweed, eclipta, and Asiatic hawksbeard), 4 Brassicaceae (including bittercress and yellow fieldcress), 3 Caryophyllaceae (chickweeds and pearlwort), 7 Euphorbiaceae (spurges and phyllanthus), 2 Onoagraceae (willowherbs and water purslane), mulberryweed, marsh parsley, oxalis, and three common woody weeds. Each listing includes a description of the species, color photographs of different ages or identifying characteristics, life cycles and reproductive strategies, and general control information. The guide also includes a table that ranks the effectiveness of selected preemergence herbicides currently labeled for use in container nurseries. The production and printing of this manual were supported by grants and partnerships with the USDA Risk Management education program, the Virginia Agricultural Pest Survey, the Virginia Department of Agriculture and Consumer Services, and the North Carolina Association of Nurserymen (NCAN). It is published and distributed by the North Carolina Association of Nurseymen; for copies, call 919-816-9119.

BUSHKILLER, A NEW INVASIVE SPECIES IN NORTH CAROLINA. R.J. Richardson, C.A. Judge, A. Krings, and J.C. Neal, North Carolina State Univ., Raleigh.

ABSTRACT

Bushkiller [*Cayratia japonica* (Thunb.) Gagnep.] was identified in a suburban section of Winston-Salem, NC, in 2005. This introduced species is an aggressive, perennial vine in the grape family (Vitaceae). Previous reports have indicated that the species has only been found in North America within Texas, Louisiana, and Mississippi. The dispersal mechanism to North Carolina is unknown. Bushkiller is somewhat similar in appearance to Virginia creeper [*Parthenocissus quinquefolia* (L.) Planch.) and wild grape (*Vitis* sp.). Leaves consist of five leaflets with serrated margins. The terminal leaflet is larger than other four leaflets providing a distinct appearance of the foliage. Tendrils are generally opposite from leaves and do not have adhesive discs like Virginia creeper. The flowers are small yellow clusters that have been observed to abort rather than set fruit; therefore, only vegetative spread has been reported in North America. Handweeding has not controlled this plant and re-sprouting has been vigorous. Currently, research on biology and control of this plant is not available. Studies have been initiated at North Carolina State Univ. to evaluate herbicide efficacy and to determine the potential reproductive capacity of this species.

PHYTOGEOGRAPHIC DISTRIBUTION OF THE INVASIVE PERENNIAL WEED MUGWORT. J. Barney, Cornell Univ., Ithaca, NY.

ABSTRACT

One of the defining characteristics of an invasive species is anthropogenic introduction of propagules into novel habitats, often at great distances from their source. Despite the sizable human role in distributing non-indigenous species, we still know strikingly little about the mechanisms of successful establishment and future range expansion. What mechanism(s) allow invasive species to expand their range so rapidly? Can we find answers to this and correlated questions by examining the historical record?

This study modeled the historical distribution of the invasive perennial weed mugwort (*Artemisia vulgaris*) in North America as a function of various abiotic (elevation, precipitation) and anthropogenic factors (population density) and location (latitude and longitude) at the scale of political units (US counties and Canadian municipalities). Herbarium records from 273 institutions were parsed into decadal increments and integrated into a geographic information system (GIS) as presence/absence. Join count analysis revealed that the current mugwort distribution is best described as secondary spread from founder populations across North America. The predictors with the most explanatory power were the area of the political unit and the population density of that unit. This logistic model was used to estimate the probability of supporting a mugwort invasion for each political unit, with the likelihood of mugwort invasion increasing 600% for every 10-fold increase in population density.

INFLUENCE OF RYE COVER CROP ON HORSEWEED EMERGENCE AND DEVELOPMENT.

B.A. Scott and M.J. VanGessel, Univ. of Delaware, Georgetown.

ABSTRACT

Horseweed (*Conyza canadensis*) has become an increasingly problematic weed, not only in the Mid-Atlantic States but also throughout much of the eastern US, due to the occurrence of glyphosate-resistant biotypes. In order to make more effective horseweed management decisions, it is important to determine what ecological factors impact spring and fall germination and winter survival. Cover crops may inhibit horseweed emergence and seedling establishment and vigor. A study was established in DE to determine the influence of a rye (*Secale cereale*) cover crop on horseweed emergence and development. All sites were no-till and non-irrigated and the study was conducted at two locations for each of three years.

The study was a two-factor factorial, with rye seeding rate and nitrogen as the two factors. The study had four replications arranged as a randomized complete design. Rye seeding rates were 0, 33, 65, and 130 kg/ha and spring-applied nitrogen rates were 0 or 33 kg/ha. Emerged horseweed plants were counted in a $0.5m^2$ area and average size was noted on a monthly basis starting one month after rye planting. Rye biomass was taken after heading and sprayed with a postemergence graminicide. Postemergence graminicide application coincided with the timing many fields with rye cover crops are treated to kill existing vegetation. Horseweed biomass, average height and number of leaves were collected in June or July.

Horseweed dry weights were significantly higher with no rye, regardless of nitrogen application, at 5 out of 6 locations. At the five locations, the presence of rye cover regardless of seeding rate reduced horseweed biomass by 44 to 100%. The sixth location had minimal horseweed emergence and resulted in no significant differences between the treatments. At 4 out of 6 locations, the presence of rye cover crop significantly decreased horseweed densities by a minimum of 49% compared to the no rye treatment. Horseweed density varied by treatment over the sampling period; final density assessment did not accurately reflect densities recorded in the fall or early spring. Although rye had an effect on horseweed growth and density, it was not consistent and remaining horseweed plants may have needed additional control measures for most production practices.

MANAGEMENT OF ORIENTAL BITTERSWEET VINES AND PALE SWALLOWWORT AT A CONNECTICUT COASTAL RESERVE. T.L. Mervosh, Connecticut Agric. Exp. Sta., Windsor, and D. Gumbart, The Nature Conservancy, Middletown, CT.

ABSTRACT

We received a grant from the Office of Long Island Sound Programs at the Connecticut Department of Environmental Protection to conduct research on control of Oriental bittersweet (*Celastrus orbiculatus* Thunb.) and pale swallowwort (*Cynanchum rossicum* (Kleopov) Barbarich) at Bluff Point Coastal Reserve in Groton, CT. These non-native, invasive plants threaten the health of ecosystems at this coastal site and many other locations. Oriental bittersweet is a woody vine that wraps around and climbs trees and grows over lower vegetation. Bittersweet vines are widespread in parts of the forested section at Bluff Point and are adversely affecting trees and shrubs. Pale swallowwort is an herbaceous perennial in the milkweed family that spreads by rhizomes. Swallowwort, a relatively recent invader at Bluff Point, is outcompeting two rare native plants [yellow thistle (*Cirsium horridulum* Michx.) and Scotch lovage (*Ligusticum scoticum* L.)] along the shoreline, particularly the cobble beach habitat just above the high tide line. Research was conducted over a 3-year period. Experimental treatments were applied in 2003 and 2004, and data were collected through 2005.

For Oriental bittersweet, we tagged vines in two size classes: diameters of 15 to 25 mm (“small”) and diameters of 26 to 40 mm (“large”). Vines were measured and treatments were applied to vines between 15 and 30 cm above ground. Each treatment was applied randomly to ten vines (five small and five large) at each of three timings (May, August, November) in 2003, and similarly to a different set of vines at the same timings in 2004. Herbicides were applied undiluted with a paint brush. Basal-bark (BB) treatments consisted of 1.5 ml of herbicide applied uniformly to the lower bark of uncut vines. Cut-stump (CS) treatments consisted of 0.75 ml of herbicide applied to the stump surface of freshly cut vines. Eight treatments were applied: BB untreated (uncut check), BB triclopyr ester (61.6% ai), BB triclopyr ester (13.6% ai), CS untreated (cut check), CS triclopyr amine (44.4% ai), CS triclopyr amine (8% ai), CS glyphosate (41% ai), CS glyphosate (25% ai). Vines were evaluated in the summer of the following growing season. CS herbicide treatments were generally more effective than BB treatments, especially when applied in November 2004. All CS treatments with either triclopyr or glyphosate were effective in reducing vine survival (77 to 93% mortality) and number of sprouts from stumps or roots (91 to 99% reduction).

For pale swallowwort, 1.83 x 3.05 m plots were established in areas of high infestation along the cobble beach. Treatments (RCB design with three replicates) applied to plots in July 2003 and again in August 2004 included hand pulling, cutting, application of glyphosate (20.5% ai) or triclopyr amine (22.2% ai) to cut stems, and foliar sprays of glyphosate (0.82% ai) or triclopyr amine (0.89% ai). Plots were evaluated for percent area covered by swallowwort, swallowwort vigor, and presence of other vegetation. By July 2005, glyphosate foliar sprays and cut-stem treatments with glyphosate or triclopyr caused the greatest reduction in the amount of swallowwort, and the glyphosate spray treatment was most effective in reducing swallowwort vigor. Triclopyr foliar sprays caused temporary injury but swallowwort recovered, and long-term control was no better than that provided by hand pulling or cutting once per year.

INFLUENCE OF DNA HERBICIDES ON OVERWINTERING OAK SEEDLINGS.

A. Acuna and H. Mathers, The Ohio State Univ., Columbus.

ABSTRACT

A common nursery practice is to apply preemergence herbicides such as Dinitroanilines (DNA) to woody plants in containers before covering them at the beginning of the winter season. The effect of these herbicides on the cold hardiness of woody plants is not well known. The objective of this research was to determine the difference in growth potential for seedlings in two species of oak, red oak (*Quercus rubra* and pin oak (*Quercus palustris*), under low controlled temperatures and two different herbicides treatment for two different freezing periods, December and February.

On November 5th 2004 two herbicides were applied over the oak seedlings Pendulum (pendimenthalin, 3.0lbs ai/A) and Treflan (trifluralin, 2.0 lbs ai/A). One group of plants did not receive any herbicide (control). On November, 282 plants were measured for total height and number of buds; these were located into an unheated poly house with 4-mil milky poly, Ohio State Univ., Columbus, Ohio.

On December 2nd, 2004 a total of 120 plants (60 of each species) previously labeled according to random treatment assignment were selected and exposed to artificial freezing temperatures of, 0, -5, -10, -15 or -20°C. 4 replications of each herbicide treatment and specie were exposed to the same temperature. The same procedure was used in February 2005. After freezing treatment, plants were exposed to a 24 hours period of 0°C in a cold chamber and then were transferred to a heated greenhouse and evaluated for regrowth 30, 60, 90 and 120 days after artificial freezing (DAF). Regrowth was evaluated measuring percentage of height alive, percentage of buds alive, number of laterals branches, number of leaves, average size of leaves and a visual score from 0 to 10 (0= dead plant and 10= healthy not injured plant).

In the February 30 DAF there were no significant differences in any of the parameters measured in the two species. In December 30 DAF, however, visual rating at -5°C in Pine oak was significant. The Pin oak control plants had higher visual rating than Pin oaks treated with herbicides.

At the February 120 days DAF there were significant differences for Red oak between 0°C to -5°C. Herbicide effects were statistically significant for Pendulum and Treflan. These herbicides increased survival as measured in all 6 measures of evaluation. At 120 DAF we speculate that the benefit of the herbicides to Red oak plants is during periods of greatest temperature fluctuation or when the plant starts to break dormancy. In this experiment plants that received artificial freezing during February 2005 had been exposed to temperature fluctuations in the unheated polyhouse. This is in part also explains why the herbicide treatments were only significant for the February freezing date and between 0 and –5°C freezing temperatures. This phenomenon was not observed in Pin oak.

TOLERANCE OF FALL PLANTED BULBS TO HERBICIDES. A.F. Senesac, Cornell Coop. Ext., Riverhead, NY, M.A. Czarnota, Univ. of Georgia, Griffin, and W.B. Miller, Cornell Univ., Ithaca, NY.

ABSTRACT

Fourteen popular bulbs: *Allium christophii* x 'Globe Master', *Camassia cusicki*, *Chionodoxa gigantea* 'Luciliae Alba', *Crocus vernus* 'Flower Record', *Hyacinthoides* 'Excelsior', *Hyacinthus orientalis* 'Pink Surprise', *Hyacinthus orientalis* 'Atlantic', *Muscari armeniacum*, *Narcissus cyclamineus* 'Tete a Tete', *Ornithogolum umbellatum*, *Scilla siberica*, *Tulipia* 'Tarda', *Tulipia* 'Cape Cod', *Tulipia* 'Pink Impression' were planted in Riverhead, NY and Griffin, GA in the fall of 2004. Four preemergence herbicides: mesotrione, flumioxazin, oxadiazon and sulfentrazone were applied one week post plant and twelve postemergence herbicides: sulfentrazone, carfentrazone, trifloxysulfuron, clorsulfuron, metsulfuron, halosulfuron, 2,4-D amine, MCPP, triclopyr, clopyralid, dicamba and fluroxypyr were applied in early spring 2005 to evaluate safety for potential use in bulb or mixed landscape plantings. Overall, these materials do not show promise for safe use on fall planted bulbs. Although some materials were safe on some bulbs, no one herbicide was safe on all bulbs. In general, the spring-applied postemergence materials were slightly less injurious except for *Allium* and the three tulip cultivars. Injury symptoms worsened as the season progressed for both preemergence and postemergence treatments. For most of the bulbs in which visual injury was observed, bulb weight and bulb/foliage weight were also reduced as determined by a spring 2005 harvest.

USING A WET BLADE MOWER FOR PEST CONTROL, FERTILITY, AND GROWTH RETARDATION IN FINE TURFGRASS. J.B. Willis and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Wet Blade (WB) technology directs chemical to the cut portion of leaf surfaces during mowing by wetting the underside of mower blades with solution. This dual action of mowing and applying a solution eliminates the need for separate chemical application to the mown area. Applying chemical to the cut portion of the leaf allows the product to move directly into the plant via xylem and phloem tissue. This action also limits the likelihood of herbicide movement from spray drift. Mowers commonly overlap turf to avoid obstructions in the lawn and a WB mower may cause turfgrass injury or discoloration due to such overlapping. Since most WB research has been conducted with single pass treatments, information is needed to determine likelihood of streaks or discoloration caused by WB mowers in turf. Past research on weed control has shown that WB mowers were about 75% as effective as foliar spray for controlling weeds like smooth crabgrass (*Digitaria ischaemum*) in fine turf. Programs that provide complete weed control with WB mowers are needed to facilitate turf managers acceptance of WB. Our objectives were to evaluate white clover and smooth crabgrass control with single or repeated WB applications of Drive, Acclaim, or Speedzone and to determine likelihood of streaking due to multiple overlaps of a WB mower when applying plant growth retardants or chemical fertilizers.

All trials were conducted in Blacksburg, VA on 8 by 20 m plots. In weed control studies, treatments for crabgrass control included quinclorac (Drive™) at 1 lb/A and fenoxaprop (Acclaim™) at 28 oz/A applied in 1, 2, 3, and 5 treatments of fractionalized rates. For example when applied 5 times, the quinclorac rate was 0.2 lb/A during each treatment. Treatments for white clover control included quinclorac at 1 lb/A and a three-way pre-mixture product (SpeedZone™) at 5 pt/A applied at fractionalized rates as in the crabgrass study. In the "streaking" study, treatments included glyphosate (Roundup PRO™) at 5 oz/A and liquid iron (Ferromec™) at 2.5 gal/A applied to a uniform stand of turf-type tall fescue. These treatments were applied once, twice, or three times by overlapping the plot center repeatedly with the mower.

Smooth crabgrass was controlled between 63 and 88% regardless of treatment with no statistical differences between treatments. The high level of crabgrass infestation and poor turfgrass cover is blamed for lack of effective weed control from both foliar spray and WB treatments and the study will be repeated elsewhere. White clover control was statistically equivalent regardless of WB treatment or when compared to a full rate foliar treatment. Numerical trends indicate that 3 to 5 WB treatments are more effective than 1 or 2. Additional studies were conducted and found that increasing herbicide rates by 0.25 % can result in broadleaf weed control from single WB treatment that is numerically equivalent to foliar spray. WB treatments were not as likely to cause streaking as foliar spray treatments. Repeated overlaps of glyphosate with foliar spray reduced chlorophyll content, increased visually estimated streaking, and decreased turfgrass color compared to the same treatment applied with the WB mower.

MESOTRIONE FOR PREEMERGENCE BROADLEAF WEED CONTROL IN TURFGRASS.

D.B. Ricker, J.B. Willis, S.D. Askew, Virginia Tech, Blacksburg, and R.J. Keese, Syngenta Professional Products, Carmel, IN.

ABSTRACT

Mesotrione is a corn (*Zea mays*) herbicide that has preemergence and postemergence activity on multiple field and turfgrass weed species. Currently, mesotrione is being evaluated for preemergence and postemergence weed control in Kentucky bluegrass (*Poa pratensis),* perennial ryegrass (*Lolium perenne L.),* and tall fescue (*Festuca arundinacea*) turf. In tilled cropping systems, mesotrione controls several broadleaf weed species through residual activity in treated soil. Although broadleaf weeds have been controlled in turf with postemergence treatments, evidence for residual activity on broadleaf weeds is lacking. Our objectives were to determine the most effective rate and number of mesotrione treatments to extend preemergence weed control and to determine if various broadleaf weeds are controlled preemergence.

Three field trials were conducted during the summer of 2005 at the Virginia Tech Turfgrass Research Center and The Glade Road Research Facility in Blacksburg, Virginia. Each site was treated with glyphosate at 4.48 kg ai/ha two weeks before trial initiation to control existing vegetation and allow for substantial weed emergence. Weed populations varied between sites, however, common purslane (*Portulaca oleracea),* dandelion (*Taraxacum officinale),* large crabgrass (*Digitaria sanguinalis),* yellow nutsedge (*Cyperus esculentus),* and yellow woodsorrel (*Oxalis stricta)* were evaluated either singly or repeatedly at three different sites.

Preemergence application timing for sites one, two, and three were March 29, April 11, and May 11, respectively. Sequential applications were made three weeks after trial initiation. Treatments were applied at 280 L/ha and included the following: Mesotrione at 0.14, 0.21, and 0.28 kg ai/ha applied alone, mesotrione at 0.14 kg ai/ha followed by (fb) mesotrione at 0.14 kg ai/ha, mesotrione at 0.21 kg ai/ha fb mesotrione at 0.21 kg ai/ha, and isoxaben at 1.48 kg ai/ha applied alone.

Mesotrione applied alone at 0.28 kg ai/ha controlled weeds better than 0.14 and 0.21 kg ai/ha 42 days after treatment (DAT). Mesotrione at 0.28 kg ai/ha controlled yellow nutsedge 83 and 100% at sites one and three, 42 DAT. Mesotrione at 0.28 kg ai/ha controlled prostrate knotweed and yellow woodsorrel 100% 42 DAT. Mesotrione at 0.28 kg ai/ha controlled large crabgrass and dandelion 85 and 93%, respectively at sites two and three. Mesotrione at 0.21 kg ai/ha fb mesotrione at 0.21 kg ai/ha controlled yellow nutsedge, prostrate knotweed, and yellow woodsorrel 100% at sites one and two, 56 DAT. Mesotrione at 0.21 kg ai/ha fb mesotrione at 0.21 kg ai/ha controlled large crabgrass and dandelion 75% at site three and 93 and 86%, respectively at site two, 56 DAT. Mesotrione at 0.21 kg ai/ha fb mesotrione at 0.21 kg ai/ha controlled large crabgrass 36% at site three but less than 5% at sites one and two, 120 DAT. Yellow woodsorrel was controlled 100% 120 DAT regardless of rate or sequential application.

RESPONSE OF DALLISGRASS AND BAHIAGRASS ALONG A SOIL MOISTURE GRADIENT. G.M. Henry, M.G. Burton, and F.H. Yelverton, North Carolina State Univ., Raleigh.

ABSTRACT

Paspalum dilatatum Poir. (dallisgrass) and *Paspalum notatum* Fluegge (bahiagrass) are two of the most prevalent weed species in managed turfgrass. These rhizomatous, perennial grass species are known to affect appearance, texture, and playability of turfgrass in home lawns, athletic fields, and golf courses. They reportedly tolerate both droughty, sandy soils, and moist, clayey soils. Preliminary analysis of dallisgrass and bahiagrass spatial distribution showed strong correlations between volumetric soil moisture content and species presence. Techniques used to investigate the response of weed species to soil moisture based on frequency or volume-of-watering are often criticized for problems associated with rooting volume and unnatural soil moisture profile and root distribution. Soil moisture gradient tanks allow for natural capillary action (soil water) and surface irrigation to simulate rainfall. When filled with soil and regulated by an outfall, capillary rise keeps the low end of the tank near field capacity and plants growing along higher elevations are subjected to progressively lower soil moisture levels. Six soil moisture gradient tanks were constructed. Each tank was steeply sloped and had a volume of nearly 4 m^3. Rhizomes of each grass were planted perpendicular to the slope (moisture gradient) to allow examination of growth characteristics at several moisture levels. Sand and sandy loam soils were tested. Dallisgrass and bahiagrass were tested individually and in competition with bermudagrass. Soil moisture levels were expressed as centimeters above the water table and were correlated to volumetric soil moisture in the top 50 cm using a thetaprobe.

Percent survival, above ground biomass (g), and rhizome production (g) were obtained two months after initial treatment. Lowest order curves giving high R^2 values were fit to the data for comparison of plants at different soil moisture levels. Bahiagrass growth and survival was less affected by soil moisture than dallisgrass. Bahiagrass survival was 100% regardless of simulated environmental conditions. Bahiagrass rhizome production increased as depth to water table increased when grown in sandy loam soil, but decreased or remained relatively constant when grown in sand. Dallisgrass survival decreased as depth to water table increased. This trend was more severe when grown in competition with bermudagrass. Dallisgrass rhizome production decreased as depth to water table increased in all simulated environments except when grown as a monoculture in sandy loam soil. Results suggest that it may be possible to disadvantage *Paspalum* sp. in competitive interactions with bermudagrass by altering soil moisture. Substrate selection during construction and aeration may help create a landscape that discourages *Pasaplum* sp. infestation.

HERBICIDE MICRO-RATE APPLICATIONS FOR WEED CONTROL IN BEET. D.E. Robinson, Plant Agriculture, Univ. of Guelph, Ridgetown, Ontario.

ABSTRACT

Aside from pyrazon, there are currently few available herbicides for postemergence broadleaf weed control in red beet in Ontario, and those herbicides that are available control only a limited spectrum of the weeds growers encounter in the province. The objective of this research was to evaluate the tolerance of red beet to postemergence applications of triflusulfuron and clopyralid, as well as low doses (micro-rates) of pyrazon + triflusulfuron + clopyralid applied postemergence. A program of four micro-rate treatments of pyrazon+ethametsulfuron+clopyralid (540+4.5+45 and 1080+9+90 g ai/ha) was examined for visual injury, stand reduction, sugar content, beet yield, and weed control in red beet. All applications were made to subsequent weed flushes at the cotyledon stage. When the micro-rate program was applied, treatments of pyramin (540 and 1080 g ai/ha), triflusulfuron (4.5 and 9 g ai/ha) and clopyralid (45 and 90 g ai/ha) were also applied on their own to determine beet tolerance to each component of the micro-rate program. The micro-rate treatments caused significant visual injury at the suggested overlap rate, and corresponded to a reduction in stand and yield. When applied alone, there was little or no injury to red beet in the pyrazon and triflusulfuron treatments. The clopyralid treatment caused some slight leaf deformation after application, but visual injury was never greater than 5%, and there were no reductions in beet stand, sugar content, or beet yield. The micro-rate program was applied along with a recommended non-ionic surfactant that was not used in the tolerance trials, so it is hypothesized that the addition of the adjuvant was responsible for the injury observed in the trials. Since we observed tolerance to triflusulfuron and clopyralid alone, additional research to evaluate micro-rate treatments with different rates of adjuvant will be conducted to determine whether a micro-rate program can be developed for weed control in red beet.

AMENDING SUBSOIL WITH COMPOSTED POULTRY LITTER: EFFECT ON TURF COVER, SOIL PHYSICAL AND CHEMICAL PROPERTIES, AND WEED PRESSURE.

M. Mandal and R.S. Chandran, West Virginia Univ., Morgantown.

ABSTRACT

In urban developments, turf is often established under sub-optimal soil conditions opportune for weed infestations. Experiments were completed in 2004 to evaluate the incorporation of composted poultry litter on turfgrass establishment, soil properties, and weed pressure. To simulate construction disturbance, 20 cm of topsoil was removed. Composted poultry litter, a waste product derived from the poultry industry, was incorporated to a depth of 12.5 cm at 10, 20, and 40% vol/vol (4.4, 8.8, and 17.5×10^4 Kg ha^{-1}, respectively) prior to seeding or sodding Kentucky bluegrass (*Poa pratensis*). Composted plots were compared to fertilized plots (20-27-5, N-P_2O_5-K_2O, to provide 146 kg/ha of Nitrogen), or control plots. Composted poultry litter elevated the soil organic matter and its water holding capacity. It also raised the soil pH along with levels of extractable K, Ca, and Mg. Besides, composted poultry litter increased CEC by 15-68%, and decreased the bulk density up to 42%. In spring 2004, 85% turfgrass cover was recorded in plots with 20% compost. One year after seeding, all compost-treated plots exhibited 100% turf cover. Only one-third and two-third of the control plots were covered by turf during spring and fall of 2004, respectively. Weeds monitored included common dandelion (*Taraxacum officinale*), buckhorn plantain (*Plantago lanceolata*), yellow woodsorrel (*Oxalis stricta*), and white clover (*Trifolium repens*). Plots with 20 and 40% compost had six percent and 72% fewer total weeds, respectively, than control. Fertilized plots exhibited weed pressure similar to control. Overall, compost treatments were able to maintain superior turf cover and quality and lower weed populations compared to conventionally fertilized or control plots.

HORSEWEED CONTROL IN CONIFER BEDS. M.W. Marshall, B.H. Zandstra, R.H. Uhlig, D.A. Little, Michigan State Univ., East Lansing, and R.J. Richardson, North Carolina State Univ., Raleigh.

ABSTRACT

The occurrence of horseweed (*Conyza canadensis*) is increasing in production conifer beds in Michigan. Because of its competitive ability and its prolific seed production, field studies were initiated in 2004 and 2005 to evaluate horseweed control in conifer production beds. Treatments included glyphosate (0.84 kg/ha), flumioxazin (0.28 kg/ha), clopyralid (0.28 kg/ha), clopyralid plus dithiopyr (0.56 kg/ha), clopyralid plus isoxaben (0.84 kg/ha), clopyralid plus isoxaben plus oryzalin (2.24 kg/ha), clopyralid plus oryzalin, clopyralid plus oxyfluorfen (1.12 kg/ha), and clopyralid plus flumioxazin. Herbicides were applied in water at a carrier volume of 187 L/ha with a pressure of 207 KPa on November 17, 2003 and October 26, 2004. Experimental design was a randomized complete block design with 3 replications and individual plot sizes of 1.6 by 6 m. Weed control and conifer injury ratings were evaluated 7 months after treatment (MAT) and 9 MAT on a 0 to 100% scale with 0 indicating no control or injury and 100 equal to weed or crop death. In 2004, horseweed control ranged from 92 to 100% with all treatments at 7 MAT. By 9 MAT, clopyralid alone, clopyralid plus dithiopyr, flumioxazin alone, and clopyralid plus flumioxazin provided greater than 80% control. The other treatments ranged from 58 to 73% control at 9 MAT. At 7 MAT, no significant conifer injury was observed across all treatments. In 2005, horseweed control was 100% with all clopyralid-containing treatments. Glyphosate and flumioxazin provided 88 and 55% control, respectively. At 9 MAT, horseweed control across all clopyralid-containing treatments was greater than 98%. Horseweed control declined to 30% with the flumioxazin treatment. Similar to 2004, no differences were observed in conifer injury across all treatments. Clopyralid and clopyralid-containing tank mixtures provided excellent control of horseweed the following season after fall application. Therefore, inclusion of a growth regulator herbicide, such as clopyralid, would provide better management of horseweed. In addition, incorporation of different herbicide modes of action to the program would provide resistance management.

EDAMAME AND SWEET CORN RESPONSES TO 20% ACETIC ACID VINEGAR APPLICATIONS. C.B. Coffman, J. Radhakrishnan, and J.R. Teasdale, USDA-ARS, Beltsville, MD.

ABSTRACT

Weed management continues to be the primary problem in crop production for organic growers. Timely cultivations using the appropriate equipment along with crop rotations are the tools presently available to organic farmers for weed management. Food-grade vinegar has been investigated at the Beltsville Agricultural Research Center (BARC) for several years as a potential herbicide for organic farmers. Initial studies of the herbicidal potential of vinegar included acetic acid concentrations from 5 to 30%, and revealed that concentrations less than 20% were less reliable for weed control. The responses of edamame *(Glycine max)* and sweet corn *(Zea mays),* high value row crops, to basal applications of vinegar have been investigated for several years at Buckeystown and Beltsville, MD. The objective of this project was to evaluate crop responses to basal applications of 20% vinegar for within-row control of weeds. Cultivation was employed for weed control between rows. Edamame was sown in 36-inch rows on 17 May 2005, at a rate of 170,000 seeds per acre, on an organic farm near Buckeystown, MD. Experimental plots consisted of three 20-foot rows with the center row being the treated portion of the plot. Treatments were (1) vinegar applications to within-row weeds at the base of the soybean plants and (2) untreated controls. Treatments were replicated four times and were randomly placed throughout the field. Vinegar applications were made on 12 July 2005, using a hand held sprayer. Vinegar was applied to weeds to achieve complete coverage until runoff. Crop plants were 26 to 27 inches high when treatments were made. Weed flora was dominated by giant foxtail *(Setaria faberi)* and redroot pigweed *(Amaranthus retroflexus).* Treatments were visually rated five weeks after vinegar application. Sweet corn was sown in 30-inch rows on 14 June 2005, at a rate of 22,000 seeds per acre, in a clean cultivated field at the Beltsville Agricultural Research Center. Weeds between the rows were controlled by cultivation. Treatment plots were 3-rows, 20 feet long, with the center row being the treated portion of the plot. Treatments included (1) basal applications of vinegar to within-row weeds to achieve complete weed coverage until runoff, (2) unweeded control, and (3) hand weeded control, and were replicated four times. Vinegar applications and hand weeding were done on 21 July 2005. Dominant weeds included smooth pigweed *(Amaranthus hybridus)*, giant foxtail, and smooth crabgrass *(Digitaria ischaemum)*. Injury scores for edamame and sweet corn in vinegar treatments ranged from 0 to 10. Edamame plants were harvested on 17 August and sweet corn plants on 23 August 2005. Vinegar treated edamame yielded 58% less grain than untreated controls. Biomass from vinegar treated sweet corn was 6% less than the hand weeded treatment and 8% higher than the untreated controls.

RAPE SEED YIELD: RISKS AND BENEFITS OF IMPROVED VARIETIES, J.M. Jemison, Jr. and P. Sexton. Univ. of Maine Cooperative Extension, Orono, ME.

ABSTRACT

Canola is a new crop that is getting increased attention among farmers in northern New England. There are large differences in the seed cost of canola varieties, based in part on technology fees associated with incorporation of herbicide tolerance. This raises the question of which varieties would be the most cost-effective for growers to plant. In order to address this question, canola variety trials with 25 varieties of canola were conducted in northern (Presque Isle), and central (Orono), Maine. The trials were set up as randomized complete block designs at both sites with four replications. The Presque Isle trial was conducted on-farm embedded in a field of canola and was planted on 2 June 2005. The Orono trial was conducted at the University of Maine Roger's Farm and was planted on 14 June 2005. Trifluralin was preplant incorporated at a rate of 1 pint per acre for weed control at both sites. Plots were harvested with a small plot combine. At Presque Isle, diquat was applied as a desiccant after all the plots had greater than 50% change in seed color. At Orono, plots were swathed, allowed to dry, and then hand-fed into a small plot combine. All samples were oven dried, weighed, and corrected to 10 percent moisture for calculation of marketable yield. Variable costs were calculated by adding seed costs given by the seed companies with herbicide cost for each variety assuming that GMO lines would be treated with the herbicide they are tolerant to, and including a $9/A cost of application. To estimate return to variable costs among varieties, we assumed a price per bushel of $6.11 and subtracted the seed and herbicide costs from this for each variety. The other costs of production (fertilizer, soil preparation, harvest etc.,), which would have cost approximately $130/A, were not considered in these calculations because they were the same across all varieties.

When the data were pooled across sites, there were significant site by variety interactions, so the data for each site were analyzed separately. There was no correlation in varietal performance between the two sites ($r^2 = 0.04$). At Orono, the mean yield was 1444 lbs per acre with a range of 1039 to 1854 lbs per acre. At Presque Isle the mean yield was 1842 lbs per acre with a range of 1457 to 2205 lbs per acre; however varietal differences were non-significant due to some missing data. Return to variable cost (among varieties) averaged $132.80 at Orono, ranging from $79 to $182/A. Return to variable cost (among varieties) averaged $181.70 at Presque Isle, ranging from $130 to $221/A. The delayed planting at Orono may have led to the lower yields and lower net variable return. There was no clear association of herbicide tolerance with yield or net return. This study was not designed to directly compare yield and return of genetically modified (GM) and non-GM lines, and there were many more GM lines evaluated than non-GM lines. At Orono, the conventional and GM lines with the greatest return on variable costs were not significantly different. At Presque Isle, there were no significant differences, and in comparing numerical values the line with the greatest net return was GM while the line with the 2nd greatest return was conventional. Whether a grower selects GM or non-GM should be based more on the expected field weed pressure and less based on expected yield benefits. This would be particularly true if the predominant

weeds in the field were not well controlled by trifluralin. However, given the number of weeds with which GE canola can outcross (particularly yellow mustard) the benefit of the herbicide tolerance may be short lived. In summary, there was a strong environment by variety interaction, and we failed to detect a difference in net return/A between the higher yielding GM and conventional canola varieties. Note: weed control was not a variable in these experiments.

Table 1. Rape seed lines and net value of returns. se = standard error.

Site	Line	Type	net value	net value se*
PI	INVIGOR 4870	LL	221	31.8
PI	Hyola 401	NA	208	17.3
PI	KAB-36	CL	202	14.2
PI	Hyola 514	RR	201	3.1
PI	46H02	NA	194	25.1
PI	HyClass 905	RR	193	7.3
PI	SW Titan	RR	192	18.4
PI	Hyola 420	NA	191	11.4
PI	INVIGOR 2663	LL	188	26.3
PI	Hyclass 712	RR	185	26.2
PI	Crosby	RR	182	12.6
PI	SW Patriot	RR	181	19.5
PI	Minot	RR	178	24.5
PI	Hyola 357	RR	178	10.2
PI	INVIGOR 5630	LL	177	25.6
PI	HyClass 2061	RR	177	18.6
PI	Oscar	NA	168	13.9
PI	SW Marksman	RR	166	23.0
PI	46A76	CF	165	6.0
PI	43A56	RR	158	6.2
PI	46H23	RR	151	15.0
PI	Hylite 618 CL	CL	130	10.4
	MEAN		181.7	
	CV		17.8	
	LSD		NS	

Site	Line	Type	net value	net value se
Orono	SW Patriot	RR	182	11.4
Orono	SW Marksman	RR	168	18.7
Orono	Oscar	NA	166	23.3
Orono	43A56	RR	164	14.6
Orono	Hyola 357	RR	158	3.8
Orono	INVIGOR 5630	LL	156	9.9
Orono	Crosby	RR	152	24.2
Orono	HyClass 905	RR	151	21.7
Orono	KAB-36	CL	144	9.7
Orono	Hyola 420	NA	140	23.5
Orono	HyClass 2061	RR	140	13.2
Orono	Hyola 514	RR	129	19.9
Orono	Minot	RR	126	11.9
Orono	SW Titan	RR	119	44.5
Orono	46H02	NA	117	30.8
Orono	46H23	RR	117	22.7
Orono	Hyclass 712	RR	113	28.0
Orono	Hyola 401	NA	110	2.3
Orono	Hylite 618 CL	CL	96	25.7
Orono	46A76	CF	93	28.7
Orono	INVIGOR 4870	LL	92	25.8
Orono	INVIGOR 2663	LL	79	24.3
	MEAN		132.8	
	CV		24.4	
	LSD		46	

A NEW SMUT FUNGUS FOR CLASSICAL BIOLOGICAL CONTROL OF CARDUUS THISTLES. D.K. Berner, and E.L. Smallwood, USDA, ARS, Foreign Disease-Weed Science Research Unit, Fort Detrick, MD.

ABSTRACT

The mission of the weed science section of the Foreign Disease-Weed Science Research Unit (FDWSRU) is to discover, in the native range of target plants, exotic diseases of introduced invasive weeds in the U.S. If FDWSRU subsequently proves that the causative organisms (pathogens) are safe, for non-target plants in the U.S., the pathogens causing the diseases are released for classical biological control of the target invasive weed.

Obligate pathogens such as rusts and smuts have, historically, been the most successful in classical biological control of weeds. This is due to the highly specific and damaging nature of the pathogens.

In 2003 we reported a new smut fungus collected from milk thistle (*Silybum marianum* (L.) Gaertn.) in Greece. At the time, we tentatively identified this fungus as *Microbotryum cardui* (A. Fischer v. Waldh.) Vánky and thought that the host range could include a number of *Carduus* thistles that were introduced to the U.S. Upon further research we later re-named this fungus as a new species, *Microbotryum silybum* Vánky & Berner that appears host-specific to milk thistle. In the spring of 2005 we collected another smut fungus from Italian thistle (*Carduus pycnocephalus* L.) in Greece. This fungus is morphologically and genetically (DNA ITS sequences) distinct from *M. silybum* and roughly fits the morphological description of *M. cardui* reported from plumeless thistle (*Carduus acanthoides* L.) This fungus is the only *Microbotryum* sp. reported on *Carduus* sp. and the reported host range includes *C. acanthoides, C. crispus* (curly plumeless thistle), *C. nutans* (musk thistle), and *C. pycnocephalus*, all of which are introduced invasive species in the U.S. All of these species are annual plants that depend solely on seed production for re-establishment. The fungus *M. cardui* infects rosettes of the host plant in the fall and overwinters in these rosettes. In the spring, the fungus grows with the growing point of the plant and establishes systemic infections. All flowers of infected plants become filled with teliospores of the fungus, and the plants do not produce any seeds. For annual plants that reproduce solely by seeds, infection by *M. cardui* is catastrophic and can endanger populations of the weeds. Although the fungus is rare in nature, it may be quickly developed, through artificial augmentation, for large-scale field tests in the country of origin. In this presentation, details on developing this smut fungus for classical biological control of *Carduus* thistles are presented. Because there are no native *Carduus* sp. in the U.S., an effective host-specific pathogen for this genus of invasive weeds is particularly attractive.

THIN PASPALUM AND DALLISGRASS CONTROL WITH FLAZASULFURON AND FORAMSULFURON. D.S. McCall, J.B. Willis, D.B. Ricker, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Dallisgrass (*Paspalum dilatatum* Poir.) and thin paspalum (*Paspalum setaceum* Michx.) are common weeds of turfgrasses in Virginia. Dallisgrass is found predominantly in the coastal plains, while thin paspalum grows more commonly in the Piedmont and mountainous regions of the state. The current control recommendation for controlling dallisgrass is sequential applications of MSMA alone or tank mixed with metribuzin or simazine. Foramsulfuron and flazasulfuron were evaluated for selective control of dallisgrass and thin paspalum in bermudagrass [*Cynodon dactylon* (L.) Pers.]. Foramsulfuron is registered for use in warm season turfgrasses. Flazasulfuron is an experimental compound that is being examined for its use in turfgrass to control cool-season grassy weeds, sedges, and some broadleaf species. Flazasulfuron was tested at rates of 0.026, 0.053, and 0.158 kg ai/ha. Foramsulfuron was tested at a rate of 0.043 kg ai/ha. For each treatment, MSMA was applied at 2.24 kg ai/ha, followed by (fb) consecutive applications of each product on a 14-day interval.

The test site was located in a bermudagrass rough at Hanover Country Club in the coastal plain of Virginia near Richmond, with the predominant weed being dallisgrass. MSMA fb flazasulfuron controlled dallisgrass 88, 99, and 100% from lowest to highest rate at 22 days after final application. MSMA fb foramsulfuron completely controlled dallisgrass. Bermudagrass injury ranged from 4 to 9%, though no statistical separation was measurable.

In a separate study, the same treatments were applied to a bermudagrass rough, infested with thin paspalum, at Chatmoss Country Club in the Piedmont region near Danville. In this trial, MSMA fb all rates of flazasulfuron and the tested rate of foramsulfuron controlled thin paspalum near completely 14 weeks after final application. There was no noticeable bermudagrass injury.

FOLIAR AND ROOT ABSORPTION AND TRANSLOCATION OF BISPYRIBAC-SODIUM IN FOUR COOL-SEASON TURFGRASS SPECIES. D.W. Lycan, Syngenta Crop Protection, Visalia, CA, and S.E. Hart, Rutgers, The State Univ. of New Jersey, New Brunswick.

ABSTRACT

Greenhouse studies were conducted to investigate the response of creeping bentgrass, annual bluegrass, and Kentucky bluegrass to foliar, soil, or foliar plus soil applications of bispyribac-sodium. Injury and dry weight reduction from foliar plus soil applications of bispyribac were equal to soil applications but less than foliar applications in all species 28 days after treatment (DAT). Creeping bentgrass was injured less than annual or Kentucky bluegrass regardless of application placement. Foliar and root absorption and subsequent translocation of ^{14}C-bispyribac-sodium in creeping bentgrass, annual bluegrass, Kentucky bluegrass, and roughstalk bluegrass were further evaluated. Foliar absorption of ^{14}C-bispyribac into creeping bentgrass was less than that of annual bluegrass, Kentucky bluegrass, or roughstalk bluegrass at most harvest timings from 4 to 72 hours after treatment (HAT). Absorption at 24 HAT was 17, 29, 28, and 31%, respectively. Data pooled across harvest timings of 24, 72, and 168 HAT revealed all species retained 90 to 93% of foliar absorbed ^{14}C-bispyribac in treated leaves. Annual and roughstalk bluegrass translocated greater levels of foliar-absorbed ^{14}C to the crown and shoots compared to creeping bentgrass. In root absorption studies, both annual and roughstalk bluegrass accumulated approximately 47 or 74% more ^{14}C per dry weight of plant tissue than creeping bentgrass or Kentucky bluegrass, respectively, after 72 hours in nutrient solution containing ^{14}C-bispyribac. Annual and roughstalk bluegrass translocated more root-absorbed ^{14}C to shoots (77 and 80% of absorbed, respectively) than creeping bentgrass and Kentucky bluegrass (66% of absorbed for both species). These studies suggest that bispyribac is readily absorbed by roots and translocated to shoots and root-absorbed bispyribac may greatly influence its herbicidal activity within a plant. In addition, creeping bentgrass displayed lower levels of foliar and root absorption and subsequent translocation than annual and roughstalk bluegrass that may influence tolerance to bispyribac.

AN ASSESSMENT OF PRE AND POST-EMERGENCE HERBICIDE APPLICATIONS ON WEEDS IN MAINE WILD BLUEBERRIES. D.E. Yarborough and K.F.L. Guiseppe, Univ. of Maine, Orono.

ABSTRACT

Hexazinone is a widely used herbicide, which has contributed to increases in the production of wild blueberries (*Vaccinium angustifolium)* in Maine since 1982. But since it is very soluble, it has been detected in groundwater adjacent to blueberry fields and throughout the state. There is evidence that reliance on hexazinone without herbicide rotation has increased populations of annual grasses and herbaceous weeds such as bunchberry (*Cornus canadensis*). Therefore alternative herbicides are needed to control local these weed populations and to maintain productivity of Maine's wild blueberry production. A split block design was established on six wild blueberry fields to obtain a diversity of soil types and weed species. A block was established in the Maine towns of Lamoine, Northport, Union, North Penobscot, T-19, and at Blueberry Hill Farm in Jonesboro. Each 120' x 72' block was comprised of 24' X 36' treatment plots including an untreated control, a pre and post-emergence application of mesotrione at 6 oz/A and a pre and post-emergence application of flumioxazin at 12 oz/A. At a right angle a 36' X 120' plot of an untreated control and a hexazinone treatment at 64 oz/A was applied to give a total of ten combinations. Preemergence treatments, including the hexazinone treatment applied on May 11 – June 7 and postemergence treatments that were applied June 14-June 22. A soil sample was taken at each site and the Maine Soil Testing Laboratory at the University of Maine determined soil texture, OM and pH. Evaluation of blueberry cover and phytotoxicity, herbaceous weeds, grasses and ferns were made using a Daubenmire cover class scale on 27 June and 26 August. Data were transformed to percent cover and analyzed by the General Linear Model of SAS with significant means separated by a Duncans multiple range test.

Blueberry cover was significantly reduced by the high phytotoxicity observed on the post-emergence treatments (Figures 1, 2). Grass cover was higher in the untreated control than all treatments at the June evaluation but not the August evaluation. In June, all applications reduced grass cover, but significant additional suppression was obtained with the addition of hexazinone to the flumioxazin and mesotrione treatments, with the best suppression obtained with the post-emergence application of flumioxazin (Figure 3). The use of hexazinone also significantly reduced the amount of grass and broadleaf weed cover in the June evaluation. Although broadleaf weed cover was initially reduced after pre and postemergence applications in June, except for the preemergence mesotrione application, the cover of postemergence mesotrione was higher than the control in the August evaluation. The addition of hexazinone to both herbicide treatments further reduced the broadleaf cover, though not significantly. Neither flumioxazin nor mesotrione reduced fern cover without Hexazinone, but the addition of hexazinone to either herbicide treatment reduced fern cover with the exception of the post-emergence mesotrione treatment for the August evaluation. The postemergence flumioxazin application had the lowest fern cover. These herbicides were evaluated at Blueberry Hill Farm in Jonesboro, Maine last year and no phytotoxicity was seen on blueberry plants with their post-emergence treatments. The

unusually cold and wet weather Maine experienced throughout the spring months may have increased the susceptibility of the blueberries to the herbicides.

Figure 1. Blueberry Cover following Pre and Post-Emergence Herbicide Applications

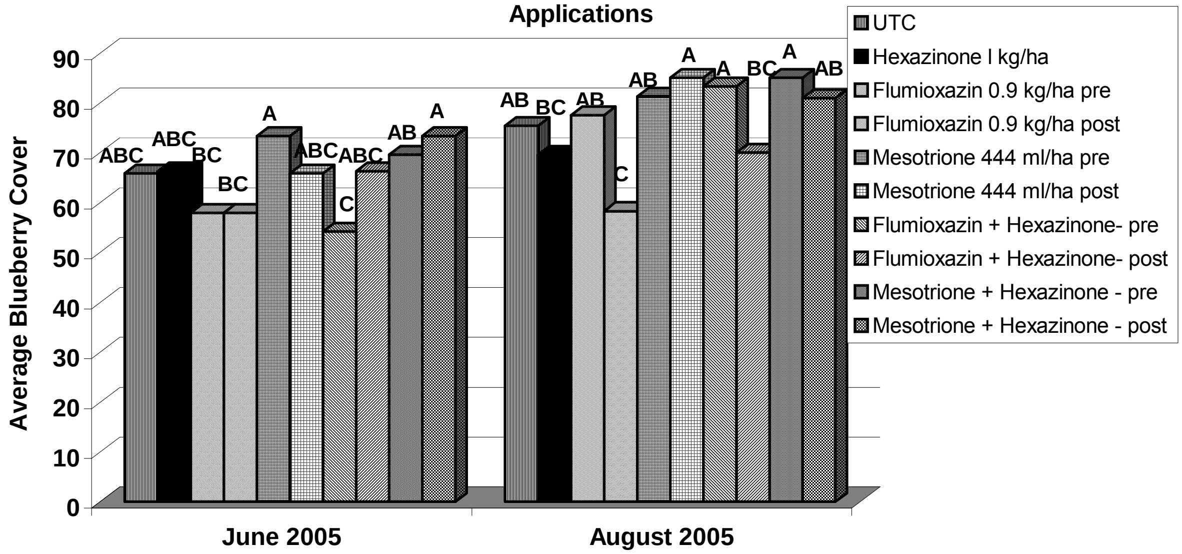


Figure 2. Blueberry Phytotoxicity following Pre and Post-Emergence Herbicide Applications

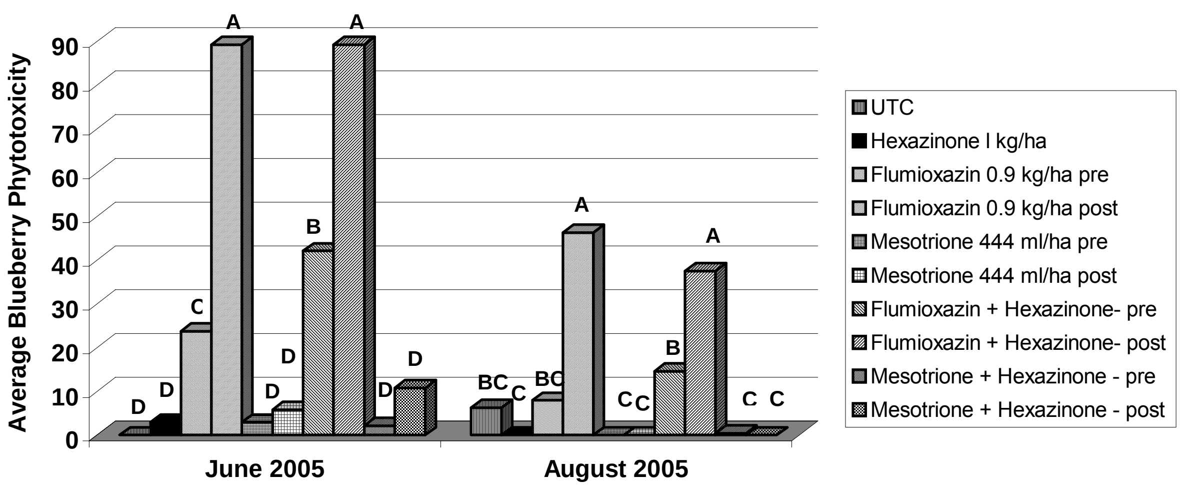
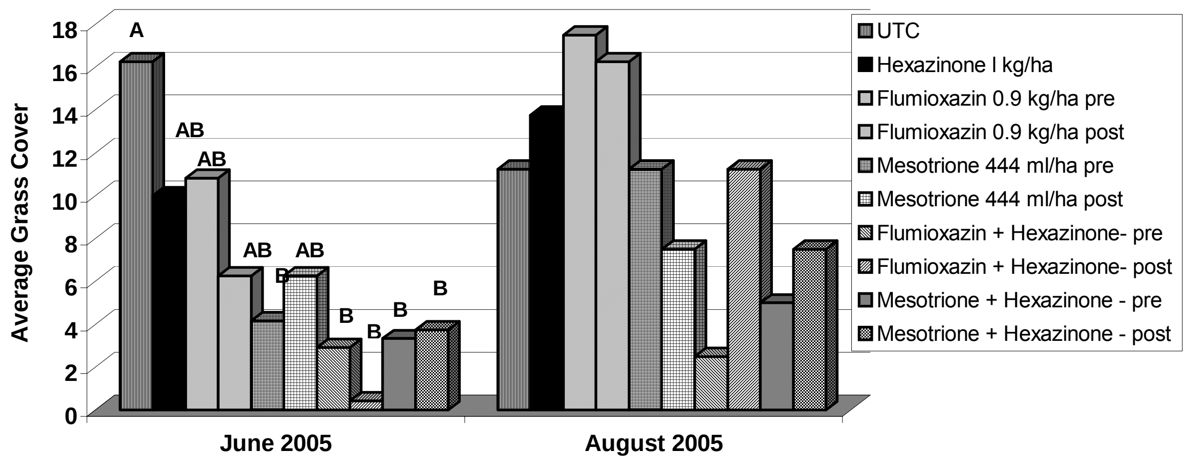


Figure 3. Grass Cover following Pre and Post-emergence Herbicide Applications



LIVERWORT GEMMAE DISPERSAL: THE EFFECT OF OVERHEAD IRRIGATION AND ITS INFLUENCE ON GEMMA PRODUCTION. J. England and M. Jeger. Department of Agricultural Sciences, Imperial College London, Wye Campus, Wye, Ashford, Kent, TN25 5AH, UK.

ABSTRACT

Liverworts (*Marchantia polymorpha* L.) growing on the surface of container plants are a major problem in nurseries. The removal of liverwort, moss and weeds from pots is estimated to cost the UK horticultural industry £13 million each year. Many aspects of the lifecycle of liverwort are known; the aim of these experiments is to provide information on the epidemiology of infestation. Liverwort can reproduce asexually by gemmae, vegetative propagules produced in circular structures (gemma cups) found on the dorsal surface of the thallus. Gemmae are released when water splashes into the cup, transporting them away from the parent plant; dispersal distances of 0.6m by small raindrops and 1.21 metres by individual water drops of 4.74 mm diameter were previously recorded. The dispersal of liverwort gemmae was investigated using a glasshouse overhead sprinkler system with three different nozzle sizes controlling flow rate, four water pressures (1.5, 2, 2.5 and 3 bar) and two nozzle heights (1 and 2 metres). A further experiment investigated the effect of gemma dispersal on the replenishment of gemmae within gemma cups. All the gemmae were removed from pre-identified gemma cups and counted. Three treatments were then applied whereby gemmae were removed from cups and counted either every three days, weekly or at the end of the experiment (control). The pots of liverwort were positioned in a completely randomised design on capillary matting on a shaded glasshouse bench, providing damp, shady conditions for four weeks. The dispersal experiment showed that for all nozzles generally fewer gemmae were dispersed at the extreme water pressures (1.5 and 3 bar). More gemmae were dispersed with increased nozzle heights when using the nozzle with a flow rate of 160 lh^{-1}. For the other two nozzles there was no clear effect of nozzle height on the number of gemmae dispersed. However, with the 60 lh^{-1} flow rate nozzle, the distance travelled by gemmae increased with increased nozzle height. The maximum dispersal distance was 1.6m during this experiment. The number of gemmae collected during the initial removal process of the gemma replenishment experiment was fairly constant across all treatments. For subsequent collections more gemmae were collected during the 3-day treatment than either the weekly or control treatments. Increased gemma cup replenishment occurred with increased occasions of gemmae removal. These experiments suggest the number of gemmae produced and dispersed could be minimised by reducing or eliminating overhead irrigation applications.

GIANT HOGWEED ERADICATION IN PENNSYLVANIA AND NEIGHBORING STATES. M.A. Bravo and J.C. Fuller, Penn. Dept. Agric, Harrisburg.

ABSTRACT

The first official record of *Heracleum mantegazzianum* introduction to England occurred in 1817. The species was again recorded in 1828, in Cambridgeshire, England. This species has been used in Europe as decorative, ornamental, garden plants since the early 1900's. Recently, giant hogweed spread rapidly across Europe into areas previously uninfested. Hundreds of miles of riverbanks were overrun and within a few years, the species has populated the countryside. Currently, 21 European countries have reported wild populations of invasive *Heracleum* species as well as wild populations of *H. sosnowskyi* and *H. persicum*. In 2005, the European Commission financed the Giant Alien Project. A best practice manual providing guidelines for the management and control of giant hogweed was developed to disseminate up-to-date knowledge on the biology, ecology, taxonomy and management of invasive species. Here in the U.S., a similar increase in the reports of wild giant hogweed populations is occurring. Giant Hogweed was first introduced in the early 1900's to the U.S. Many states have records of the plant's existence as a garden ornamental prior to the 1980's, but few reports of wild populations. The Pennsylvania Department of Agriculture (PDA) first discovered giant hogweed in 1985 two years after the Federal Government declared the plant a federal noxious weed. When the state's eradication program was initiated, giant hogweed had only been identified in Maine, New York and Pennsylvania. In addition to these three states, this species is now reported in Connecticut, New Hampshire, New Jersey, Maryland, Washington D.C., Michigan, Ohio, Oregon and Washington. A joint effort between PDA and the U.S. Department of Agriculture established the Giant Hogweed Eradication Program in 1998. Initially, only six sites were identified in Erie County. By the end of 1998, 97 sites had been identified in Northwestern PA. By 2005, more than 600 sites had been identified in 14 counties in Pennsylvania and New York has reported wild populations in 22 counties and more than 200 confirmed sites. Both New York and Ohio have discovered populations of giant hogweed in areas adjacent to or within close proximity of the PA populations. This presentation is a detailed report on the current distribution of giant hogweed in Pennsylvania, New York, Ohio and New Jersey, and will highlight the C.A.P.S. (Cooperative Agricultural Pest Survey) program's efforts in public outreach, educator and applicator training, and chemical control methods utilized in the eradication program.

CROP MANAGEMENT EXTENSION GROUP AT PENN STATE: A SYNERGISTIC TEAM.
D.D. Lingenfelter and W.S. Curran, Penn State Univ., University Park.

ABSTRACT

Field crop production is a critical component of Pennsylvania agriculture. Over 4 million acres of field crops (corn, hay, soybeans, small grains, and other grain and forage crops) are produced each year in Pennsylvania. These crops are managed by producers and a variety of professionals who provide products, technical support, or regulatory oversight. The industry is rapidly changing as innovative technologies are introduced, new regulations are implemented, farms consolidate, and new markets develop for farm crops. Often these issues result in new questions and conflicting viewpoints, and the industry needs a neutral third party to provide science-based leadership. Unlike many states, field crop production in Pennsylvania is diverse and closely linked to animal production systems. This often makes field crop production decisions complex. Because of these complex and ever-changing issues, field crop advisors and producers in Pennsylvania depend on the latest technology and information in order to remain competitive regionally, nationally, and globally. The Crop Management Extension Group (CMEG) at Penn State University helps clientele deal with these issues.

CMEG is comprised of faculty, staff, and extension educators located in 4 departments in the College of Agricultural Sciences and six extension regions throughout the state. Group members and their activities are organized around 6 key areas: IPM, forage crop production, grain crop production, sustainable and organic crop production, nutrient management, and soil management. For each of the key areas, CMEG members develop educational programs that strive to meet the needs of our farms and their advisors in this challenging environment. Some of the key programs that CMEG members support each year as a group include hard-copy and digital-based production guides, newsletters and educational materials, and numerous field days, workshops and conferences. A primary goal of CMEG is to enable producers to make informed effective decisions that benefit the industry and the Commonwealth.

The CMEG group has had a number of significant achievements. Development of the Certified Crop Advisor program in the state has led to a higher degree of professionalism among crop advisors and generated support for training programs. The CMEG programs have created awareness on many issues that others in private industry often don't discuss, such as the use of unnecessary applications of fertilizers and pesticides, the overall impacts of transgenic crops, and the need for cover crops and conservation practices. Penn State's CMEG members are providing leadership to the agricultural community to develop practical solutions to key issues while continuing to develop the economic potential of crop production in the state.

In summary, CMEG is successful because it is comprised of dedicated individuals who all want success in their professional lives. A team approach that allows a flexible yet directed focus, along with a critical mass of energy (people) to get the job done, are key components for the success. Strong leadership that recognizes foundational strengths yet supports new ideas and programs is also critical.

THE IR-4 FIELD RESEARCH PROGRAM AT CORNELL UNIVERSITY. M. Miranda Sazo, R.R. Bellinder, and E.L. Lurvey, Cornell Univ., Ithaca and Geneva, NY.

ABSTRACT

The IR-4 field research program at Cornell University is conducted mainly in vegetables at the H.C. Thompson Vegetable Research Farm at Freeville, NY. Fruit residue trials are conducted at Cornell Orchards located on campus in Ithaca and at Lansing, NY. A Field Research Director supervises the IR-4 field research program, supported by a Research Support Specialist, technicians, and summer assistants. Two hundred and twenty eight field residue trials have been conducted at Cornell since the 1970s. Approximately 67% of this effort has been focused on herbicides for vegetable and fruit crops (152 studies), followed by fungicides (38 studies), and insecticides (38 studies). Prior to becoming an official regional testing center in 1994, IR-4 trials were conducted by the incumbent vegetable crops weed scientists. Between 1970-1979 and 1980-1989 the program conducted 5 and 24 field residue trials, respectively. Since becoming a center, the program has conducted more than 80 residue trials, primarily herbicides, for vegetable crops, between 1990-1999. During this same period the first residue trials of a fungicide (iprodione/basil) and an insecticide (ethroprop/radish) were conducted in 1993 and 1995, respectively. Twelve and 2 field residue trials were conducted for fungicides and insecticides between 1990-1999, respectively. Fruit residue trials were begun in 1994 with glyphosate for strawberries and since then, trials have been done with cherries, apples, peaches, and caneberries. Since 2000, 5 herbicide, 4 fungicide, and 7 insecticide fruit trials have been completed. Eighty-three vegetable residue trials (33 herbicides, 22 fungicides, and 28 insecticides) were conducted during this same period. The success of the program has led to the generation of 54 product uses since 1990 for fomesafen, desmedipham, s-metolachlor, linuron, metribuzin, phenmedipham, bentazon, metolachlor, and ethalfluralin through Section 18, 24(c), and 2(ee) third party registrations.

2005 NEWSS SUMMER CONTEST: RULES CHANGES AND RESULTS.

D. Johnson, Penn State Univ., University Park, J. Barney, Cornell Univ., Ithaca, NY, J.A. Hebberger, D. Lingenfelter, and W. Curran, Penn State Univ., University Park.

ABSTRACT

The 2005 North Eastern Weed Science Society student weed contest was held at Penn State University's Southeast Research and Extension Center near Landisville, Lancaster County. A total of 45 graduate and undergraduate students participated. Clemson, North Carolina State, VA Tech, Penn State, Cornell, SUNY-Cobleskill, Guelph, and Nova Scotia Ag College were represented. All students participated in weed identification, unknown herbicide identification, sprayer calibration, and farmer problem events. Over 40 volunteers, including faculty, staff, students, extension educators, and industry sales and research reps helped with the contest as judges, farmers, scorekeepers, etc.

In response to student and coach requests to broaden the scope of the contest to include more weed biology and basic science, some rules were changed on an experimental basis in the weed identification and unknown herbicide identification events. Rather than simply identifying a particular weed, the students also had to choose the correct biological or ecological characteristic of the weed from a list of four characteristics, only one of which was correct. These characteristics included growth habit, area of origin, biocontrol, method of reproduction, botanical terms, life cycle, etc. For the unknown herbicides, in addition to identifying the herbicide, chemical class, and mode of action, the student also had to choose a chemical or physiological property from a list, only one of which was correct. Such properties included water solubility, soil sorption, translocation patterns, etc. Surveys of students and coaches after the contest showed that these changes were well accepted.

In the farmer problem event, an attempt was made to move away from agronomic problems involving strictly herbicides. There were scenarios such as invasive weed management in a riparian zone, biology/ecology of invasive weeds in a forest setting, organic weed control, Christmas trees, turfgrass, and vegetable crops, in addition to agronomic crops.

In the Graduate Division, 1st place team was NCSU (Walter Thomas, Whitnee Barker, Wesley Everman), 2nd place team was Clemson (Mayak Malik, Prashant Jha, Marcos Oliveria), and 3rd place team was VA Tech (David McCall, John Willis). Individual winners were 1st place, John Willis (VA Tech), 2nd place, Wesley Everman (NCSU), and 3rd place Prashant Jha (Clemson).

In the Undergraduate Division, 1st place team was Guelph team B (Andrew Chisholm, Brian Gowan, Chrissie Schill), 2nd place team was Guelph team A (Phil Aitkin, Gerald Pynenborg, Jim Burns), and 3rd place team was Cornell (Kristine Averill, Cameron Douglass). Individual winners were 1st place, Gerald Pynenborg (Guelph), 2nd place, Jim Burns (Guelph), and 3rd place, Brian Gowan (Guelph).

Congratulations to the winners and to all students for participating. The 2006 contest will be hosted by DuPont at their farm in Maryland.

PERSPECTIVES ON TEACHING A LARGE SIZE CLASS. P.C. Bhowmik, Univ. of Massachusetts, Amherst.

ABSTRACT

Teaching is the primary function of educational institutions. We all give our best effort to our educational programs for undergraduates, graduate students, and other students from off-campus enrollments. Teaching a course in educational environments is a challenging job, and this unique task can be rewarding as well. One of our objectives is to prepare our students best suited for their future career. There are many conventional teaching tools that we use for our classroom teaching. In recent years, CBIT (Computer-Based Instructional Technology) has revolutionized teaching tools. Some of them are OWL (Online Web-based Learning), PRS (Personal Response System), ANGEL (A New Global Environment for Learning), and many others. These new technologies may impact differently on learning experience in various sizes of class or distance education. What is a large size class? A large size class could be 100 to 250 students, or 500 students. My class enrollments ranged from 65 to 100 students at the University of Massachusetts. My large lecture course is a basic weed science course “Principles of Weed Management” taught to students from the College of Natural Resources and Environment, as well as students from the ‘Five area colleges’. I use power point presentations and chalk board as routine tools. In addition, handouts are given to supplement each lecture. My goal is that we need to somehow try and captivate the large audience in each lecture. Ideally, the class engages in active learning: exercises are given, students actively work in class, and students help each other. In general, I want students to come to class prepared and then actively participate in the lecture. Rather than simply presenting lecture material, I try to engage the students with activities in class that have them apply what we are discussing. The purpose of this presentation is to share my teaching experiences in relation to student learning, methods of teaching, and benefits or problems of having a large size class.

TEACHING AND OUTREACH SYMPOSIUM: DEVELOPMENT AND USE OF AN INSTRUCTIONAL SUPPORT TOOL FOR WEED IDENTIFICATION AND MANAGEMENT. A. DiTommaso, Cornell Univ., Ithaca, NY.

ABSTRACT

Weed identification is an especially critical facet of weed science teaching and outreach. One outstanding challenge that weed science instructors and extension educators face is finding effective strategies for not only developing weed identification skills of their students/stakeholders, but also integrating important aspects of the biology/ecology and management of weed species in their lectures and/or presentations. There are few currently available resources that integrate these three essential components of weed science teaching and outreach into a single resource. This was the main motivation for developing the *Weed Identification, Biology and Management* software program. The program was originally developed for use by students in the introductory weed science undergraduate course at McGill University, Montreal, Canada to help them gain knowledge of, and to recognize, important agricultural, environmental and urban weeds. For each of the over 100 species featured, information on nomenclature, distribution, habitats, morphology, life history, biology, and management options is provided. The program includes detailed, high quality digital images of the various stages of the weed as well as *in situ* photos in the field. Other useful aspects of this resource include the classification of all species based on flower color and seedling morphology and a grass key. Also, technical taxonomic and botanical terms in each species description are linked to an illustrated glossary. The response from students, extension educators, and other users of the program since its release in 2003 has been overwhelmingly positive and with many of the users surveyed stating that it has substantially increased their overall knowledge and appreciation of the plants featured.

PRODUCTION AND USE OF ON-LINE QUIZZES. M.A. Fidanza, Pennsylvania State Univ., Reading, PA.

ABSTRACT

In many academic institutions of higher learning and especially land-grant universities, recent attention has focused on the improvement of the undergraduate education. Although research is still an important function and mission of the land-grant university, the scholarship of teaching and learning is also becoming an important part of the overall mission of research, teaching, and outreach. The purpose of this presentation is to describe how information or education technology can be used to design, develop, and implement quizzes on-line. At the Berks Campus of the Pennsylvania State University, a web-based instruction tool was used to develop an undergraduate course website that included an on-line quiz component. That web-based tool is called ANGEL ("a new global environment for learning"). The benefits and challenges of on-line quizzes will be discussed from both an instructor and student point-of-view. An understanding of student learning styles and methods of teaching and instruction could contribute to the overall improvement of the scholarship of teaching and learning in academia.

DELIVERY OF RESEARCH BASED INFORMATION TO THE GREEN INDUSTRY IN NEW JERSEY AND DELAWARE. S. Hart, Rutgers, The State Univ. of New Jersey, New Brunswick.

ABSTRACT

Weed management has become an important part of the overall turfgrass extension program at Rutgers, The State University of New Jersey. While diseases are considered the most important pest on golf courses, weeds are considered the most important pest for professional landscapers and homeowners. A number of outlets have been in place for many years to disseminate weed management information including educational meetings, field days, fact sheets (which can now be downloaded directly from the internet), and personal contact via phone and e-mail. A number of excellent education programs are in place at Rutgers University to serve as a conduit for weed management extension. Perhaps the two hallmarks are the New Jersey Turfgrass Association Expo and the Rutgers turfgrass field days. Expo will generally draw 1200-1400 turfgrass professionals and I routinely give 3 to 4 presentations at this meeting. We host a lawn and landscape and a golf and sports turf field day each year with attendance in the 200-300 range. In addition, the Golf Course Superintendents Association of New Jersey hosts educational programs and there are regional "Green Industry" programs hosted by the New Jersey Landscape Contractors Association and Rutgers Cooperative Research and Extension. There are also "Green Industry" programs hosted by Rutgers Office of Continuing and Professional Education with the highlight being the Two Year Golf Certificate Program.

The foundation of any good Extension program in turfgrass weed management is to develop a close relationship with both the "Green Industry" and the distributors and manufactures of herbicides (hereafter referred to as private industry). As Extension Specialists we rely on private industry for funding to develop an applied weed management research program and also for updates on new herbicide products and formulations. Since the majority of weed management in turfgrass relies on herbicide use this relationship with private industry is critical. A close relationship with the "Green Industry" keeps the Extension Specialist informed on weed management challenges as well as emerging problems. Perhaps the biggest challenge for a weed management Extension Specialist is the diversity of clientele that must be served. Our major clientele groups in New Jersey are Rutgers Cooperative Research and Extension (RCRE) Agents at the county level, golf course superintendents, professional landscapers, athletic field managers, and sod producers. RCRE Agents require fundamental educational materials in terms of presentations and fact sheets to assist in Master Gardener training who in turn deal directly with homeowners. Their biggest weed management concerns along with professional landscapers are crabgrass, broadleaf weeds and yellow nutsedge (although the number of inquiries concerning annual bluegrass and roughstalk bluegrass have been steadily increasing). In contrast, the biggest weed management concern for golf course superintendents and sod producers is likely annual bluegrass and roughstalk bluegrass. In addition to the challenge of balancing the needs of this diverse clientele I must also provide weed management extension to the ornamental production industry and serve the "Green Industry" in the

state of Delaware. Where will the future take us in weed management extension? Undoubtedly, the Internet will continue to become a more important conduit for the dissemination of weed management information. I have been astounded at the number of weed management fact sheets downloaded from the RCRE web site. A fact sheet entitled "Weed Management in Home Lawns" recorded approximately 17,000 downloads in 2003 and fact sheets directed to professional recorded 4000-5000 downloads that same year. My long-term goal for the Internet is to develop a web site combining weed images, ecology and biology, cultural controls and herbicide recommendations.

PERSPECTIVES ON EARNING AN MBA ON-LINE. L.H. Norton, Bayer Environmental Science, Bethlehem, PA.

Globalization and advancements in technology have increased the pace of business. The need to be more fluid in various business practices has lead to a deficiency with the traditional educational knowledge base. A greater emphasis is being placed on newly emerging concepts and practices. In an effort to educate the existing workforce with these new theories and initiatives, new concepts in education, such as on-line classes, are being implemented. The purpose of this presentation is to describe the requirements for successfully completing an on-line MBA education while continuing to be a part of the workforce. Many critical factors need to be considered by the student prior to and while engaging in an on-line educational program. Some of these factors include budgeting of time, technological requirements, curriculum and communication.

TEACHING PRINCIPLES: BE PERSONAL, GET PASSIONATE, AND SIMPLIFY. S. Glenn, Univ. of Maryland, College Park.

ABSTRACT

There are many different approaches to teaching and, as we have heard today, many new innovative technologies that are being used to transfer information. However, the basics of good teaching remain constant. Three of those basic principles are to be personal, get passionate, and simplify.

Personal: New technologies for transferring information can be of great benefit, but it is important not to lose the personal contact with students. Distance learning and computer-oriented classroom presentations may be efficient from the standpoint of time and personnel. However, the face-to-face interaction between teacher and student is lost and learning suffers. Students respond to people, not screens.

Passion: Students respond to a teacher's passion. Teach what you enjoy and show the students you enjoy it. Enthusiasm is contagious! It keeps the classroom alive.

Simplify: It is the teacher's job to take complex material and make it easy to understand. Too often in the classroom simple concepts are made complex. Take a concept and break it down to its most simple component and build it back up step-by-step until the concept is complete and clear. Do not forget to tie the concept in with other concepts that they have studied. Students want to see the big picture.

Be personal, get passionate, and simplify! These are the cornerstones to good teaching. They can only be implemented in the old-fashion, face-to-face, teacher-to-student exchanges.

NATURAL PRODUCT POTENTIAL FOR SWEET CORN AND ONION. G.J. Evans and R.R. Bellinder, Cornell Univ., Ithaca NY.

ABSTRACT

Weed control is one of the most expensive inputs in organic systems and there are limited tools available for controlling weeds. Natural products may aid in weed control in certain cropping situations. With this in mind, acetic acid (vinegar) and Matran II (clove oil) treatments were selected, within a modest and economically feasible range of concentrations and volumes, to assess their potential use in sweet corn (*Zea mays* L.) and onion (*Allium cepa* L.). Field trials were conducted in the summer of 2005 at the Thompson Research Farm in Freeville, NY. Evaluations were made for weed control, crop tolerance, and yield. Acetic acid was applied at concentrations from 15-30%, at 34 or 68 GPA. Matran II was applied as a 10% dilution in water, or as a 5% dilution in 20% acetic acid; each at 34 GPA. Treatments were broadcast with a CO_2 backpack sprayer, with two applications on each crop. Applications were made to corn varieties 'Trinity' (early) and 'Avalon' (late) at 15cm and at 30-45cm. Initial injuries to the corn included leaf dieback and yellowing, and were more pronounced with the later application. When acetic acid and Matran II treatments were applied to 'Trinity' at the early timing, compared to the handweeded control, there was a 5-28% reduction in ear number, a 5-26% reduction in harvest weight, and no significant reduction in individual ear weight. At this same timing, ear numbers and weights of 'Avalon' did not differ significantly from the handweeded control. Injury increased in both varieties with the late-stage applications, and in almost all cases, yields were reduced more than 10%. In corn, the aboveground dry weight for common lambsquarters (*Chenopodium album* L.) 13 DAT was 88-98% less than that of the weedy check with early vinegar applications, and 35-63% less with the late vinegar applications. Acetic acid and Matran II treatments were applied to onions at the preemergence-1LF stage, and at the 2LF stage, and the crop was handweeded as necessary for the remainder of the season. The early treatments caused no significant reduction in harvest numbers, and weights were significantly reduced only with the 68 GPA, 20% acetic acid application. All late applications caused a significant reduction in both number and weight of onions. Aboveground dry weights for Powell Amaranth (*Amaranthus powellii* S.), sampled from the onion treatments 13 DAT, was 54-93% less than that of the non-weeded check in the early applications, and 39-71% less in the late applications. The time taken for the first handweeding session of the early treatment applications was reduced by 34-66%, while the later treatment applications resulted in a 7-36% reduction in initial handweeding time. Subsequent handweeding times did not differ with treatment. The usability of these products appears very dependant on the time of application, such that weeds are at a stage where they can be adequately controlled, and the crop is at a growth stage that minimizes injury, or allows adequate time for regrowth from injury. Weed control and crop injury increase when acetic acid is applied at 68 GPA as opposed to 34 GPA. Adequate weed control is possible with a lower concentration of acetic acid when the spray volume is increased. When applied ideally, these products show the potential to reduce weed pressure. Trials will be repeated again in the summer of 2006.

EVALUATING TRIKETONE HERBICIDES FOR POSTEMERGENCE WEED CONTROL IN SWEET CORN. R.R. Bellinder and C.A. Benedict, Cornell Univ., Ithaca, NY.

ABSTRACT

Postemergence (POST) annual grass control in sweet corn has become a serious problem for growers. Control fails when preemergence (PRE) herbicides are not activated by rain soon after application. Uncontrolled, these grasses reduce yields significantly. New triketone herbicides have shown promise for controlling grasses. Topramezone and AE 172747 are new materials that like mesotrione, have both PRE and POST activity on broadleaf and grass weeds. However, where mesotrione controls primarily only large crabgrass, the new products appear to control multiple species. Preliminary greenhouse and field trials have been conducted to evaluate weed control and sweet corn tolerance, respectively, to both products. Applied POST with crop oil concentrate (COC) and urea ammonium nitrate (UAN), topramezone (0.016, 0.032 lb ai/A) and AE 172747 (0.123, 0.246 lb) provided good to excellent control (80- 95%) of large crabgrass, fall panicum, witchgrass, giant foxtail, and barnyardgrass. Early greenhouse trials with topramezone indicated that POST control of grasses increased substantially with addition of first COC and again with COC + UAN. Sweet corn tolerance to both products applied POST was tested in 16 to 24 processing and fresh market varieties in 2004 and 2005 and no significant injury or negative impacts on yield were observed despite applications being made with both COC and UAN. Greenhouse trials are in process to evaluate further the range of broadleaf and grass weeds potentially controlled PRE and POST by these triketones.

EFFECT OF TIMING AND RATE ON TOMATO TOLERANCE TO POSTEMERGENCE APPLICATIONS OF S-METOLACHLOR.

D.E. Robinson, Plant Agriculture, Univ. of Guelph, Ridgetown, Ontario, and A.S. Hamill, Agriculture and Agri-Food Canada, Harrow, Ontario.

ABSTRACT

Tomato growers have expressed concern over lack of season-long eastern black nightshade and grass control, and are looking for a means to extend the residual control that s-metolachlor provides for these weeds. Currently, s-metolachlor, along with a low rate of metribuzin is applied prior to transplanting, which does provide excellent early season control, but late season escapes do occur. One possible management technique would be to apply a portion of the s-metolachlor prior to transplanting, and then apply the remainder overtop of the tomatoes at a later date to the soil before the emergence of subsequent weed flushes. Weed-free tolerance trials were conducted at two locations over a two year period to test for visual injury, red, green and total yield of tomatoes to pre-plant incorporated (PPI) applications of s-metolachlor+metribuzin (800+375 g ai/ha), followed by postemergence (POST) applications of s-metolachlor+metribuzin (400+150 or 800+150 g ai/ha) made 7, 14, 21 and 28 days after transplanting (DAP). Weed control trials were also conducted to determine the efficacy of each treatment. Injury was commercially significant when the higher rate of s-metolachlor+metribuzin (800+150 g ai/ha) was applied at 7 and 14 DAP. All treatments provided excellent full season control of velvetleaf, redroot pigweed, common ragweed, common lamb's-quarters, eastern black nightshade and green foxtail. Red and total yields were not decreased by any of the rates or timings of POST s-metolachlor+metribuzin. Green yields were not different than the untreated check in any of the treatments.

STRAWBERRY PHENOLICS AND THEIR EFFECT ON SEED GERMINATION AND VIGOR OF WEED SPECIES. S. Cheplick, K. Shetty, and P.C. Bhowmik, Univ. of Massachusetts, Amherst.

ABSTRACT

Allelopathic compounds have the potential to influence current weed control practices because of their growth suppressant as well as growth stimulating abilities. Strawberry and raspberry leaves contain many phenolic compounds, some of which are known to have allelopathic effects. Renovation of strawberry beds after fruiting season as well as yearly pruning of old fruiting canes in raspberry plantings result in the accumulation and eventual decomposition of crop leaf material around the beds. Extracts of strawberry and raspberry leaves were examined for their effect on the germination and vigor of common lambsquarters (*Chenopodium album* L.). Total phenolic content and antioxidant activity of the extracts were measured in addition to several enzyme assays. HPLC was used to help identify active phenolic compounds in these extracts that are potentially linked to germination and vigor response.

EFFECT OF HERBICIDE-FUNGICIDE TANK-MIX COMBINATIONS ON WEED CONTROL AND TOMATO TOLERANCE. K.E. McNaughton, A.S. Hamill, and D.E. Robinson, Univ. of Guelph, Ridgetown, ON.

ABSTRACT

In an effort to decrease labour costs, processing tomato producers in Ontario are interested in the possibility of tank mixing fungicide and herbicide applications. In field studies conducted in Ridgetown, Ontario the addition of chlorothalonil and chlorothalonil plus copper to rimsulfuron and thifensulfuron-methyl, each alone and in a tank-mix with metribuzin, was examined to determine if weed control would be affected by the tank-mix. In all years of the study rimsulfuron plus chlorothalonil and thifensulfuron-methyl plus chlorothalonil showed no decrease in velvetleaf or common lambsquarters control, however in 2003 there was a general trend of decreased weed control with these two tank-mixes. Alternatively, the addition of copper (functions as a bactericide) to the rimsulfuron plus chlorothalonil and thifensulfuron-methyl plus chlorothalonil tank-mixes did affect weed control. In the rimsulfuron plus chlorothalonil plus copper tank-mix both velvetleaf and common lambsquarters control were reduced in two of the three years. In the thifensulfuron-methyl plus chlorothalonil plus copper tank-mix, velvetleaf control was reduced in two years. Although common lambsquarters control was only significantly reduced in one year, the general trend showed a decline in control from 94% to 85%. These findings suggest that tank-mixes of rimsulfuron and thifensulfuron-methyl plus chlorothalonil could be considered, as far as herbicide control is concerned. However, the addition of copper to either combination makes the tank-mix ineffective.

THE IMPACT OF MECHANICAL, CULTURAL, AND CHEMICAL WEED CONTROL TECHNIQUES ON PEACH TREE ESTABLISHMENT. B.A. Majek and D.L. Ward, Rutgers, The State Univ. of New Jersey, R.A.R.E.C., Bridgeton.

ABSTRACT

Peaches *Prunus persica* L. 'John Boy' were planted in the spring of 2004. The orchard was arranged to be a split plot design with five replications. Each plot was ten feet wide and 15 feet long. The trees were planted in the center of each plot. Five feet of tall fescue sod separated the trees in the row and fifteen feet of sod separated the trees between rows. The four main plots were herbicide treatments. They were untreated, residual herbicides plus postemergence herbicides when needed to control weeds, postemergence paraquat when needed to control weeds, and pelargonic acid applied at the same timings as the paraquat. The residual herbicides were pendimethalin and isoxaben, and were applied at recommended rates on June 2, 2004. Postemergence herbicides were applied June 6th, June 30th, and August 10th in 2004. The residual herbicides plus paraquat when needed, and paraquat when needed were the most effective herbicide treatments. Pelargonic acid was less effective than paraquat, but more effective than no treatment. The four sub-plots were no tillage, cultivated when needed, yard waste (leaf) mulch, and landscape fabric mulch. The trees were cultivated June 25th and September 9th in 2004. The yard waste and landscape fabric mulches were laid in early summer, 2004. One cubic yard or yard waste was used per plot. Heavy weed growth that occurred between cultivations in the tilled subplots and in the untilled subplots adversely affected tree growth in the untreated and pelargonic acid main plots. The yard waste mulch and landscape fabric mulch provided excellent weed control and superior tree growth across all main plots, including the plots not treated with any herbicide.

THE IR-4 PROJECT: HERBICIDE REGISTRATION UPDATE. M. Arsenovic, F.P. Salzman, D.L. Kunkel and J.J. Baron, IR-4 Headquarters, New Brunswick, NJ.

ABSTRACT

The IR-4 Project is a publicly funded effort to support the registration of pest control products on specialty crops. The Pesticide Registration Improvement Act (PRIA) is affecting IR-4 submissions and EPA review of packages. The IR-4 Project continues its role to meet grower's needs for weed control options despite a climate in which fewer herbicides are available.

IR-4 submitted herbicide petitions to the EPA from October 2004 to September 2005 for: clethodim on leafy greens subgroup, legume vegetables group, asparagus, hops, and sesame; ethofumesate on dry bulb onion; glyphosate on dry pea, safflower, and sunflower; lactofen on fruiting vegetables group; pendimethalin on green onion and perennial strawberry; and sethoxydim on root vegetables subgroup, pepper (to reduce PHI), okra, and buckwheat.

From October 2204 through September 2005, EPA has published Notices of Filing in the Federal Register for ethalfluralin on rapeseed, canola, crambe, Mustard seed, and potato, flumioxazin on pome fruits group, stone fruits group, and strawberry; paraquat on *Brassica* leafy vegetables group, pome fruits group, stone fruits group, tree nuts group, berries group, edible-podded legume vegetables group, succulent shelled pea and bean subgroup, dried shelled pea and bean subgroup, cucurbit vegetables group, fruiting vegetables group, grape, cranberry, hops, ginger, okra, tanier, and dry bulb onion; and terbacil on watermelon.

EPA established tolerances from October 2004 though September 2005 on 2,4-D on hop, wild rice, s-metolachlor on sweet corn, popcorn, garlic, dry bulb onion, green onion, safflower, shallots, head and stem *Brassica* subgroup, foliage of legume vegetables group, fruiting vegetables group, leaf petioles subgroup, edible-podded legume vegetables subgroup, dried shelled pea and bean subgroup, root vegetables (except sugar beet) subgroup, tuberous and corm vegetables subgroup, and tobasco pepper.

THE NON-NATIVE VASCULAR FLORA OF SABLE ISLAND, NOVA SCOTIA, CANADA. R. Stalter, A. Jung, S. Shallalah, A. Starosta, M. Cerami, St. John's Univ., Jamaica, NY, E.E. Lamont, New York Botanical Gardens, Bronx, NY, and D.T. Kincaid, Lehman College, City Univ. of New York, Bronx.

ABSTRACT

The objective of this study was to compare non-native vascular plant species at Sable Island, Nova Scotia, reported by Macoun (1900), Gussow (1911), St. John (1921), Erskine (1953), Catling et al (1984) and Stalter (2002). The percentage of non-native vascular plants ranged from 15% (Gussow 1911) to 31 % (St John 1921). Gussow (1911) concentrated his vascular plant inventory on native vascular plant species; his selective collecting accounts for his low percentage of non-native plant species at Sable Island. However, according to Chi-Square tests, there is no significant difference between the frequencies of native verses non-native vascular plant species within the six collections from 1900 to 2002. Although the species of non-native plants has changed over time, the percentage of non-native vascular plants has not changed significantly over the past century.

INTRODUCTION

Sable Island (44˚ N' Lat., 60˚ W' Long.) composing 3400 ha, is the emergent part of a great sand bar of the continental shelf in the northwestern Atlantic. The island extends approximately 41 km running nearly east and west in a shallow crescent. The island is composed of unconsolidated sand, and supports two lines of dunes. The dunes on the northern side of the island are much higher than those in the south. The central portion of the island has numerous freshwater ponds and Lake Wallace, a 2 km long brackish lake on the islands' south side. The island is 161 km from Canso Head, Nova Scotia and approximately 290 km southeast of Halifax. The island's vegetation and topography have been noted for 500 years as a windy sandy island populated by low-growing shrubs, grasses and forbs (Gilpin 1858). In 986, the Norse explorer Bjorn Heriulfson may have observed the island on his voyage to Nova Scotia and Newfoundland (Oxly 1886).

There are few long-range inventories of vascular plant species at specific study sites. The present study, covering a 102-year period, may be one of the longest comparative vascular plant island inventories of its kind, as no century-long study comparing non-native vascular plant species at a specific study site has been reported in the literature.

The objective of this study is to compare the historical and extant non-native vascular flora at Sable Island. The first botanist to document the vascular flora of Sable Island was Macoun who collected plants on the island in 1899. His survey included 152 species of which 35 were non-native. In 1911, Macoun's study was followed by Gussow's study in which he identified 81 species including 12 non-native vascular plants. Gussow concentrated his study on native vascular plant species (Erskine 1953). Gussow's list contains the fewest number of non-native species and the lowest percentage of non-native species.

During 1901 the Canadian Government planted 81,345 trees and shrubs including 68,755 evergreens ("of 25 varieties") and 12,590 deciduous trees and shrubs ("of 79 varieties"). At the end of the 1901 growing season, many of the aforementioned trees and shrubs were in poor condition. The following seasons took a heavy toll on the plantings. Salt spray borne on strong winds may have stressed the plantings.

St. John (1913) conducted the most complete vegetation study of the island. He recorded the greatest number of vascular plant species (178) and the greatest number of non-native species (56). St. John recorded 13 surviving plants of the original 81,345. It is impossible to know what contribution the reforestation project had on the number and variety of non-native vascular plant species on the island. St. John (1921) did record a number of non-native vascular plants that had not existed on Sable Island previously.

Thirty-two years passed before Erskine (1953) conducted the fourth plant inventory of the island. He identified 142 species of vascular plants including 35 non-native species. A fifth inventory conducted in 1981 and portions of 1982 and 1983 were undertaken by Catling et al (1984). They identified 172 species including 47 non-native taxa. They published a list of 154 native species and 69 introduced taxa including species recorded by previous investigations. The most recent study, by Stalter in August 2002 listed 147 species; 38 were not native to Sable Island. Stalter's study did not include vouchers because he was not permitted to collect vascular plant specimens.

METHODS

The literature was searched for vascular plant species surveys of Sable Island. Five surveys and the 6th conducted by Stalter in 2002 are reported in this study (Table 1). Those making significant contribution to the understudy of the islands vascular plant species flora are Macoun (1900), Gussow (1911), St. John (1921), Erskine (1953) and Freedman et al (1984). Stalter conducted a sixth unvouchered inventory of vascular plant species in August of 2002. More detailed information of the aforementioned studies including literature cited can be found in Stalter and Lamont (in press).

The species identified by the six investigators were cross-classified by status as native or non-native vascular plant species (Table 2). The frequencies were placed in a contingency table and native and non-native status were tested for independence by a Chi-Square test (Sokal and Rohlf 1991). Nomenclature follows Haines and Vining (1998).

RESULTS AND DISCUSSION

With the exception of the results of Gussow (1911) there is no significant difference between the way native species versus non-native species sort themselves out across the 6 investigators, Chi Square = 5df, p = 0.07. When Gussow's (1911) biased study is removed, Chi Square = 4df, p = 0.50. The number of species identified by Gussow, 81, is slightly more than half the total number of species identified by the other five investigators. There is very little difference in the way native versus non-native species sort themselves out from 1952 to the present and from 1900 to the present.

The Brassicaceae (n=5), Caryophyllaceae (n=6), Chenopodiaceae (n=3) and Fabaceae (n=6) are composed of a high percentage of non-native species. Many of these taxa are components of the spring flora though Stalter (2002) observed many of them in August.

Several factors may play a role in the number and percent of native and non-native vascular plant species comparisons. These factors include: (1) seasons when the vascular plant species were collected, (2) time spent on Sable Island collecting plant material, (3) expertise and skill of the investigator collecting plant specimens, (4) total number of vascular plant species collected by each research group, (5) possible bias in collecting vascular plant species.

Generally, those who spent the longest time on the island collected the greatest number of plant species. The most thorough study, performed by St. John (1921) in 1913, was the most inclusive with 172 vascular plants. Catling et al (1984) collected extensively in 1981, and in portions of 1982 and 1983. They reported 172 vascular plant species, approximately the same number as that of St. John (n=178).

In summary, the percentage of non-native vascular plants at Sable Island has changed little in the past 100 years. The islands isolated location from mainland Canada, the small number of people visiting the island, a potential source of seed of new species, the harsh climate characterized by wind-driven salt spray, desiccating wind, course porous nature of the soil (exacerbating drought) and bright sunlight may be important factors in maintaining the present assemblage of vascular plant species at Sable Island.

Table 1. A summary of the vascular flora of Sable Island, Canada.

	Fern Allies	Ferns	Gymn.	Dicots	Monocots	Totals
Family	1	2	2	43	13	61
Genus	1	3	3	107	42	156
Native sp.	1	3	2	86	54	146
Non-N. sp.	0	0	3	60	15	78
Total sp.	1	3	5	146	69	224

Table 2. Number of Fern Allies, Ferns, Gymnosperms, Dicots and Monocots collected by Macoun, Gussow, St. John, Erskine, Catling et al and Stalter, Sable Island, Canada. The number of non-native vascular plants is indicated in parentheses (). Percent non-native vascular plant species (%) follows Totals.

Collector	Date	Fern Allies	Ferns	Gymn.	Dicots	Monocots	Totals	%
Macoun	1900	1	2	2	97(26)	50(9)	152(35)	23.0
Gussow	1911	1	1	1	57(9)	21(3)	81(12)	14.8
St. John	1913	1	1	5(3)	120(44)	51(8)	78(56)	31.5
Erskine	1953	1	1	2	94(28)	44(7)	142(35)	24.6
Catling et al	1984	1	2	4(2)	107(33)	58(12)	172(47)	27.3
Stalter	2002	1	1	3(1)	94(27)	48(10)	147(38)	25.8

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PERSISTENCE AND WEEDINESS POTENTIAL OF TRANSGENIC AND NON-TRANSGENIC BENTGRASS HYBRIDS. S. Hart, F. Belanger, and P. McCullough, Rutgers, The State Univ. of New Jersey, New Brunswick.

ABSTRACT

The potential development of transgenic creeping bentgrass (*Agrostis stolonifera* L.) combined with the ability of creeping bentgrass to outcross to non-transgenic creeping bentgrass as well as related bentgrass species has raised concern if transgenic bentgrass hybrids will have increased persistence and weediness potential in the environment. Field studies were conducted from 2002 to 2005 at the Rutgers University Horticultural Research Farm II to evaluate the persistence and weediness potential of transgenic and non-transgenic bentgrass species in managed and unmanaged ecosystems. Managed ecosystem consisted of a sward of Kentucky bluegrass maintained as a home lawn in terms of mowing height, fertilizer, herbicide inputs and supplemental irrigation. Unmanaged ecosystem consisted of a sward of mixed fine and tall fescue maintained as a typical New Jersey roadside in terms of mowing height with no inputs or supplemental irrigation. Plant material evaluated included glufosinate resistant creeping bentgrass (GRCB), hybrids of GRCB with non-transgenic creeping bentgrass, colonial bentgrass (*Agrostis capillaris* L), dryland bentgrass (*Agrostis castellana* Boiss and Reut.) redtop (*Agrostis gigantia* Roth) and velvet bentgrass (*Agrostis canina* L.). Plants were propagated in the greenhouse and then transplanted in September of 2002 and 2003 in 1.3 m equidistant rows. Plant diameters were measured at transplanting and in the spring summer and fall of the following two years. In the unmanaged experimental site 0.6 m wide strips were treated with 1.7 kg ae/A glyphosate two weeks prior to transplanting to facilitate bentgrass establishment. In the managed experimental site bentgrasses were directly transplanted into the Kentucky bluegrass sward. Overall, the majority of bentgrasses were able to persist, grow and be highly competitive in both ecosystems. However, bentgrasses were more competitive in the unmanaged ecosystem relative to the managed ecosystem. Hybrids between transgenic creeping bentgrass and non-transgenic creeping bentgrass, colonial bentgrass, velvet bentgrass, and especially dryland bentgrass were less or equally persistent and competitive than their non-transgenic hybrid counterparts. However, hybrids of transgenic creeping bentgrass and redtop were more persistent and competitive compared to non-transgenic redtop in the managed ecosystem experiments established in 2002 and 2003 and the unmanaged ecosystem experiment established in 2002. This was likely due to the differences in growth habit between the two bentgrasses. Transgenic hybrids adopted the more prostrate growth habit of creeping bentgrass that was more tolerant to mowing rather than the more upright growth habit of redtop.

USING MULTIVARIATE ANALYSIS TO DESCRIBE VEGETATION PATTERNS IN VARIOUS CRANBERRY-DOMINATED COMMUNITIES. H.A. Sandler, Univ. of Massachusetts-Amherst Cranberry Station, East Wareham.

ABSTRACT

Bogs dominated by the American cranberry, *Vaccinium macrocarpon* Ait., offer an opportunity to examine differences in vegetation patterns between agricultural and natural communities. In this study, fourteen *Vaccinium*-dominated communities, representing four bog types (peat, mineral, abandoned, and wild), were surveyed between 1998 and 2000 in southeastern Massachusetts for plant community composition and crop productivity. We measured plant species abundances, cranberry performance, and soil characteristics on the edges and interiors of the four bog types. Natural and agricultural bogs did not differ greatly in species richness or cover of introduced or native plants other than cranberry, even though soil nutrient concentrations, cation exchange capacity, and percentages of organic matter, clay, and silt were higher in agricultural than in natural bogs. Richness and cover of all groups of plants was higher on the edges of bogs than in the interiors, even though soil characteristics differed little between edge and interior. Shoot biomass and marketable fruit yield of cranberries were generally lower on bog edges than in interiors, and highest in active agricultural bogs.

A recent statistic package (K.R. Clarke and R.M. Warwick. 2001. Change in marine communities: An approach to statistical analysis and interpretation, 2nd Ed., Plymouth Marine Laboratory, UK) offers a user-friendly interface for analyzing multivariate data. The software entitled, PRIMER (Plymouth Routines in Multivariate Ecological Research), can analyze data generated in community ecology and environmental science that includes multiple species and multiple environmental variables. The data generated from the above study will be used as an example to inform weed scientists about the software package and to demonstrate the potential usefulness of this product for future weed ecology research.

EFFECT OF PLANTING AND TERMINATION DATE ON MECHNAICAL CONTROL OF CEREAL RYE AND HAIRY VETCH: AN INTRODUCTION.
W. Curran and S. Mirsky, Penn State Univ., University Park.

ABSTRACT

Cover crop roller/crimpers are increasing in popularity. In 2003, The Rodale Institute designed and fabricated a roller/crimper with the hope of controlling cover crops in no-till organic crop production systems. Proponents of the roller/crimper technology tout the ability to control cover crops without tillage, possible reductions or elimination in the use of herbicides for cover crop control, maximizing the weed suppression potential of the cover crop by increasing the mulching characteristics, providing another tool for organic farmers, and promoting the adoption of no-till agriculture and all its benefits. However, very few research trials have examined these potential benefits and little information is available with regard to best management strategies when using a roller/crimper.

In 2004, faculty and staff from Penn State University attended a field day at the Rodale Institute and observed some successful results with the Rodale roller/crimper research. During the winter of 2005, Penn State constructed a roller designed after the Rodale prototype. This paper will present a little more background information on cover crop roller/crimpers and their potential use and describe a cover crop experiment that Penn State conducted in 2005. A second paper presented during this annual meeting will describe some results from our 2005 cover crop roller experiment and where we hope to go from here.

EFFECT OF PLANTING AND TERMINATION DATE ON MECHNAICAL CONTROL OF CEREAL RYE AND HAIRY VETCH: FIRST YEAR'S RESULTS. S.B. Mirsky, W.S. Curran, and M.R. Ryan. Penn State Univ., University Park.

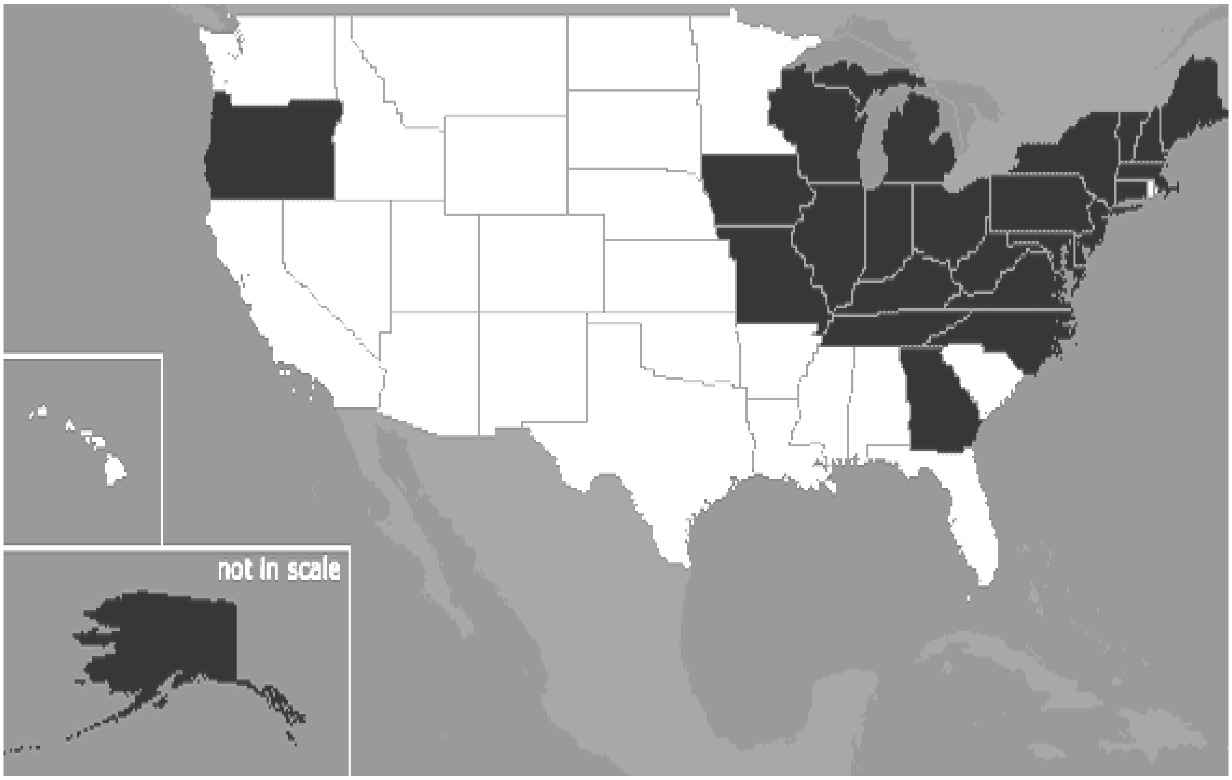
ABSTRACT

Mechanical weed control with high tillage and cultivation frequency are typical weed management strategies for reduced pesticide or organic producers. Improving soil quality, namely increasing soil organic matter levels, is a goal that is frequently highlighted by producers. However, despite greater return of organic matter to the soil, the increased number of disturbances inherent to these cropping systems often results in a zero net gain or loss of soil organic matter. Rolling/crimping cover crops, as opposed to residue incorporation, has been suggested as a means of reducing tillage, weed populations, and herbicides used to control the cover crops. However, research identifying efficacy of mechanical control of cover crops at varying growth stages and subsequent weed suppression are limited. The objective of this experiment was to test the effects of planting and termination dates on rye (*Secale cereale*) cover crop biomass production and ensuing weed control. Efficacy of mechanical control of rye at different developmental growth stages was also tested. Planting of rye cultivars were seeded 10 days apart from August 25-October 15 (six planting dates and a control with no rye planting). Spring termination of cover crops occurred on 5/1, 5/10, 5/20, and 5/30. Rye biomass was sampled prior to each termination date, and weed population size was measured four and eight weeks after each termination date. Rye biomass increased with each time step for kill dates, and decreased with progressively later planting dates. Mechanical control of rye improved with later developmental stages, stem elongation (16%), booting (68%), inflorescence emergence-anthesis (82%), and milk development (>90%). Identifying developmental stage thresholds for rye cover crop control will enhance success and adoption of rolling/crimping technology. Additionally, identifying combinations of planting and termination dates of a rye cover crop will progress adoption and integration of this cover crop for improving soil quality and reducing weed populations.

CHARACTERISTICS AND DISTRIBUTION OF GARLIC MUSTARD: AN INVASIVE SPECIES. D. Sarkar, P.C. Bhowmik, and N. Tharayil, Univ. of Massachusetts, Amherst.

ABSTRACT

Garlic mustard [*Alliaria petiolata* (Bieb.) Cavara and Grande], is a cool season, shade tolerant, biennial herbaceous plant. It belongs to Brassicaceae or mustard family. Currently, it is reported as an invasive plant species (Figure 1). Garlic mustard is native to Western Eurasia, ranging from England to Sweden to the western regions of former USSR (Turkestan, NW-Himalayas), India and Sri Lanka, and south to Italy and Mediterranean basin. This species was introduced to North America by early European settlers for its medicinal properties and for culinary purpose. It is widely distributed in the northeastern and midwestern states, ranging from southern Ontario to Tennessee and Georgia (Figure 1). Isolated occurrences have been reported in Utah, Colorado, and in the Pacific Northwest. Garlic mustard most frequently occurs in moist, shaded soils of river floodplains, deciduous forests, roadsides, edges of woods, forest openings and trails. It grows on sand, loam and clay soil, limestone and sandstone substrates with high fertility. Garlic mustard rarely occurs on peat or muck soil and does not tolerate high acidity. This species presents a potential threat to native plants and animals in forest communities. Once introduced to an area, garlic mustard outcompetes native plants by aggressively monopolizing light, moisture, nutrient, and space. Seedlings emerge in early March and emergence continues till May. The first year plant develops the rosette stage consisting of a cluster of 3 or 4 round, scallop edged leaves rising 2 to 4 inches tall. Plants flower irrespective of their size in the following March-April. Flowering plant ranges from 12 to 48 inches in height. Generally, garlic mustard produces one or two flowering stem with numerous white flowers that have four separate petals. Leaves are alternate and triangular in shape, have large teeth, and can be 2 to 3 inches across in fruiting plants. Leaves and stem give off an odor of garlic when crushed. Flowers are either self fertilized or cross-pollinated by a variety of insects. Viable seeds are produced within days of initial flowering. Fruits are slender capsules 1 to 2.5 inches long that produce a single row of oblong black seeds with ridged seed coats. Seed production varies from 66 to 356 seeds per plant, but can be as high as 7900 seeds for robust plants. The seeds are dispersed by large animals, by flowing water and by human activities. Seeds of garlic mustard exhibit a remarkably strong innate dormancy and require 50 to 105 days of cold stratification. Effective management strategy requires a long term commitment because seeds of garlic mustard can remain viable in the soil for five years or more. For light infestation, mechanical control like, hand pulling or cutting at ground level can prevent seed production. Severely infested land can be controlled by glyphosate (1 to 2% solution) application to the foliage during late fall or early spring. Fall and early spring burning may be effective, but it can encourage germination of seeds from the seed bank. Finally, this species should be monitored carefully for its future infestation in other habitats and suitable control measure should be developed for forest communities.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INFLUENCE OF AMF ON COMPETITION BETWEEN THE INVASIVE VINE, PALE SWALLOW-WORT AND COMMON MILKWEED. L.L. Smith, A. DiTommaso, J. Lehmann, Cornell Univ., Ithaca, NY, and S. Greipsson, Troy State Univ., Troy, AL.

ABSTRACT

Ecosystem degradation resulting from increasing invasion of aggressive non-native plants ranks as one of the greatest threats to biodiversity. During the last 20 years, the invasive alien vine pale swallow-wort (*Vincetoxicum rossicum*) [Asclepiadaceae], has become a major problem in the Great Lakes Basin of the Northeastern U.S. and Ontario, Canada. One possible mechanism that may facilitate pale swallow-wort invasion is its ability to form strong mycorrhizal associations. A de Wit replacement series design was used to assess the effects of the soil microbial community, specifically arbuscular mycorrhizal fungi (AMF), on competition between pale swallow-wort and common milkweed (*Asclepias syriaca*), a native Asclepiad species that occurs in similar habitats.

In this study, soils were collected from two central NY State field sites dominated either by pale swallow-wort or common milkweed. For each soil type, three treatments were used: (1) sterile, autoclaved soil, (2) unamended soil, treated with the mycorrhizal suppressant fungicide benomyl at 20 mg kg-1 soil every three weeks, and (3) no amendments. Plants were grown in the greenhouse for four months at a density of 4 plants/pot in proportions of 100:0, 75:25, 50:50, 25:75, and 0:100 pale swallow-wort:common milkweed mixture. The total, shoot, and root dry biomass of both species was significantly lower ($p < 0.0001$) when plants were grown in the sterile soil treatment compared with soil from the benomyl or unamended treatments. Morgan extraction of whole plant tissue showed that both species growing in sterile soil had significantly lower phosphorus, potassium, calcium, and magnesium content than unamended soil (soil from both treatments was non-limiting for nutrients). Relative yields of both species were not significantly different from one another when comparing total yield, or root and shoot dry weights. Pale swallow-wort plants did show a significant competitive advantage in root-to-shoot production over common milkweed ($p = 0.0003$) in the unamended treatment, especially when grown in previously swallow-wort dominated soil. The relative crowding coefficient (RCC), while not statistically significant, supported this general trend. The relative yield total (RYT) in all treatments did not significantly differ from 1.0 suggesting that both species were utilizing the same resources. Therefore, the lack of a soil microbial community significantly reduced the relative biomass of both species and may have promoted the competitive advantage afforded pale swallow-wort in terms of root-to-shoot production.

IS THERE EVIDENCE FOR VOLATILE NOVEL WEAPONS IN THE INVASIVE WEED MUGWORT? J. Barney, J. Sparks, and T. Whitlow, Cornell Univ., Ithaca, NY.

ABSTRACT

One mechanism proposed to explain the success of invasive species in their introduced range is that of secondary metabolite mediated plant-plant interactions. The Novel Weapons Hypothesis posits that chemicals exuded in the native range are benign to the surrounding plant community due to their coevolutionary history, whereas in the introduced range these compounds are often foreign to the surrounding biota and become toxic. To date, this theory has primarily been examined in knapweed (*Centaurea* sp.) root exudates with no attention paid to atmospherically emitted secondary products. Biogenic volatile organic carbon compounds (BVOC) are gaseous plant products involved in the formation of ozone and the propagation of aerosol in the atmosphere, as well as in direct plant-plant interactions. Several studies have putatively demonstrated BVOC (specifically terpenoid) mediated allelopathy in several introduced species, but have not examined the Novel Weapons Hypothesis. We examined the *in situ* role of BVOCs in the invasion dynamics of the perennial weed mugwort (*Artemisia vulgaris*), a common Eurasian invader of North American rights-of-way, nurseries, and disturbed sites. Initial laboratory studies using enclosed test chambers showed excised crushed mugwort leaves can decrease seed germination/establishment via indirect (atmospheric) interaction, at high BVOC concentrations (ppm). To determine if terpenoids were mediating competition in the field we quantified intra-canopy BVOC concentrations in two monospecific mugwort populations before and after disturbance. Only after heavy disturbance were BVOC concentrations higher than ambient, yet they existed at concentrations 3-6 orders of magnitude lower than laboratory bioassay studies. Preliminary evidence for atmospherically mediated allelopathy is poor in this species, and does not support the Novel Weapons Hypothesis.

WEED SEED PREDATION BY GROUND BEETLES. M. Murray, W. Curran, M. Barbercheck and D. Mortensen, Penn State Univ., University Park.

ABSTRACT

Weed management in cropping systems is a constant challenge for farmers. Crop-weed competition causes an overall crop yield loss of 12% annually, costing farmers around $4 billion dollars. As a result, many farmers resort to chemical herbicides to control nuisance weeds.

Since 1966 herbicide use in the United States has increase four-fold. In 1997, farmers worldwide spent approximately $16.9 billion dollars on herbicides. Due to the negative impacts of herbicides on farm profitability and human and environmental health, farmers and communities are searching for alternative weed management practices.

Ecologically based weed management may be the answer. This practice reduces weeds by altering the ecological processes occurring in an environment. One type of ecological management is conservation biological control that consists of enhancing natural biocontrol agent populations that help keep pests in check. Weed seed predation by ground beetles is one such biocontrol agent. Ground beetles can be responsible for up to 90% of weed seed predation in agroecosystems and can consume up to 11 seeds daily. *Harpalus pensylvanicus* is a granivorous ground beetle that is native to Pennsylvania and the Northeast. This beetle is believed to feed on a number of weed seeds frequently found in Pennsylvania farm fields.

The use of *H. pensylvanicus* as a major weed seed predator is being examined at Pennsylvania State University. *Harpalus pensylvanicus* consumes not only weed seeds, but also numerous biota including pollen and insect eggs, larvae and adults. By evaluating the overlap in beetle activity density and weed seed rain, the importance of weed seeds to *H. pensylvanicus*' survival and their impact on weed management can be assessed.

H. pensylvanicus' activity density was monitored July through October 2004 and June through September of 2005. Giant foxtail *(Setaria faberi)* seed rain was monitored at two locations in 2005. Beetle activity density peaked during the beginning of August in both 2004 and 2005. In addition, there was a drastic increase in activity density in mid-July and a drastic decrease in mid-September. On the other hand, giant foxtail weed seed rain occurred between August and October. Preliminary results suggest that peak weed seed rain in central Pennsylvania occurs during late September and early October.

These results imply that *H. pensylvanicus*' lifecycle may not be synchronized with the weed seed rain of several major summer annual weeds in central Pennsylvania. *H. pensylvanicus* had peak activity density in the beginning of August while peak giant foxtail seed rain occurred in late September and early October. Future research should focus more on food preference by *H. pensylvanicus* and other weed seed predators that could impact the summer annual weed seed bank.

A MULTI-DISCIPLINARY APPROACH TO THE CONTROL OF JAPANESE KNOTWEED. A.Z. Skibo and M.A. Isaacs, Univ. of Delaware, Georgetown.

ABSTRACT

Japanese Knotweed (*Polygonum cuspidatum* syn. *Fallopia japonica*; POLCU) is an invasive, herbaceous perennial plant that has become a major weed in riparian areas throughout Delaware. Preliminary greenhouse herbicide screening trials were conducted in 2003-2004 examining POST-applied herbicide combinations for efficacy on POLCU. Field experiments were conducted over 2003-2004 to evaluate single season control and the effects of multi-year herbicidal combinations on POLCU. A second field trial was conducted in 2005 to verify single-season control results obtained in 2003. Mesotrione (.106, .186, and .23 kg ai/ha) in combination with dicamba (.56 and .84 kg ai/ha) plus atrazine (1.12 kg ai/ha) provided very good control (93%) 28 days after treatment (DAT). Nicosulfuron (0.0133 kg ai/ha) plus rimsulfuron (0.0133 kg ai/ha) plus atrazine (0.85 kg ai/ha) plus dicamba (.56 kg ai/ha), and the combination of primisulfuron (.2 kg ai/ha) plus dicamba (.56 kg ai/ha) provided very good control (90% and 83%) respectively, 28 DAT. Carfentrazone-ethyl (.0058 kg ai/ha) plus dicamba (.56 kg ai/ha) with atrazine (1.12 kg ai/ha) provided excellent control (94%) 28 DAT. Triclopyr (.56 and .28 kg ai/ha) in combination with carfentrazone-ethyl (.093 kg ai/ha) provided an excellent control (90%) when compared to Triclopyr (.56 kg ai/ha) alone (71%) 28 DAT. F-4113 (.06 kg ai/ha carfentrazone-ethyl plus 2.81 kg ai/ha IPA salt of glyphosate, FMC.) provided greater control of POLCU (74%) 28 DAT, as compared to glyphosate (potassium salt of glyphosate 3.65 kg ai/ha) alone, (34%) 28 DAT. However, the year following treatment, the potassium salt glyphosate treatments did provide excellent control of plant biomass. Presently, a population genetics survey is being conducted on POLCU congeners utilizing eight simple sequence repeat (SSR) microsatellite markers to determine hybrid prevalence and distribution across the Delmarva Peninsula.

CLONAL EXPANSION AND REPRODUCTIVE OUTPUT OF THE INVASIVE VINE PALE SWALLOW-WORT IN CENTRAL NY STATE. K.M. Averill, A. DiTommaso, C.L. Mohler, S.H. Morris, Cornell Univ., Ithaca, NY, and L.R. Milbrath, USDA-ARS, Plant, Soil and Nutrition Lab, Ithaca, NY.

ABSTRACT

The non-native invasive vine, pale swallow-wort [*Vincetoxicum rossicum* (Kleopow) Barbar. (Asclepiadaceae)] is becoming a species of great concern in many northeastern states and the Canadian Provinces of Ontario and Quebec. This herbaceous perennial invades a range of habitats and has the capacity to smother and outcompete native vegetation. The effective management of non-native invasive plants such as pale swallow-wort using the classical biological control approach may provide economically and environmentally feasible long-term suppression. However, the eventual success of the biological control program is dependent on the availability of essential biological and ecological data about which life stage(s) of pale swallow-wort are important for population growth and are most susceptible or sensitive to control efforts. The objectives of this study are to determine (1) the rate of clonal (vegetative) expansion, and (2) the reproductive output of isolated pale swallow-wort plants of similar size at four infested sites in central NY State. At each site, assessments were made in two habitats typically invaded by pale swallow-wort, old-fields and forest understories. Clonal expansion data were collected from 30 target plants in each habitat at each site and reproductive data were collected from a subset of these target plants. During this first season of monitoring, clonal expansion was surprisingly minimal likely because of the extremely dry conditions experienced during the 2005 growing season. Although the number of seedlings and follicle production were variable between the different sites, values were generally lower in the forest understory compared with old-field habitats. Differences in light availability between the forest understory habitats at the four sites may explain some of the variability observed. The monitoring of these target plants will continue during the 2006 and 2007 seasons.

THE POTENTIAL FOR ALLELOPATHY DURING DECOMPOSITION OF HAIRY VETCH RESIDUE. J.R. Teasdale, A.A. Abdul-Baki, USDA-ARS, Beltsville, MD; Y.B. Park, Cheju National Univ., Jeju, South Korea; and R.C. Rosecrance, Chico State Univ., Chico, CA.

ABSTRACT

Residue of leguminous cover crops such as hairy vetch (*Vicia villosa* Roth) on the soil surface in minimum tillage cropping systems contributes to integrated weed management and provides nitrogen for subsequent crops. Rapid decomposition is a recognized characteristic of hairy vetch residue, but there has been little research to document the change in allelopathic potential of this residue during decomposition.

Hairy vetch aboveground vegetation was harvested from the field one day before desiccation with paraquat, five days after desiccation, or one month after desiccation and brought to the greenhouse for assay. Emergence of several annual weed species was assessed as a function of various rates of hairy vetch residue placed on the soil surface. There was no significant difference between live or recently killed vetch in suppressing weeds when compared at equivalent biomass. However, vetch harvested just before or just after desiccation suppressed all species more than vetch residue that remained in the field for one month. The I50 values were approximately doubled when residue remained in the field for one month. In a second experiment, fresh hairy vetch was used intact (unleached) or was leached in a container overnight with a circulating pump. A similar greenhouse assay was conducted as that previously described for assessing suppression of weed emergence by residue. Stems of leached residue were similar in diameter to those of unleached residue, averaging 1.8 mm. However, unleached hairy vetch residue had intact leaves whereas leached residue had shriveled or missing leaves. Unleached hairy vetch residue inhibited emergence of all weed species more than a comparable amount of leached residue. In a petri dish assay, aqueous extracts of living hairy vetch shoots harvested before the cover crop was killed were more toxic to lettuce roots than extracts of desiccated hairy vetch residue. By 3 weeks after kill, extracts of hairy vetch residue had lost 23 to 51% of activity relative to the activity of extracts from live hairy vetch tissue. By 6 to 9 weeks after kill, extracts of hairy vetch residue had little activity left. In addition, aqueous extracts of upper leaf tissue had more inhibition than lower leaf or stem tissue.

All of these results could be explained by the presence of aqueous soluble allelopathic compounds in fresh hairy vetch residue that were lost during the decomposition process in the field or the leaching process in the laboratory. Higher inhibition of seedling growth by aqueous extracts of upper leaves compared to lower leaves or stem tissue is consistent with the findings that fresh and unleached tissues were more inhibitory than decomposed and leached tissue. Generally, decomposed and leached material had lost most leaf tissue and was composed primarily of stems. This suggests that allelochemicals are present primarily in the most metabolically active upper leaves of fresh hairy vetch residue and that allelopathy contributes to weed suppression for a relatively short time following cover crop kill until leaf tissue has decomposed.

WEED SEEDBANK DECLINE IN PLASTIC-MULCHED BEDS. E.R. Gallandt and T. Molloy, Univ. of Maine, Orono.

ABSTRACT

A field trial, comparing fall-made "permanent" plastic-mulched beds with repeatedly established (in the same locations) spring-made beds, was established at the Rogers Farm in Stillwater, ME, in late September 2002. Each bed treatment consisted of three beds; the area between the fall beds was sown to perennial ryegrass that, overtime, became a mixture of ryegrass and white clover. This sod area was managed by mowing with a side discharge mower to distribute clippings onto the plastic in an effort to protect the plastic from UV degradation.

Based on observation of the soils in the greenhouse flats, the Fall between bed soils were darker and with greater aggregates than any other treatments. Water infiltration, measured as an indicator of soil quality, was similar in the Fall and Spring bed treatments. Soil samples were collected from the within and between bed areas of both the Fall and Spring bed treatments for analysis of particulate organic matter.

The germinable seed bank was similarly very low (< 100 total germinable weed seeds per m^{-2} to 10 cm depth) within beds of both Fall and Spring bed treatments. Attention to weed management along plastic edges, i.e., by hand pulling, and timely mowing are needed to reduce likely seed rain between beds where the total germinable seedbank was comparatively greater. Benefits of longer-term plastic mulching regarding weed seedbank depletion are likely obscured when plastic is removed and tillage homogenizes the relatively weedy between bed area and the relatively weed-free bed area.

THE INFLUENCE OF TRANSPLANT TIMING ON THE SAFETY OF PREEMERGENCE HERBICIDES TO BEDDING PLANTS. A.F. Senesac, Cornell Coop. Ext., Riverhead, NY and D. Loughner, Dow Agro Sciences, Huntingdon Valley, PA.

ABSTRACT

A field trial was established in June 2005 at the LIHREC to determine if delaying planting after preemergence herbicide application affects the safety to five bedding plants. On June 21, two pre-emergence granular herbicides, Rout 3G, (oryzalin/oxyfluorfen) at 0.75 and 1.5 lbs/A (a.i.) and Woodace Preen Plus 1.88G at 2.5 and 5.0 lbs/A (a.i.) were applied to freshly tilled Riverhead sandy loam. Three plants each of the following bedding plants: celosia, dahlia, dusty miller, gazania and marigold were planted into one set of plots and the entire study was irrigated immediately with 1 inch of water. At 3 and 7 days after treatment, a second and third set of the same bedding plant cultivars were transplanted into treated plots. As a standard comparison, another set was transplanted into soil treated with trifluralin Preen 1.87G (4.0 lbs/A a.i.) on the day of transplanting. Injury was evaluated at 8, 15, 29 and 34 days after treatment. The aboveground fresh weight of all plants was measured 35 days after treatment. The results indicate that significant stunting injury, which was relatively slow to appear, was evident in all treated plots to some extent. The results of the fresh weight harvest indicate that the delay in planting by seven days caused the greatest level of treatment-related injury. In general, the least injured were those planted on the day of treatment. This effect is contrary to the conventional wisdom that a delay in planting after treatment 'safens' preemergence herbicides on herbaceous plant material. However, it appears that the irrigation after each planting had the effect of moving the herbicides into the soil solution and therefore in a region that allowed for greater contact with plant roots; thus increasing the injury.

DISCOVERY OF A FEDERAL NOXIOUS WEED ON A RESEARCH STATION AND ITS IMPACTS ON RESEARCH AND MAINTENANCE ACTIVITIES. J.C. Neal and M.G. Burton, North Carolina State Univ., Raleigh.

ABSTRACT

Benghal dayflower (*Commelina benghalensis*), also known as tropical spiderwort, is a federal noxious weed that spreads by above-ground and underground stems, and seeds produced by above-ground and subterranean flowers. This species, like many others in the dayflower family (Commelinaceae) is tolerant of many herbicides and can be quite difficult to control. The North American distribution is FL, GA, LA and CA. In 2001 this species was discovered on a research farm operated by the North Carolina Department of Agriculture (NCDA) and North Carolina State University (NCSU). Subsequently, the species has been discovered on two more NCDA and NCSU research farms, most recently at the Horticultural Research Laboratory (HFL) in Raleigh NC. A standard response to such a discovery is to rapidly quarantine the area, fumigate the infested site(s) and monitor the treated area and adjacent fields for new emergence. However, long-term research projects at the research farms represented significant public investments that could not be replaced. Therefore, a long-term management strategy was established in the long-term research plots that includes a quarantine of all soil and articles that might transport soil and propagules from the affected areas, a wash station for all equipment and vehicles that exit the quarantined site, and intensive scouting and control programs. The most recent discovery at the Horticulture Field Laboratory raised the questions: “Is the quarantine effective? And, Could NC State University staff or vehicles be vectoring propagules to new sites?” However, the HFL site and other infested sites had no shared equipment, vehicles or staff. Therefore, other means of dispersal (e.g. animals, pine straw mulch or contaminated stock plants) are likely responsible for the movement of the propagules. The discovery on research farms has placed significant financial and operational burdens on researchers and farm managers at these sites. Following the identification of a noxious weed on a research farm, rapid and decisive action is necessary to prevent further spread of the species and to be consistent with the mission of institutions dedicated to protecting the quality of life of the people and environments of the state.

FIELD HORSETAIL RESPONSE TO HERBICIDES IN NON-CROPPING SYSTEMS.
D.A. Little, Michigan State Univ., East Lansing, R.J. Richardson, North Carolina State Univ., Raleigh, B.H. Zandstra, and M. Wilson, Michigan State Univ., East Lansing.

ABSTRACT

Field horsetail is a primitive, perennial weed species that is tolerant to many herbicides. It is commonly found in landscapes, orchards and nurseries. In 2003, 2004, and 2005 field and greenhouse studies were conducted to determine potential herbicide controls for field horsetail. Field trials were conducted at three Michigan nurseries and a Michigan State research farm. Treatments included dichlobenil (2.24 kg ai/ha), glufosinate (1.12 kg /ha), dichlobenil + glufosinate, flumioxazin (0.28 kg/ha), glufosinate + flumioxazin, glufosinate + flumioxazin + oryzalin (3.36 kg/ha), halosulfuron (0.07 kg/ha) + clopyralid (.21 kg /ha) + non-ionic surfactant (0.25 % v/v), flumioxazin + halosulfuron + non-ionic surfactant, mesotrione (.28 kg/ha) + crop oil concentrate (0.25 % v/v), clopyralid (0.47 kg/ha) + MCPA (2.63 kg/ha), triclopyr (1.12 kg/ha), fluroxypyr (0.21 kg/ha), 2,4-D (1.12 kg/ha) + triclopyr, and glyphosate (2.24 kg/ha). At one month after treatment, dichlobenil, dichlobenil + glufosinate, clopyralid + MCPA, glufosinate + flumioxazin + oryzalin, and glufosinate + flumioxazin gave the best and most consistent control. Dichlobenil is showing promise as a pre-emergence control. Growth regulator herbicides like 2,4-D, triclopyr and MCPA gave strong results. The combination of glufosinate + flumioxazin gave 71% to 94% control and glufosinate + flumioxazin + oryzalin gave 78% to 99% control. Greenhouse results were similar to the field results; however, control was generally better in the greenhouse.

ROOT HARDINESS AND THE INFLUENCE OF DNA HERBICIDES IN OVERWINTERED CONTAINERS. M. Bigger and H. Mathers, The Ohio State Univ., Columbus.

ABSTRACT

The limiting factor in container production is temperature. Young roots have been found to be significantly less hardy than their mature counterparts (Steponkus, 1976; Studer et al., 1978). The objectives of this research were to: determine young and mature root hardiness values for containerized plants treated and not treated with herbicides and investigate differences in growth potential between untreated and DNA herbicide treated containers 30 and 60 days after emergence (DAE) from overwintering. Research was conducted 2003-2004 (Year 1) and 2004-2005 (Year 2).

In the fall (August 8, 2003, & August 16, 2004) plants received their initial fall herbicide treatment of 1X Surflan (oryzalin, 2.0lbs. ai/A), Barricade (prodiamine, 2.0lbs. ai/A), Pendulum (pendimethalin, 3.0lbs ai/A), Treflan (trifluralin, 2.0 lbs ai/A) or no treatment (control). This was repeated again October 15, 2003, and October 12, 2004. In addition, the trial year 2 had a third herbicide application, directly after planting in the spring (May 26, 2004). November 12, 2003 and November 15, 2004, plants were measured for overall height, and consolidated into a poly house covered with 4-mil milky poly. 100 plants, both years, were overwintered completely in the unheated poly house to emulate standard container nursery overwintering practices. Shoot and root dry weights, and a visual rated score 0-10 (0=complete death, 10=no injury present) were taken at the end of May each year. Another 500 plants were exposed to artificial freezing temperatures of, 0,-5,-10, -15, or –20°C in either January or March of each year. After freezing they were placed in a heated greenhouse and evaluated for regrowth one and two months after freezing and/or evaluated for root browning. Regrowth was evaluated two ways by a visual rating score 0-10. Browning was assessed in mature and young roots by a visual rated score 0-4, (0=no injury present, 4=complete death).

The data shows the greatest benefit of herbicide treatments were in the temperature range of 0°C to -5°C. The species most affected by herbicide were dogwood and viburnum. The best measure of effects was at 30 DAE verses 60 DAE. The herbicide effects were also greatest with young roots verses mature roots. Fluctuations in temperatures were greater, and had a longer duration in year 2. Herbicide treatment effects were greatest in year 2 in the poly house experiment and with the artificial freezes. Evidence indicates the ambient group in year 2 did not correlate as well as in year 1 with percent survival data of young roots indicating that temperature fluctuation in the soil was a major factor. Herbicide effects were greatest with Surflan and Barricade. Surflan effects were more pronounced in year 1 when plants were smaller and Barricade in year 2 when starting plants were larger. Data indicates the Barricade and Surflan may serve to protect the roots between 0°C and -5°C under fluctuating temperature conditions. This protection, which was marked by an increase in root mass with Barricade, was at the expense of the shoot growth.

POSSIBLE NEW USES FOR NEW AND OLD ORNAMENTAL HERBICIDES. L. Case and H. Mathers, The Ohio State Univ., Columbus.

ABSTRACT

Six herbaceous perennial species were selected as part of an IR-4 project to determine if these species are tolerant to pendimethalin (Pendulum 2G), isoxaben+trifluralin (Snapshot), and s-metolachlor (Pennant Magnum). Species selected were agastache (*Agastache* 'Blue Fortune'), Japanese Painted Fern (*Athyrium nipponicum* 'Pretum'), clematis (*Clematis* 'Midnight showers'), Helianthus (*Helianthus salicifolius* 'First light'), switchgrass (*Panicum virgatum* 'Dallas blues'), and spiderwort (*Tradescantia x andersoniana* 'Sweet kate'). Plants were upshifted to two-gallon (#2) pots filled with a media consisting of 60% hardwood, 32% pinebark (19.2% pb, 12.8% pb fines), 6% municipal sludge, 2% grit on June 16 or 17, 2005 and placed in shade (Clematis, Spiderwort, and Fern) or outside (Agastache, Switchgrass and Helianthus) at Smith's Gardens near Delaware, OH. On June 21, 2005, treatments were applied, and on July 26, 2005, treatments were reapplied. Each herbicide was applied at three rates and was compared to a control at 8 evaluation dates: 3 DA1T (days after first treatment), 7 DA1T, 14 DA1T, 28 DA1T, 3 DA2T (days after second treatment), 7 DA2T, 14 DA2T, and 28 DA2T. Application of s-metolachlor was accomplished with a CO_2 backpack sprayer equipped with 8002 evs flat-fan nozzles at rates of 2.5 lb ai/A (1X, 2.8 kg ai/ha), 5.0 lb ai/A (2X, 5.6 kg ai/ha), and 10 lb ai/A (4X, 11.2 kg ai/ha), and an application volume of 25 gal/A (233 L/ha). Isoxaben+trifluralin and pendimethalin were applied using a handheld shaker jar. Isoxaben+trifluralin rates were 2.5 lb ai/A (1X, 2.8 kg ai/ha), 5.0 lb ai/A (2X, 5.6 kg ai/ha), and 10 lb ai/A (4X, 11.2 kg ai/ha). Pendimethalin rates were 2.0 lb ai/A (1X, 2.3 kg ai/ha), 4.0 lb ai/A (2X, 4.5 kg ai/ha), and 8.0 lb ai/A (9.0 kg ai/ha). Trial design was a randomized complete block design with three reps. Each rep consisted of ten treatments; each treatment had six species with three subsamples per species. Evaluations consisted of taking plant heights and widths, and visual rating scores. Visual rating scores were based on a 1-10 scale, 1 representing no phytotoxicity and 10 representing death.

All three herbicides were phytotoxic to at least one of the species at one of the rates tested. Pendimethalin caused phytotoxicity to Agastache at 8.0 lb ai/A; phytotoxicity did not show up until 28 DA1T. Stems became brittle and many snapped off, which then became dead. Pendimethalin was also phytotoxic to the Fern, mostly at the 2X and 4X rates, also not showing up until 28 DA1T. Isoxaben+trifluralin caused some problems with the Agastache, mostly with the 4X rate. Stems became somewhat brittle, however, not enough to break off; rather, they just drooped over.

Isoxaben+trifluralin also caused phytotoxicity to Fern at all rates tested, again, not showing up until 28 DA1T. Agastache showed phytotoxicity to s-metolachlor, especially after the first application and at the higher rates. Plants showed leaf distortion and burning about 14 DA1T and were not able to recover from the first application, and the second application did not have much of an effect on the plants; in fact, the plants that were sprayed with the 1X rate almost recovered fully by 28 DA2T. Spiderwort should not be sprayed with any rate of s-metolachlor. Plants quickly lost their yellow color, and many died at the 2X and 4X rates. Some of the Spiderwort

plants that were sprayed with the 1X rate did get back some of the yellow color, but were very distorted and small. Fern showed some frond scorching from the s-metolachlor, with the magnitude increasing with increasing rates, especially right after each application. Fern does have significant regrowth after application of s-metolachlor, with either the 1X or 2X rate; the 4X rate should not be applied to Fern. This trial showed each of these herbicides had some value in a perennial container yard.

HERBICIDAL CONTROL OF BUTTERFLY BUSH. M. Zazirska and J. Altland, Oregon State Univ., Corvallis.

ABSTRACT

Butterfly bush (*Buddleja davidii*) is native to China but has been reported as an invasive weed in Europe, New Zealand, Australia, and parts of the United States. It was introduced to the United States as an ornamental and is now widely distributed in landscapes and gardens. Several factors lend to its invasive habits. Butterfly bush starts flowering and producing seed in its second year, although some panicles may be present within the first year. It has enormous reproductive potential with approximately 3 million seeds per mature plant (1). Seeds are small, lightweight and capable of being dispersed by multiple vectors such as wind, water, animals and human activities. Butterfly bush rapidly develops an extensive root system that allows it to survive on dry soils during periods of drought stress. In Oregon it has been documented to colonize industrial sites, road sides, and other waste areas. However, of greatest concern is its spread into natural riparian areas.

Due to increasing awareness of its invasiveness, there is greater need for control recommendations. The objective of this research is to determine which herbicides and application methods are most suitable for eradicating butterfly bush from natural or riparian areas.

Uniform plants in 4 inch pots of the cultivars 'Black Knight' and 'Ellen's Blue' were planted in a Willamette silt loam soil July 26, 2004. Eight single plant replications per cultivar were planted in a randomized complete block design. Herbicides were applied to butterfly bush on September 16, 2005 when plants were approximately 6 to 7 feet tall and wide, and all were flowering profusely. Sprayed herbicides were applied using a CO_2 backpack sprayer with a single 8004 flat fan nozzle at 35 psi. Painted herbicides were applied to recently cut stumps in the concentrated form using foam paint brushes. Herbicides and rates are listed in Table 1. Herbicides were applied so that the amount of active ingredient applied to plants in paint and spray treatments were the same. Plants were rated at 1, 2, and 4 weeks after treatment (WAT) for control. Plants were rated on a scale from 0 to 10 where 0 = no injury, 3 = slight injury, 5 = moderate injury, 7 = severe injury, and 10 = complete death.

At 1 and 4 WAT, control ratings were higher on 'Black Knight' compared to 'Ellen's Blue' for all treatments indicating cultivar differences in herbicide tolerance. By 4 WAT, sprayed Aquamaster (glyphosate) and Roundup Ultramax (glyphosate) provided better control than Arsenal (imazapyr) and Garlon 3A (triclopyr). Ratings were high among all painted treatments, however, because most of the plant was pruned off prior to application, these plants were difficult to rate accurately. Some branches remained at the base of the plant, by which control was rated. Because plants were large at the time of treatment, spraying was difficult and would be even more difficult in natural areas where preservation of surrounding vegetation was desired. Painting herbicides appears to be an effective alternative to spraying, especially in sensitive ecosystems such as riparian areas.

Table 1. Postemergence butterfly bush control with selected herbicides and application methods.

Application method	Herbicide	Product	Rate (ml/plant)	1 WAT Black Knight	1 WAT Ellen's Blue	4 WAT Black Knight	4 WAT Ellen Blue
Paint	glyphosate	Aquamaster	10.0[z]	6.5 a	4.3 a	10.0 a	9.4 a
	glyphosate	Roundup	10.5	5.6 a	4.0 ab	10.0 a	9.0 ab
	imazapyr	Arsenal	7.5	2.6 c	1.9 d	9.3 b	6.9 c
	triclopyr	Garlon 3A	15.0	3.1 bc	3.0 bc	9.5 ab	7.4 c
Spray	glyphosate	Aquamaster	2.0[y]	4.1 b	1.3 d	10.0 a	7.8 bc
	glyphosate	Roundup	2.1	3.6 bc	1.3 d	9.8 ab	8.1 abc
	imazapyr	Arsenal	1.5	1.1 d	0.0 e	6.5 d	2.6 d
	triclopyr	Garlon 3A	3.0	3.1 bc	2.1 cd	7.6 c	7.3 c
Non-treated control				0.0 e	0.0 e	0.0 e	0.0 e

[z] The rate for painted plants is expressed as ml/plant, where rate was applied directly to cut stems of each plant.
[y] The rate for sprayed plants is expressed as the % concentration in spray solution. All sprays were applied at a rate of 500 ml/plant.

1. Miller, A. 1984. The distribution and ecology of *Buddleia davidii* Franch. In Britain, with particular reference to conditions supporting germination and the establishment of seedlings. D. Phil. Theses, CNAA, Oxford Polytechnic.

QUINOCLAMINE FOR CONTROL OF LIVERWORT IN THE PROPAGATION OF WOODY ORNAMENTALS. T.L. Mervosh and J.F. Ahrens, Connecticut Agricultural Experiment Station, Windsor.

ABSTRACT

Liverworts are common and troublesome weeds in container-grown nursery stock, especially in propagation houses and greenhouses. Liverworts are bryophytes, primitive plants that spread vegetatively and reproduce via spores, not seeds. Thus, they are unaffected by most herbicides used to prevent weed seedling emergence in containers. The IR-4 Ornamental Crops program has placed a high priority on evaluating plant tolerances to quinoclamine, a compound known to provide control of liverworts. Quinoclamine (Mogeton 26WP) is not yet registered for use in the U.S.

We started the experiment in March 2005 in a propagation house at a large nursery. Minimum temperature in the house was 50º F, and exhaust fans turned on when temperatures reached 85º F. Five woody species were included in the experiment: compact inkberry (*Ilex glabra* 'Shamrock'), Japanese barberry (*Berberis thunbergii* 'Crimson Pygmy'), common lilac (*Syringa vulgaris* 'Charles Joly'), azalea (*Rhododendron* 'Orchid Lights'), and rhododendron (*R. catawbiense* 'Nova Zembla'). Plants were newly potted as plugs in pint-sized containers with media consisting of 60% bark, 24% peat moss, 8% perlite and 8% vermiculite. Liverwort (*Marchantia polymorpha* L.) was prevalent in most pots. Experimental plots consisted of three plants of each species. Plots were arranged in randomized complete blocks with four replicates. Plant height (longest shoot) and percentage of pot surface area covered by liverwort were recorded prior to the first set of treatment applications on March 23. The plants and liverwort were actively growing at this time. Quinoclamine dosages of 0, 3.25, 6.5 and 13 lb ai/A were sprayed over the top of plants in a volume of 100 gallons per acre (Mogeton concentrations were 0, 2, 4 and 8 ounces per gallon of spray). Treatments were sprayed in two passes with a two-nozzle boom equipped with TeeJet 8004VS tips calibrated to apply 50 gal/A at 36 psi and 3 ft/s walking speed. Inside temperature was 55º F. Pots were irrigated via overhead sprinklers for the first time 24 hr later. Visual control ratings for liverwort were recorded 1 and 4 weeks after the first treatment application (WAT1). Liverwort populations were the most dense and uniform in inkberry pots. Plant injury ratings were recorded 1, 2 and 4 WAT1, and plant heights were measured 4 WAT1 (April 20). Treatments were re-applied over the same plants on April 20 when the temperature was 90º F in the house. Procedures were the same as before. Liverwort declined in all pots as the house became hotter, so liverwort was not evaluated after April 20. Plant injury was rated at 1, 2 and 8 weeks after the second treatment (WAT2), and plant heights were measured 8 WAT2 (June 23).

No significant injury or growth reduction was observed on inkberry, lilac or rhododendron at any time. Azalea treated with the highest quinoclamine dose displayed moderate injury symptoms but overall growth reduction was minimal. Some injury to barberry occurred at all doses, but the extent of injury was variable from plant to plant. At 4 WAT1 in inkberry pots, liverwort control (percent reduction in area covered by liverwort relative to untreated pots) was 79, 95 and 99% at quinoclamine doses of 3.25, 6.5 and 13 lb ai/A, respectively. Quinoclamine demonstrates potential for providing liverwort control in containers of tolerant ornamental plants.

EFFECT OF FLUMIOXAZIN IN LATE FALL ON CONTAINER-GROWN DECIDUOUS SHRUBS.

S. Barolli, Imperial Nurseries, Granby, CT; J.F. Ahrens, Connecticut Ag. Exp. Sta., Windsor; and R. Gray, Imperial Nurseries, Granby, CT.

ABSTRACT

Previous experiments indicated that deciduous shrubs tolerate sprays of flumioxazin only when fully dormant in the spring. Flumioxazin sprays after bud break in the spring or on deciduous shrubs in early fall have caused unacceptable injury. The objective of this experiment was to determine whether certain deciduous shrubs would be affected by flumioxazin sprays applied in late fall after the shrubs were senescing but still in leaf.

Three plants of each of five species in 2-gallon containers were included in each experimental unit. Ten herbicide treatments were replicated four times in randomized complete blocks. The plants included spiraea (*Spiraea* 'Magic Carpet'), potentilla (*Potentilla* 'Gold Finger'), azalea (*Rhododendron* 'Northern Lights'), lilac (*Syringa* 'Miss Kim') and rose (*Rosa* 'Knockout'). All plants were in full leaf at treatment but had been exposed to several hard frosts. The spiraea leaves were senescing yellow; the others were quite green.

The treatments included sprays ('SureGuard') and granules ('BroadStar') of flumioxazin at 0.25, 0.5 and 1.0 lb ai/A, granular oxyfluorfen plus pendimethalin ('OH-2') at 2.5 + 1.25 lb ai/A, and sprays of isoxaben + oryzalin at 0.93 + 2 lb ai/A and simazine + oryzalin at 1 + 2 lb ai/A. The granules were applied with a calibrated auger-feed applicator and sprays were applied in 50 gal/A with a calibrated CO_2-powered hand-held boom. All treatments were applied at 45^o F on November 4, 2004 and irrigated for 30 minutes within 30 minutes after treatment. The plants were in a hoophouse that was covered with polyethylene on November 15, 2004. The plastic was removed on March 20, 2005. Vigor ratings were made on May 24, 2005 when all plants were actively growing.

The sprays of isoxaben + oryzalin and simazine + oryzalin and the granules of oxyfluorfen + pendimethalin or flumioxazin had no effect on plant vigor. Vigor of spiraea was significantly reduced by flumioxazin sprays at 0.5 or 1.0 lb/A, but not at 0.25 lb/A. Flumioxazin sprays did not significantly affect potentilla, azalea, lilac or rose. These results indicate that flumioxazin sprays may have potential for late-season use on deciduous shrubs to prevent weed invasion in winter and early spring. Confirming data will be needed.

COMBINATIONS OF SULFOMETURON METHYL AND HEXAZINONE FOR FRASER FIR PLANTATIONS. J.F. Ahrens, Connecticut Ag. Exp. Sta., Windsor.

ABSTRACT

Five experiments were conducted in 2005 to evaluate phytotoxicity and efficacy of combinations of sulfometuron methyl and hexazinone in plantings of fraser fir (*Abies fraseri*) Christmas trees. Three experiments were in Somers, CT on fine sandy loam soils with 4 to 4.4% organic matter; two were in Woodbury, VT on silt loam soil with about 10% organic matter. One was on newly planted firs and the others were on firs established in the field for one to four years. In one experiment, semi-directed sprays were applied at 30 gal/A with an off-center nozzle from each side of the row; in the others, sprays were applied at 30 gal/A with fan nozzles over the tops of the trees. Typical plots had four to five trees with treatments replicated three to four times in randomized complete blocks.

Rates of sulfometuron ranged from 0.375 to 0.75 oz ai/A combined with hexazinone in sulfometuron:hexazinone ratios of 1:10.5, 1:15 and 1:20. In CT the primary weeds were large crabgrass (*Digitaria sanguinalis* (L.) Scop.), horseweed (*Conyza canadensis* L.), and common ragweed (*Ambrosia artemisiifolia* L.). In VT the target weed was the perennial smooth bedstraw (*Galium mollugo* L.). The combinations gave long-season control of horseweed, ragweed and crabgrass when applied before bud break in the spring. Fall applications controlled horseweed and ragweed but gave poor control of crabgrass in June. Spring applications gave longer-lasting control of annual weeds than fall applications. A non-ionic surfactant ('Induce') at 0.25% v/v did not affect weed control or fir injury with the combinations or sulfometuron alone. A fall application of sulfometuron plus glyphosate and a spring application of flumioxazin plus glyphosate controlled bedstraw, but fall or spring applications of sulfometuron plus hexazinone did not.

Fraser fir injury was slight and tolerable at all rates in established trees. However, sulfometuron plus hexazinone at 0.75 + 11.25 oz ai/A or 0.75 + 15 oz ai/A caused moderate injury to newly planted firs, whereas half these rates gave long-season control of annual weeds and little injury. Further experimentation is warranted and planned with sulfometuron plus hexazinone in Christmas trees.

HOARY ALYSSUM CONTROL IN FRASER FIR CHRISTMAS TREE PLANTATIONS.
M.W. Marshall, B.H. Zandstra, R.H. Uhlig, and D.A. Little, Michigan State Univ., East Lansing; and R.J. Richardson, North Carolina State Univ., Raleigh.

ABSTRACT

Hoary alyssum (*Berteroa incana*) is a member of the mustard family that has invaded Christmas tree plantations in Michigan. Due to its competitive nature and ability to thrive in adverse conditions, field studies were conducted in 2003 to 2004 and repeated in 2004 to 2005 to evaluate hoary alyssum control in Fraser fir (*Abies fraseri*) Christmas trees. In the first study, fall treatments included simazine (1.68 kg/ha) plus oxyfluorfen (0.56 kg/ha), flumioxazin (0.28 kg/ha) plus glyphosate (0.84 kg ae/ha), glyphosate, triclopyr (1.68 kg ae/ha), lactofen (0.28 kg/ha), clopyralid (0.09 kg/ha) plus lactofen, halosulfuron (0.05 kg/ha), and simazine plus oxyfluorfen plus glyphosate. Pendimethalin (3.36 kg/ha) was broadcast over the entire experimental area. A nonionic surfactant was included with the lactofen treatments. Weed control and Fraser Fir injury were evaluated 6 months after treatment (MAT) and 8 MAT on a 0 to 100% scale with 0 indicating no control or injury and 100 equal to weed or crop death. In 2003-2004, hoary alyssum control at 6 MAT ranged from 83 to 94% with simazine plus oxyfluorfen, flumioxazin plus glyphosate, and simazine plus oxyflourfen plus glyphosate. At 8 MAT, flumioxazin plus glyphosate and simazine plus oxyflourfen plus glyphosate provided 73 to 78%. A slight crop injury was noted with the triclopyr treatment. Control declined in 2005 with glyphosate providing 88% and 72% control 6 and 8 MAT, respectively. All other treatments provided less than 62% control at 6 MAT. In the second study, spring treatments included glyphosate (0.84 kg ae/ha), glufosinate (1.12 kg/ha), bentazon (1.12 kg/ha), triclopyr (1.68 kg ae/ha), 2,4-D (1.12 kg/ha), atrazine (1.12 kg/ha), mesotrione (0.02 kg/ha), hexazinone (1.12 kg/ha), sulfometuron (0.78 kg/ha), rimsulfuron (0.03 kg/ha), and trifloxysulfuron (7.5 g/ha). In 2004, glyphosate, triclopyr, 2,4-D, mesotrione, hexazinone, sulfometuron, and trifloxysulfuron provided 77 to 100% control at 4 MAT. In 2005, glyphosate, glufosinate, sulfometuron, atrazine, and hexazinone provided greater than 83% control at 1 MAT. By 4 MAT, hoary alyssum control with atrazine, mesotrione, hexazinone, and sulfometuron was greater than 95%. The other treatments provided less than 70% control. Application timing plays a critical role when planning hoary alyssum control strategies. Since hoary alyssum has an extended germination period, herbicide treatments containing a residual component would be needed to provide long-term control.

PHYSIOLOGICAL JOINT ACTION OF ALLELOPATHIC COMPOUNDS IN PLANT BIOASSAYS. N. Tharayil and P.C. Bhowmik, Univ. of Massachusetts, Amherst.

ABSTRACT

Allelopathy, the branch of chemical ecology that investigates plant secondary metabolite mediated plant-plant interactions has been a field of controversy for decades. The controversy mainly arises due to the fact that lab bioassays could seldom be duplicated under field conditions. In this study, we revisit one of the earlier hypotheses explaining the disparity between field and lab results; that allelochemicals in mixtures could act in tandem to produce a concerted phytotoxic effect. Phenolic acids *viz.* hydroxybenzoic acid (HYB), vanillic acid (VAN), coumaric acid (COU) and ferulic acid (FER) were selected for this study because of their ubiquitous nature in plant exudates and their role in allelopathy. To analyze the difference in response of plant species one dicot species lettuce (*Lactuca sativa* L.) and two mocot species perennial ryegrass (*Lolium perenne* L.) and barnyardgrass (*Echinochloa crusgalli* L.) were used in the study. As our previous experiments clearly demonstrated that soils could modify the chemical composition of exogenously applied phenolic acids and since we were looking into the physiological joint action of compounds, the experiments were done in petri-dishes with filter paper medium. To minimize the biological variation each experiment had 4 replicates of 15 seeds per plate and the experiment were repeated 4 times. Radicle length was measured at the end of 5 days incubation period. Relative potencies of the compounds were determined based on their LD_{50} values. For lettuce, the benzoic acid derivatives (HYB & VAN) were twice more phytotoxic than the cinnamic acid derivatives (COU & FER). The cinnamic acid derivatives were twice more potent than benzoic acid derivatives for grasses. To study the joint physiological action of these compounds, based on their relative potencies, binary mixture of four phenolic acids were prepared in 3 ratios *viz.* 1:1, 1:3, 3:1. The response level analyzed was LD_{50} and the joint action was statistically determined both by Combination Index and by Separate Ray Model. In case of lettuce, all binary mixtures of VAN with HYB and with COU were highly synergistic in all the 3 ratios tested. The binary mixtures of both benzoic acid derivatives were able to produce the same toxic effect at half their theoretical mixture toxicities. The other phenolic acid mixtures were additive to antagonistic. Advantage of Separate Ray Model over conventionally used isobole technique in joint action studies will be discussed.

GLYPHOSATE-RESISTANT ALFALFA SYSTEMS IN PENNSYLVANIA: YIELD, QUALITY, AND ECONOMICS. B. Dillehay, W. Curran, M. Hall, D. Mortensen, and J. Hyde, Penn State Univ., University Park.

ABSTRACT

Pennsylvania is the fourth largest dairy producer in the U.S. High quality alfalfa (*Medicago sativa*) is essential to dairy production, however Pennsylvania only ranks 19th nationwide in alfalfa production. Alfalfa production may be increased through better weed management. Weed management in alfalfa is complex because both interference and quality must be considered. The use of glyphosate in glyphosate-resistant Roundup Ready alfalfa offers unprecedented weed control and crop safety, and became commercially available in late summer 2005. However, with the introduction of any new agricultural technology, efficacy and management validation must be provided under local conditions. Experiments were initiated in Pennsylvania in spring 2004 and examined weed control and alfalfa performance. New seedlings of Roundup Ready alfalfa were treated with competitive herbicide programs that were already available for conventional alfalfa as well as new programs that included glyphosate. Treatments included an untreated check, glyphosate, imazethapyr, imazamox, clethodim, 2,4-DB, benefin, EPTC, as well as tank mixtures and varied timings. Yield, biomass composition, and quality were collected for 3 separate harvests during 2004. A second production year of data was collected in 2005 that included 4 harvests. The trial was replicated with a new seeding in 2005 and the same parameters were measured. When compared with the untreated check, alfalfa yield was increased and weed biomass was reduced in the herbicide treatments. Alfalfa crude protein and relative feed value was increased in the herbicide treatments, while alfalfa ADF and NDF were reduced in the herbicide treatments. Similar trends in alfalfa yield and weed biomass occurred in the 2005 seeding. Preliminary results indicate that weed management in alfalfa could boost alfalfa production and quality in Pennsylvania. Further, Roundup Ready alfalfa could be a successful addition to weed management for alfalfa in Pennsylvania.

ALTERNATIVE CROPPING SYSTEMS FOR ORGANIC DAIRY PRODUCERS: IMPROVEMENTS AND LESSONS LEARNED. J.M. Jemison, Jr., and C. Reberg-Horton, Univ. of Maine Coop. Ext., Orono.

ABSTRACT

Producing quality forage with minimal weed pressure is a goal of organic dairy producers. Growers need new tools that include effective crop rotations, and timely cultivation. An experiment was initiated in 2004 to evaluate an alternative cropping system strategy for organic dairy producers that would better balance crop emergence, growth, and time to canopy closure compared to silage corn. Our interest was to: 1) quantify yield, quality, and weed pressure of winter and spring small grains and brown midrib sorghum sudan grass (BMRSS) double crops; 2) quantify yield, quality and weed pressure of organic corn produced using two tine and two row cultivations; and 3) determine if crop ecology and use of narrow crop row spacing would more effectively control weeds compared to cultivation under organic production systems.

In year two, we planted five small grains on 25 September 2004: winter rye, winter triticale, winter barley, winter wheat and oats at approximately 120 lbs/A. Manure was applied at 16 tons/A, and was disked in immediately to supply approximately 70 lbs of N, 96 lb P2O5 and 128 lbs K2O/A. In the spring, we disked in the winter-killed oats and sewed spring barley at the same plant density. Grains were harvested at soft dough. Winter barley was harvested 9 days prior to the winter wheat, triticale and winter rye. Manure was applied to the stubble and disked in immediately. A Brillion seeder was used to drill in BRMSS seed that led to a poor stand in this treatment, but the extra nine days of growth did influence total yield. Due in part to fluctuating extremely hot and cold periods in June, spring wheat was shorter in 2005 than in 2004, and it matured almost three weeks earlier than in 2004 at roughly the same time as the winter wheat, triticale and rye. The remaining grains were harvested at the same time. Following small grain harvest, manure was applied at the same rate and disked in immediately. Another area was sewn to BMRSS without manure applied. This was done to test BMRSS response to the second manure application and to provide a comparison to 2004. On 8 July 2005, we drilled the remaining BMRSS plots with a grain drill. Due in part to a warmer than normal autumn, two cuts were taken from the BMRSS (1st on 22 August, 2nd on 21 October). All grain samples were dried and weighed. Samples were ground and NIR was used to assess forage quality.

Corn yield was significantly affected by intensity of cultivation (Table 1). With four cultivations (2 tine and 2 row cultivations), corn yield was 11,838 lbs dry matter/A or 19.7 tons/A at 30% dry matter. Weed biomass (predominantly red root pigweed, lambsquarters and yellow foxtail) was 1733 lbs dry matter/A or roughly 12.3% of total (weed + forage) dry matter yield, and this was considerably lower percentage compared to 2004. Soil conditions were drier at the time of cultivation that greatly improved the effectiveness of the tine cultivations. Yields of winter rye, triticale and wheat were excellent in 2005 (Table 2). Winter barley appeared to be damaged by a period of extreme cold following snow melt; seed heads were very small, and the plants were stunted. As well, spring barley yields were lower than in 2004 in part due to early heading apparently caused by fluctuating extremes of temperature. Yield of BMRSS

was influenced more by manure than by planting date, although given the very low BMRSS population, it is possible that with optimum germination, yield of the earlier planted BMRSS could have been greater (Table 3). Weed pressure was significantly greater in the BMRSS sewn with the Brillion, again due to poor population.

Feed quality of the various forages is presented in Table 4. Winter wheat has an excellent feed profile with some of the highest values for nonstructural carbohydrates (NSC), NSC yield, total digestible nutrients (TDN) and TDN yield. In 2004, spring barley gave similar values, but this year's early heading reduced quality. In Table 5, one can compare silage corn to a winter wheat + BMRSS or triticale + BMRSS double crop system (accounting for only one cut of the BMRSS). With these comparisons, one finds that the alternative cropping system provides an excellent quality feed and the total production loss (TDN yield or NSC yield) is between 8 and 15% lower than with that of silage corn. The weed biomass in the alternative system is considerably lower (similar to that found in 2004), but this year we performed no physical weed control in the alternative system. Weed management in the corn would have cost approximately $40.00/A. The other added feature is that the weeds in the corn system go to seed; in the alternative system, the cuts are made before the plants go to seed, and the plants are young, very digestible (TDN – 50% and crude protein of 16%). So, in this case the weeds are much less problematic. The alternative system requires one additional manure application, harvest operation, and tillage. Seed costs of open-pollinated corn compared to small grains and BMRSS are fairly similar. So, in short, the alternative forage system provides a cropping system that has lower weed pressure, efficient yields, and quality forage. More work is needed to see how the system holds up over diverse winter weather conditions in the upper Northeast.

Table 1. Yield of Silage Corn - 2005

Cultivations	Dry Matter Yield	Weed Biomass (%)
4 cultivations (2 tine – 2 row cultivators – 2 direction w/tine)	12335 a	8.0 b
4 cultivations (2 tine – 2 row)	11838 a	12.3 b
3 cultivations (1 tine – 2 row) c	11036 a	16.8 b
2 cultivations (2 row)	10855 a	13.9 b
1 cultivation (1 row cultivation at canopy closure)	6727 b	31.0 a
LSD (0.05)	2489	10.3

Table 2. Yield of Small Grains – 2005

Small Grain	Dry Matter Yield (lbs/A)	Weed Biomass (%)
Winter Rye	9199 a	1.86 b
Triticale	8244 ab	0.44 c
Winter Wheat	7410 b	0.18 c
Spring Barley	4001 c	2.75 ab
Winter Barley (type)	3855 c	3.12 a
LSD (0.05)	970	0.93

Table 3. Yield of First Cut - Brown Midrib Sorghum Sudan Grass - 2005

BMRSS	Dry Matter Yield (lbs/A)	Weed Biomass (%)
BMRSS – (29 June 2005)	3359 a	27.8 a
BMRSS – (8 July 2005) +M	3518 a	5.6 b
BMRSS – (8 July 2005) - M	1743 b	2.7 b
LSD (0.05)	797	3.6

Table 4. Nutrient content of various forages - 2005.

Feed	C.P. (%)	C.P. Yield (lbs DM/A)	T.D.N. (%)	T.D.N. Yield (lbs DM/A)	N.E.L. (%)	N.E.L. Yield (lbs DM/A)	N.S.C. (%)	N.S.C. Yield	RFV (%)
Silage Corn	7.6 --	858.3 --	63.8 --	7583 --	0.62 --	7261 --	30.0 --	3585 --	***
W. Rye	5.0 d	457.0 a	59.8 c	5496 a	0.54 c	4969 a	24.8 b	2282 a	93.5 c
W. Triticale	6.1 c	506.1 a	63.0 b	5198 ab	0.60 b	4958 a	27.7 b	2298 a	109.8 b
W. Wheat	6.7 c	495.4 a	65.0 a	4814 b	0.64 a	4717 a	33.6 a	2479 a	124.2 a
W. Barley	7.9 b	301.6 b	66.0 a	2544 c	0.66 a	2553 b	35.6 a	1374 b	131.5 a
Spring barley	11.6 a	466.2 a	59.0 c	2361 c	0.55 c	2206 b	19.1 c	774 c	101.2 bc
BMRSS +M*	10.6 -	373.5 --	53.0 --	1859 --	0.45 --	1587 --	13.4 --	324 --	81.5 --
LSD (0.05)	0.98	101.4	1.7	656	0.026	669	5.0	428	9.6

* 1st cut BMRSS – harvested 28 August – 2nd cut BMRSS not figured into calculations

Table 5. Comparison of Corn to Small Grain – BMRSS double crop (one cut considered)

Feed Comparison	**Crude Protein Yield** **(lbs DM/A)**	**T.D.N. Yield** **(lbs DM/A)**	**N.E.L. Yield** **(lbs DM/A)**	**N.S.C. Yield** **(lbs DM/A)**
Silage Corn	858.3	7583	7261	3585
Triticale + BMRSS	879.6	7057	6545	3072
W.Wheat + BMRSS	868.9	6673	6304	3254
W. Barley + BMRSS	675.1	4403	4104	2147
S. Barley + BMRSS	839.7	4220	3793	2184

MANAGING SMOOTH BEDSTRAW IN PASTURE AND FORAGE CROPS IN NEW ENGLAND. R. Kersbergen and C. Reberg-Horton, Univ. Maine Coop. Ext., Orono.

ABSTRACT

Smooth bedstraw (*Galium mollugo* L.) is becoming the principal weed problem in New England hayfields. This study was initiated to examine alternatives, such as increasing nitrogen fertilization or no-till reseeding, to the standard control measures for this weed. Five treatments were applied to a heavily infested hayfield in Belfast, Maine. Treatments consisted of (i) one application of triclopyr/2,4-D (Crossbow) in the fall, (ii) tillage and reseeding of forages, (iii) two applications of glyphosate with no-till reseeding of forages, (iv) two applications of nitrogen, 200 lbs total, and (v) unchanged management with no attempt at bedstraw control. Results from the first year indicate that the glyphosate/no-till reseeding partially controls bedstraw, with a 24% reduction in bedstraw and a 55% increase in forage production in the second harvest. By comparison, the triclopyr/2,4-DB and tillage/reseeding treatments resulted in almost complete control of bedstraw with 90% and 150% improvement in forage yields respectively. While this level of control is exceptional, the high cost associated with these treatments will allow bedstraw to continue spreading on hayfields that are not intensively managed. Additional research is needed on other low cost possibilities such as burning.

STRUCTURE OF HUMIC MATERIALS ON MINERAL SURFACES. S. Ghosh, S. Kang, P.C. Bhowmik, and B. Xing, Univ. of Massachusetts, Amherst.

ABSTRACT

Clay-humic complexes play a dominant role in the sorption behavior of contaminants including hydrophobic organic compounds, heavy metals and herbicides in soil environment. The objective of our study is to characterize the humic acid (HA) fraction sorbed on mineral surfaces. In this study, HA extracted from a peat soil was coated on kaolinite, montmorillonite, and goethite sequentially four times. Solid state ^{13}C nuclear magnetic resonance (NMR) and diffuse reflectance infrared Fourier transformed (DRIFT) techniques were employed in characterizing the adsorbed HA on mineral surfaces. The solid state ^{13}C NMR results showed a relative decrease in the aliphatic carbon content in the humic acid fraction obtained after 3^{rd} or 4^{th} coating on mineral surfaces, while aromatic carbon content increased. This indicates that fractionation of HA had taken place upon sorption to the mineral surface. DRIFT spectra of both Kaolinite and montmorillonite-HA complexes depicted the presence of aliphatic C-H stretching around 2926 cm^{-1} and 2856 cm^{-1}, which revealed that aliphatic fractions were preferentially sorbed to the mineral surface with increasing coating. The HA sorption to the goethite surface was mainly governed by the carboxylic group. The DRIFT spectra of the goethite-HA complexes showed a peak around 1400 cm^{-1}, which signifies the presence of iron–carboxylate bonding. The signature of aromatic C=C stretching in goethite-HA complexes can also be viewed from the peaks at 1550 cm^{-1} and 1630 cm^{-1}. This fractionation behavior of humic substances would influence the herbicide mobility in soil system.

GRAMOXONE INTEON: NEW TECHNOLOGY FOR BROADSPECTRUM WEED CONTROL. S. Shinn and C. Foresman, Syngenta Crop Protection, Hudson, NY and Greensboro, NC.

ABSTRACT

Gramoxone Inteon™ from Syngenta Crop Protection is a new paraquat formulation that sets a higher industry standard for protection of users while delivering the same effective broad-spectrum weed control that US growers have relied on for more than 40 years. This new innovative formulation continues the Gramoxone tradition by providing outstanding weed control equal to that of Gramoxone Max. Gramoxone Inteon reduces the risk of harm from accidental ingestion through the use of a novel formulation based on alginates. Alginates are natural, non-toxic products extracted from seaweed. The alginate technology helps prevent the product from being absorbed into the body, thereby increasing time and efficacy for medical treatment. Gramoxone Inteon also has a less offensive alerting agent compared to Gramoxone Max. The alert has a mild “decaying grass” odor. This new odor creates a more positive user experience during application and handling. Gramoxone Inteon offers an effective alternative to glyphosate technology while offering a different mode of action.

HEDGE BINDWEED CONTROL IN FIELD CORN. R.R. Hahn and P.J. Stachowski, Cornell Univ., Ithaca, NY.

ABSTRACT

Postemergence (POST) herbicides were evaluated for hedge bindweed [*Calystegia sepium* (L.) R.Br.] control in field corn (*Zea mays* L.) near Aurora, NY. Corn 'DKC42-70RR' or 'DKC3714RR' was planted on May 30, 2004 and May 27, 2005 with a zone-tillage planter in blocks that had been moldboard plowed the previous season. Plot areas received surface applications of 1.59 lb ai/A of *S*-metolachlor. POST herbicide applications were made when corn was in the V3 to V4 stage of development and bindweed stems averaged 22 inches in length. POST treatments included 0.25 and 0.5 lb ai/A of dicamba (diglycolamine salt), 2.8 and 4.2 oz ae/A of dicamba/diflufenzopyr (Distinct), 0.75 lb ae/A of glyphosate (Roundup WeatherMax) alone and tank-mixed with 0.125 lb/A of dicamba or with 1.4 oz/A of dicamba/diflufenzopyr, 0.125 lb ae/A of fluroxypyr; and 0.57 oz ai/A of primisulfuron, 0.57 oz ai/A of primisulfuron/prosulfuron (Exceed), 0.75 oz ai/A of halosulfuron, and 0.56 oz ai/A of nicosulfuron/rimsulfuron (Steadfast) each applied alone and tank-mixed with 0.125 lb/A of dicamba. In addition, premixes of 2.57 oz/A of primisulfuron/dicamba (NorthStar) and 5.4 oz/A of halosulfuron/dicamba (Yukon) were included. POST treatments were applied in 20 gpa water with 0.25% (v/v) of NIS and 2.5% (v/v) of 28% urea ammonium nitrate.

When averaged over years, in-season control ratings made 4 weeks after treatment (WAT) ranged from 31% with primisulfuron alone to 98% with 0.5 lb/A of dicamba. Dicamba at 0.25 lb/A averaged 93% control while 2.8 and 4.2 oz/A of dicamba/diflufenzopyr controlled 90 and 93% of the bindweed respectively 4 WAT. Fluroxypyr controlled 75% of the bindweed at this time. Bindweed control with glyphosate improved from 75% to an average of 85% when tank-mixed with 0.125 lb/A of dicamba or with 1.4 oz/A of dicamba/diflufenzopyr. Likewise, in-season bindweed control improved when 0.125 lb/A of dicamba was tank-mixed with primisulfuron, primisulfuron/prosulfuron, halosulfuron, or nicosulfuron/rimsulfuron. Control with primisulfuron and halosulfuron increased from 31 and 49% to 92 and 90% respectively when these herbicides were tank-mixed with dicamba. Bindweed control with primisulfuron/prosulfuron and nicosulfuron/rimsulfuron benefited less from addition of dicamba with control going from 78 and 87% to 90 and 92% respectively with these premixes. In addition, the primisulfuron/dicamba and halosulfuron/dicamba premixes controlled 89 and 94% of the bindweed 4 WAT. Long-term control ratings made 1 year after treatment (YAT) on the 2004 experiment followed the same trend as those made 4 WAT. Long-term control ranged from 23% with primisulfuron alone to 91% with 0.5 lb/A of dicamba while 0.25 lb/A of dicamba provided 85% control 1 YAT. Long-term control was better when dicamba was tank-mixed with glyphosate, primisulfuron, and halosulfuron than when they were applied alone. Control 1 YAT with primisulfuron/prosulfuron (83%) and with nicosulfuron/rimsulfuron (78%) did not benefit from the addition of dicamba. Grain corn yields averaged 31 bu/A in untreated checks over the 2 years. POST treatments of dicamba alone averaged 153 bu/A and were not different from yields from glyphosate alone (147 bu/A) or from the glyphosate plus dicamba tank-mix (156 bu/A). Tank-mixing dicamba with primisulfuron or with halosulfuron increased yields from 83 to 143 bu/A or from 111 to 160 bu/A respectively. When applied alone, the primisulfuron/prosulfuron and nicosulfuron/rimsulfuron premixes yielded an average of 157 bu/A over the 2 years.

KIH-485 FOR LARGE CRABGRASS AND GIANT FOXTAIL CONTROL IN CORN. P.J. Stachowski and R.R. Hahn, Cornell Univ., Ithaca, NY.

ABSTRACT

KIH-485 was compared with other preemergence (PRE) grass herbicides for large crabgrass [*Digitaria sanguinalis* (L.) Scop.] and for giant foxtail (*Setaria faberi* Herrm.) control in field corn (*Zea mays* L.). Crabgrass experiments were conducted on coarse sandy loam soil with about 2.3% organic matter near Valatie, NY. Foxtail experiments were also conducted near Valatie and near Aurora, NY on loam soil with about 2.6% organic matter. Corn Pioneer 38P05 was used in all experiments in 2004 and 2005. Crabgrass experiments, established April 29 both years at Valatie, compared PRE applications of 1.78 and 2.37 oz ai/A of KIH-485 with 1.55 lb ai/A of acetochlor, 0.66 lb ai/A of dimethenamid-P, 7.2 oz ai/A of flufenacet, 0.95 lb ai/A of *S*-metolachlor, and either 1 or 1.4 lb ai/A of pendimethalin. All plots received a postemergence herbicide application to control annual broadleaf weeds. Early- and late-season crabgrass control ratings for these treatments averaged 95 and 87% respectively over the 2 years and there were few differences among treatments. Grain corn yields from the KIH-485, acetochlor, flufenacet, and *S*-metolachlor treatments were similar with an average of 97 bu/A. This was higher than the yield with dimethenamid-P (88 bu/A). The pendimethalin treatment and the untreated check averaged 91 and 33 bu/A respectively.

Giant foxtail experiments at Valatie, initiated May 19 and 5 in 2004 and 2005 respectively, compared PRE applications of 1.78 oz/A of KIH-485 with 1.55 lb/A of acetochlor, 0.66 oz/A of dimethenamid-P, and 0.95 lb/A of *S*-metolachlor. Early season foxtail control with acetochlor (99%) was no different than that with dimethenamid-P but slightly better than control with KIH-485 or with *S*-metolachlor. Late-season foxtail control with dimethenamid-P (95%) was better than with the other herbicides and resulted in a corn yield of 93 bu/A that was similar to yields with KIH-485 (89 bu/A) and with acetochlor (87 bu/A) but higher than with *S*-metolachlor (78 bu/A). The untreated check averaged 22 bu/A. Giant foxtail experiments at Aurora, initiated June 4, 2004 and May 10, 2005, compared PRE applications of 2.37 and 2.98 oz/A of KIH-485 with 2 lb/A of acetochlor, 0.84 lb/A of dimethenamid-P, and 1.27 lb/A of *S*-metolachlor. Giant foxtail control with acetochlor (81%) or with dimethenamid-P (83%) was better than control with either rate of KIH-485 (69 and 72%) or with *S*-metolachlor (72%). Treatments averaged 144 bu/A over the 2 years with no differences among the yields. The untreated check averaged 91 bu/A.

NEW MANAGEMENT TOOLS FOR CONTROL OF TRIAZINE-RESISTANT WEEDS IN NO-TILL CORN. R.L. Ritter and H. Menbere, Univ. of Maryland, College Park.

ABSTRACT

Triazine-resistant (TR) common lambsquarters (*Chenopodium album* L.) and TR giant foxtail (*Setaria faberi* Herrm.) continue to plague corn (*Zea mays* L.) growers throughout the Delmarva region. Until the early 2000's, most growers utilized a prepackaged mix of a grass herbicide plus atrazine for preemergence (PRE) control of giant foxtail and came back with a postemergence (POST) herbicide for control of common lambsquarters. Some growers tank-mixed a prepackaged mix of a grass herbicide plus atrazine with pendimethalin (Prowl) in order to achieve PRE control of TR common lambsquarters.

Since then, a number of new products have become available. The package-mix thifensulfuron-methyl + rimsulfuron (Basis), flumetsulam (Python) and isoxaflutole (Balance) show promise in PRE control of TR common lambsquarters. Usually they are tank-mixed with a prepackaged mix of a grass herbicide plus atrazine.

Recently, mesotrione (Callisto) has been prepackaged with s-metolachlor and atrazine and made available for PRE use in corn under the trade names of Lumax or Lexar. Excellent control of TR common lambsquarters and TR giant foxtail has been achieved with these products. Pendimethalin has also been reformulated under the trade name Prowl H2O and looks promising for PRE control of TR common lambsquarters. In 2005, a prepackaged mix of isoxaflutole (Balance) plus flufenacet (Define) was made available for PRE use in corn under the trade name Radius. In our trials in 2005, excellent control of TR common lambsquarters and TR giant foxtail was achieved.

A number of POST herbicides are available for control of these two weeds. Diflufenzopyr plus the sodium salt of dicamba (Distinct) as well as primisulfuron-methyl plus the sodium salt of dicamba (NorthStar) have gained notable market share for POST control of TR common lambsquarters, particularly where other annual and perennial broadleaf weeds exist. Mesotrione is also available POST and provides excellent common lambsquarters control. Nicosulfuron (Accent) or a prepackaged mix of nicosulfuron + rimsulfuron + atrazine (Steadfast ATZ) successfully controls escaped TR giant foxtail when applied POST.

In 2005, topramezone (Impact) was investigated for its POST activity on TR common lambsquarters and TR giant foxtail. When applied with atrazine, good control of TR common lambsquarters was noted. However, when applied with atrazine plus nicosulfuron (Accent), excellent control of TR common lambsquarters and TR giant foxtail was obtained.

ITALIAN RYEGRASS CONTROL IN WHEAT. H. Menbere and R.L. Ritter, Univ. of Maryland, College Park.

ABSTRACT

Since the late 1990's, studies have been conducted at the Central Maryland Research and Education Center located in Beltsville, MD, for control of Italian ryegrass (*Lolium multiflorum* Lam.) in winter wheat (*Triticum aestivum* L.). In the late 1990's and early 2000's, it was demonstrated that preemergence (PRE) applications of s-metolachlor (Dual II Magnum) and flufenacet + metribuzin (Axiom) had potential for controlling Italian ryegrass in winter wheat. Excellent ryegrass control with minimal wheat injury was observed. In 2003 and 2004, flufenacet (Define) was examined as a PRE herbicide for control of Italian ryegrass in winter wheat. Excellent control was obtained; however, injury with a resulting loss in yield occurred with high rates. In 2004 and 2005, KIH-485 was examined for PRE control of Italian ryegrass in winter wheat. Excellent ryegrass control was obtained. Some injury was observed when high rates were used, but yield loss did not occur. In 2005, pendimethain (Prowl H2O) was also examined for PRE control of Italian ryegrass in winter wheat. Depending upon rate and time of application, pendimethalin provided good control, no injury to the wheat, and good yields.

In 2003 - 2005, mesosulfuron-methyl (Osprey) was examined for postemergence (POST) control of Italian ryegrass in winter wheat. Excellent crop tolerance and good yields were obtained throughout the course of these studies.

In 2005, pinoxaden (Axial) was examined for its POST activity on Italian ryegrass in winter wheat. Excellent control of Italian ryegrass was achieved with no wheat injury and good crop yields.

Through the course of these studies, it has been shown that PRE control of Italian ryegrass can be achieved in winter wheat with minimal injury and good crop yields. With the arrival of a number of new POST herbicides, growers will have a number of options to choose from for control of Italian ryegrass in winter wheat.

COLONIAL, CREEPING AND VELVET BENTGRASS SAFETY AND TOLERANCE TO BISPYRIBAC-SODIUM.

S.J. McDonald, P.H. Dernoeden, Univ. of Maryland, College Park, and J.E. Kaminski, Univ. of Connecticut, Storrs.

ABSTRACT

Bispyribac-sodium (BPS) is a relatively new herbicide that can be used to selectively remove annual (*Poa annua* L.) and roughstalk (*P. trivialis* L.) bluegrass from creeping bentgrass (*Agrostis stolonifera* L.). Although efficacious against the aforementioned weed species, applications of BPS generally result in unacceptable levels of yellowing to creeping bentgrass. Additionally, information with regards to the tolerance of other bentgrass species such as colonial (*A. capillaris* L.) and velvet (*A. canina* L.) to BPS is limited. The objectives of this study were to: 1) determine the relative tolerance of colonial, creeping and velvet bentgrass to BPS; and 2) assess the ability of a liquid iron plus nitrogen product to reduce or mask injury to the bentgrass species. This study was conducted at the University of Connecticut Plant Science Research and Education Facility located in Storrs, CT. Three areas were established in 2004 to either 'Southshore' creeping bentgrass, 'SR7200' velvet bentgrass, or 'SR7100' colonial bentgrass. All sites were mowed approximately 4 times per week to a height of 0.5 inches. BPS was applied twice at 30 g ai/A or three times at 20 or 30 g ai/A. The aforementioned treatments were applied alone or in combination with Lesco's 12-0-0 Chelated Iron Plus Micronutrients (Fe + N at 6.0 oz/1000 ft^2). All treatments were applied in 50 gpa using a CO_2 pressurized (35psi) sprayer equipped with a flat-fan nozzle. Treatments were applied on 13 and 27 June and 9 July. Plots were 5 ft x 5 ft and arranged in a randomized complete block with 4 replications. Bentgrass color was rated on a 0 to 10 scale where 0 = turf brown, 7.5 = minimum acceptable discoloration, and 10 = optimum green color. Injury was rated on 0 - 5 scale where 0 = no visible injury and 5 = entire plot brown or dead.

One week after treatments were initiated, BPS applied alone discolored (5.0 to 7.1) all bentgrass species. Except for colonial bentgrass, discoloration from the aforementioned treatments generally remained unacceptable for 2 to 3 weeks following the last application, regardless of herbicide rate or number of applications. When applied to colonial bentgrass, BPS (both rates) resulted in severe discoloration on nearly all rating dates. On 7 of 8 rating dates, BPS tank-mixed with Fe + N resulted in similar or improved creeping bentgrass color (8.3 to 9.1) when compared to the untreated control (7.1 to 8.3). When applied to velvet bentgrass, the tank-mix combination resulted in acceptable to excellent turfgrass color on most rating dates. Although Fe + N was able to mask the discoloration of BPS on colonial bentgrass, application of the herbicide resulted in a significant reduction in stand density and overall reduction in turfgrass quality. The relative tolerance of the three bentgrass species to applications of BPS was creeping bentgrass = velvet bentgrass > colonial bentgrass. Tank-mixing Fe + N with BPS resulted in improved color and quality of both creeping and velvet bentgrasses when compared to applications of the herbicide alone. BPS applied alone or in combination with Fe + N, however, proved too injurious to colonial bentgrass.

ACTIVITY OF SULFOSULFURON IN CONTROLLING YELLOW NUTSEDGE AND QUACKGRASS. P.C. Bhowmik, D. Sarkar, Univ. of Massachusetts, Amherst, and D. Riego, Monsanto Company, Carmel, IN.

ABSTRACT

Sulfosulfuron (Mon 44951 75WDG) is a sulfonylurea herbicide being investigated for control of weeds in cool-season turfgrasses. It is very difficult to selectively control yellow nutsedge (*Cyperus esculentus* L.) and quackgrass [*Elytrigia repens* (L.) Nevski] in turfgrass environments. The objective of the studies was to evaluate sulfosulfuron for selective control of yellow nutsedge, quackgrass, white clover (*Trifolium repens* L.) and other broadleaf weeds. Six different experiments were conducted in 2003, 2004 and 2005. Experimental turf areas were maintained at a 1.5-inch cutting height and the clippings were left on the plots. The area was fertilized with 0.5 lb/N twice a year. All treatments were applied to 3.5 by 10 feet plots with a CO_2-backpack sprayer at a pressure of 22 psi in 50 gpa. In 2005, 6 to 8 inch tall yellow nutsedge was treated with sulfosulfuron at 0.25, 0.50, 0.75, 1.00, 1.25, and 1.50 oz product/A. Two yellow nutsedge trials were evaluated, one applied low volume at 50 GPA, August 5 and another applied high volume at 100 GPA, August 29. In trials with tall fescue (*Festuca arundinacea* Schreb.), POST treatments were applied on June 8 and sequential treatments were made on June 30, and July 30, 2005, and on June 26 followed by sequential applications on July 17 and August 7, 2003. In a broadleaf trial, POST treatments were applied on June 8 and July 20, 2005. All sulfosulfuron treatments were applied with a non-ionic surfactant, X-77 @ 0.25% (v/v). Turfgrass injury was visually estimated on a scale of 0 to 100% (0%=no injury and 100%=dead turfgrass) and turfgrass density was rated on scale of 1 to 9 (where 1=thin stand and 9=dense stand). Weed control was visually estimated on a scale of 0 to 100% (where 0%=no weed control and 100%=complete control) 2, 4, 8 and 12 weeks after treatment (WAT). POST application of sulfosulfuron at 0.5 oz/A completely controlled yellow nutsedge, irrespective of the volume of application (50 vs. 100 gpa). These treatments resulted in 50 to 85% injury to creeping bentgrass (*Agrostis palustris* L.). The same treatments gave 20 to 70% control of white clover depending on the rate and sequential applications. In general, clover recovered specially from one application of low rates (0.25 to 0.50 oz/A) of sulfosulfuron. In 2003 and 2005, the sequential applications of sulfosulfuron at 0.375 oz/A followed by 0.375 oz/A 3 or 6 WAT completely killed tall fescue, while one application of sulfosulfuron resulted in only 25 to 35% control of tall fescue. In a greenhouse experiment, the 0.28 oz/A rate of sulfosulfuron controlled 88 to 93% of the quackgrass population 3 to 6 WAT in 2004. Our results demonstrate that sulfosulfuron is effective in controlling yellow nutsedge and would provide an alternative control practice in turfgrass areas. More research is needed to establish various turfgrass species tolerance to sulfosulfuron.

TEMPERATURE INFLUENCES BISPYRIBAC-SODIUM, PRIMISULFURON, AND SULFOSULFURON EFFICACY. P.E. McCullough and S.E. Hart, Rutgers, The State Univ. of New Jersey, New Brunswick.

ABSTRACT

As new herbicides are introduced to the turfgrass industry, information is warranted regarding parameters that influence efficacy for weed control and turfgrass safety. Field experiments with bispyribac-sodium, primisulfuron, and sulfosulfuron have noted seasonal efficacy variations that are believed to result from temperature rather than other environmental parameters. To test this hypothesis, three growth chamber experiments were conducted to investigate influence of temperature on the efficacy of these three herbicides.

Responses of annual bluegrass and creeping bentgrass were tested in experiments with bispyribac-sodium (BS) applied at 0, 37, 74, 148, 222, or 296 g a.i./ha at 10, 20, or 30° C. At 10º C, BS reduced annual bluegrass clippings 20 to 80% from untreated after 4 wk but caused = 20% chlorosis. Annual bluegrass grown at 20ºC and 30ºC had clipping reductions ranging 40 to 100% from the untreated with 40 to 80% chlorosis. Creeping bentgrass chlorosis ranged 10 to 50% 4 WAT at 10º and clippings were reduced 20 to 60% from untreated turf. At 20º, bentgrass clipping reductions and leaf chlorosis from BS were 0 to 20% of the untreated 4 WAT. Increases to 30º caused 0 to 20% bentgrass chlorosis from BS but clipping yield reductions increased 20 to 40% of untreated turf. Results confirm seasonal BS efficacy variability from field experiments resulted from increased BS efficacy for annual bluegrass control at warmer temperatures with minimal bentgrass discoloration while cooler temperatures had minimal efficacy on annual bluegrass and increased bentgrass chlorosis.

Responses of creeping bentgrass, Kentucky bluegrass, and roughstalk bluegrass were tested with sulfosulfuron at 0, 5.6, 11.2, 22.4, or 44.8 g a.i./ha/3 weeks at 15, 20, or 25º C. Creeping bentgrass tolerance to sequential sulfosulfuron treatments increased with temperature while Kentucky bluegrass generally had minimal (< 10%) chlorosis at all temperatures. Roughstalk bluegrass was most sensitive to sulfosulfuron with greater chlorosis at 15 and 25º (up to 75%) than 20º (up to 65%).

Responses of annual bluegrass, Kentucky bluegrass, and roughstalk bluegrass were tested with primisulfuron at 0, 26, 52, 104, or 208 g a.i./ha/3 weeks at 15, 20, or 25º C. As temperature increased, sensitivity to primisulfuron of all three bluegrasses generally increased. Kentucky bluegrass was most tolerant to primisulfuron but sequential applications at 25° caused 11 to 34% chlorosis from untreated. Sequential primisulfuron applications on annual and roughstalk bluegrass caused substantial leaf chlorosis (40 to 100%) at 15 and 20° but caused complete desiccation at 25° at all rates after 6 weeks. Primisufluron inhibited Kentucky bluegrass growth ˜50 to 100% from untreated while annual and roughstalk bluegrass growth was inhibited 100% from untreated following sequential applications. Results confirm better primisulfuron efficacy in summer than fall from field experiments in New Jersey resulted from greater leaf chlorosis and growth inhibition at higher temperatures.

EVALUATION OF KENTUCKY BLUEGRASS GERMPLASM FOR BISPYRIBAC-SODIUM TOLERANCE. R.R. Shortell, S.E. Hart, and S.A. Bonos, Rutgers Univ., New Brunswick, NJ.

ABSTRACT

Within Kentucky bluegrass (*Poa pratensis* L.) there is a tremendous amount of genetic diversity due to the apomictic reproductive behavior of the species. Apomixis results in the preservation of cultivars with distinct characteristics. Bispyribac–sodium herbicide is an acetolactate synthase (ALS) inhibitor, which has been shown to have activity on both *P. annua* and *P. trivialis*, with safety to some cool-season grass species, including creeping bentgrass. In late August of 2000 and 2001, 173 Kentucky bluegrass cultivars and selections were established at the Rutgers University Plant Biology and Pathology Research and Extension Farm, Adelphia, New Jersey, in a randomized complete block design with 3 replications. By the summers of 2004 and 2005, both tests, 2001 and 2000 respectively, were heavily infested with *P. annua.* Field studies were conducted in 2004 and 2005 at Adelphia, NJ to evaluate the response of 173 Kentucky bluegrass cultivars to sequential applications of bispyribac-sodium. Treatments were applied in June and July of 2004 and 2005, with a sequential application of bispyribac-sodium herbicide at 148.3 and then 222.4 g.a.i. per hectare, 21 days apart. Half of each 0.91m by 1.52m plot was treated with bispyribac-sodium, while the untreated half acted as the control. The plots were then rated for turfgrass quality, percent P. annua, percent injury, and percent ground cover as differences became evident. The majority of cultivars were severely chlorotic throughout both application dates but then fully recovered to 100% ground cover and full turf quality in approximately 6-8 weeks after initial treatment. Kentucky bluegrass cultivars differed greatly in their tolerance to bispyribac-sodium herbicide. Some cultivars, such as Avalanche[R] and Princeton-105[R], were extremely sensitive to this herbicide resulting in initial injury ratings in excess of 80%, and often leading to 0 % ground cover in as little as 6-8 weeks after initial treatment. Other cultivars, such as Lakeshore[R] and Blackstone[R], only exhibited injury symptoms for 1 week after treatment and quickly recovered to full turf quality. Such diversity within the species indicates there may be some utility for the use of bispyribac-sodium in Kentucky bluegrass, but only if the most tolerant cultivars are treated and true-to-type seed is planted. If sensitive or even moderately tolerant cultivars are treated persistent injury symptoms, such as chlorosis and growth reduction may occur and eventually lead to complete turf loss in the most sensitive cultivars. Therefore, large-scale use of bispyribac-sodium herbicide on mixed or unknown Kentucky bluegrass stands should be avoided.

NITROGEN AND TRINEXAPAC-ETHYL INFLUENCE BISPYRIBAC-SODIUM EFFICACY.
P.E. McCullough and S.E. Hart, Rutgers, The State Univ. of New Jersey, New Brunswick.

ABSTRACT

Bispyribac-sodium (BS) selectively controls annual bluegrass (ABG) in creeping bentgrass (CBG) but turfgrass chlorosis following applications warrants research to mitigate these effects without reducing efficacy for ABG control. Field and greenhouse studies were conducted in NJ to investigate effects of nitrogen (N) and trinexapac-ethyl in application programs with BS. In greenhouse studies, ammonium nitrate was applied to ABG at 6, 12, or 24 kg N/ha/wk beginning 2 wk before BS applications at 0, 74, 148, and 296 g a.i./ha. Increased N rate enhanced quality of non-BS treated bentgrass but exacerbated chlorosis from BS. In field studies on creeping bentgrass and annual bluegrass fields, N treatments included: (1) withholding N 2 or 4 wk before BS treatments, (2) increasing N to 24 or 48 kg/ha 2 wk before BS treatments, or (3) continually applying N at 12 kg N/ha every 2 wk. Applications of BS were 0, 74, or 148 g a.i./ha and all treatment combinations were used. N by BS interaction was not detected for ABG chlorosis as continually applying 12 kg/ha biweekly provided the best overall quality. Increased N rates enhanced bentgrass quality the day of BS applications but did not influence bentgrass response to BS. ABG chlorosis generally increased with BS rate but was < 20% of untreated and recovered within 2 to 3 wk. All N treatments reduced dollar spot from unfertilized turf by ca. 50% while BS applied at 74 and 148 g/ha reduced dollar spot coverage by 43 and 71% from non-BS treated, respectively. ABG, grown in a monostand indigenous field, receiving increased N rates had reduced chlorosis from BS applied at 74 g/ha but not BS at 148 g/ha. ABG chlorosis from sequential BS applications in mid-June generally was not affected by N applications in July likely because N was only increased prior to initial applications. Continually applying N at 12 kg/ha biweekly provided best ABG quality but did not reduce BS control. ABG seedhead cover was reduced from non-BS treated by 70 and 95% from BS at 74 and 148 g/ha, respectively. By early July, sequential BS applications at 74 and 148 g/ha controlled ABG by 40 and 95%, respectively.

Greenhouse studies with trinexapac-ethyl (TE) applied at 0 or 0.05 kg/ha at 0, 1, or 2 wk prior to BS applications reduced ABG chlorosis when applied prior to BS applications. Field studies conducted on ABG and ABG fields revealed no BS by TE interaction for any parameters measured. Applications of TE at 0.05 kg/ha had no influence on BS efficacy for ABG control when applied before or tank mixed with BS at 111 g/ha while TE applied before or tank mixed enhanced ABG tolerance to BS. Tank mixing BS with TE in emulsifiable concentration, microencapsulated concentration, or as a wettable powder all equally mitigated bentgrass chlorosis from sequential BS treatments. In June and July, ABG treated with TE on 1 June and 21 June had 50% less dollar spot coverage than non-TE treated while BS reduced dollar spot coverage approximately 80% from non-BS treated. Applications of BS in June reduced ABG cover 98% by July. Overall, applying TE at 0.05 kg/ha before or tank mixed with BS appears to mitigate ABG chlorosis from BS without compromising ABG control while maintaining moderate N fertility (12 kg/ha/2 wks) provided best bentgrass quality without influencing ABG control from BS.

SELECTIVE BERMUDAGRASS CONTROL IN COOL-SEASON TURFGRASS WITH MESOTRIONE, TRICLOPYR, AND FENOXAPROP. J.B. Willis, D.B. Ricker, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Once bermudagrass is established in cool-season turf, it is very difficult to control, and changes turf color and quality. Traditionally, infested areas are treated with nonselective herbicides followed by turfgrass renovation. Selective chemicals are not available for common bermudagrass control in cool-season turfgrass. Fenoxaprop (Acclaim™) and triclopyr (Turflon™) are labeled for bermudagrass suppression, however long term control varies and depends on many factors. Recent work has shown that sequential applications of mesotrione can selectively control bentgrass and nimblewill without injuring cool-season turfgrass. Previous efforts using mesotrione alone for bermudagrass control have been unsuccessful long-term. However applications of mesotrione are very injurious to bermudagrass, indicating potential for control. Our objective is to evaluate mesotrione combinations with known bermudagrass suppressors for selective bermudagrass control in cool-season turf.

Two trials were conducted in 2005 on turfgrass maintained as golf fairways at 2 cm mowing height. The first trial was established on a 10-yr old stand of Vamont bermudagrass that had been overseeded with perennial ryegrass (*Lolium perenne* L.) and the second trial consisted of Kentucky bluegrass (*Poa pratensis* L.) infested with common bermudagrass on a fairway at the Virginia Tech golf course in Blacksburg. Cutting height in both trials was ¾ inch. The experimental design was a randomized complete block with three replications. Treatments were arranged in a factorial with two application scenarios and seven treatments that consisted of three herbicides applied in all possible combinations. The herbicides were Acclaim™, Turflon™, and mesotrione at 28, 32, and 4 fluid ounces product per acre, respectively. The two application scenarios were treatments in both spring and fall applied either two or three times. A nontreated control was included for comparison, making a total of 15 treatments. The first spring treatment was applied at 60% bermudagrass greenup and successive applications were made at 3-week intervals. Fall applications were applied 9, 6, and 3 weeks prior to expected senescence.

For all herbicides and combinations, three applications significantly reduced bermudagrass cover more than two applications. After spring applications, mesotrione was the most effective treatment when applied alone. For example when applied 3 times, mesotrione reduced bermudagrass cover by 45 %. The most effective treatments two weeks after final application were triclopyr plus fenoxaprop (80% control), triclopyr plus mesotrione (93% control), and triclopyr plus fenoxaprop plus mesotrione (98% control), all applied three times fall and spring. Treatments injured Kentucky bluegrass and perennial ryegrass as much as 35%, however, injury was short lived, and turfgrass recovered about three weeks after application. Applications of mesotrione produce extremely chlorotic bermudagrass, essentially turning bermudagrass white and significantly reducing color and quality ratings. Mesotrione plus Turflon™ plus Acclaim™ and mesotrione plus Turflon™ does not have this characteristic effect on bermudagrass. Thus, the three-way combination had higher turf color ratings than mesotrione alone while offering equivalent bermudagrass control.

POTENTIAL SYNERGISTIC COMBINATIONS WITH MESOTRIONE . D.B. Ricker, J.B. Willis, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Managing high quality turfgrass in the transition zone requires the use of herbicides to control weed infestations. Smooth crabgrass (*Digitaria ischaemum*) infests most turfgrass species and is a chronic problem. Mesotrione has controlled crabgrass in several university trials but complete control often requires sequential treatments. Recent research at Virginia Tech and University of Tennessee suggest that certain herbicides applied in combination with mesotrione may improve grassy weed control compared to mesotrione alone. Our objective was to evaluate several herbicide admixtures with mesotrione in an attempt to make single treatments more effective or improve crabgrass control from single or sequential treatments.

Two field trials were conducted at the Virginia Tech Turfgrass Research Center in Blacksburg, Virginia during the summer of 2005. Site one contained ‘Kelly’ Kentucky bluegrass (*Poa pratensis)* and site two contained a variety of cool-season and warm-season grasses, mainly fescue (*Festuca* sp.), perennial ryegrass (*Lolium perenne L.)*, common bermudagrass (*Cynodon* sp.), and areas of creeping bentgrass (*Agrostis palustris)*, all varieties unknown. Site one had a severe infestation of 80-95% smooth crabgrass and 40-60% smooth crabgrass at site two. Smooth crabgrass at both sites was in the mature, 5-15 tiller stage of growth.

For both trials the experimental design was a five-by-two-by-two factorial arrangement with plot sizes of 2 m by 2 m. The first factor consists of five admixtures including, bentazon at 0.28 kg ai/ha, bromoxynil at 0.28 kg ai/ha, carfentrazone-ethyl at 0.035 kg ai/ha, MSMA at 1.68 kg ai/ha, and quinclorac at 0.84 kg ai/ha. The second factor consists of mesotrione at 0.14 kg ai/ha mixed with the above herbicides or nothing was mixed and the herbicides were applied alone. Finally, all of the aforementioned treatment options were either followed by a sequential mesotrione treatment at 0.14 kg ai/ha three weeks later or not. Comparison treatments included a non-treated control for a total of 23 treatments. Adjuvants were added as suggested by herbicide labels and included 1% v/v of crop oil concentrate (COC) with quinclorac and 0.25% v/v nonionic surfactant with mesotrione, bromoxynil, and bentazon.

All treatments controlled mature smooth crabgrass better 6 weeks after treatment (WAT) when mesotrione was in admixture and when followed by a three-week sequential mesotrione treatment. Quinclorac mixed with mesotrione followed by mesotrione and MSMA mixed with mesotrione followed by mesotrione controlled smooth crabgrass 91 and 93%, respectively at both sites 6 WAT. Mesotrione followed by mesotrione controlled smooth crabgrass 50% 6 WAT. Less than 10% turf injury was observed as whitening of the leaf blades 1 WAT when treatments contained mesotrione. Quinclorac mixed with mesotrione followed by mesotrione injured turf 35% 1 week after the sequential treatment. All turf recovered quickly and no injury was recorded 2 weeks after mesotrione treatments or for the remainder of the experiment.

EFFICACY OF PLANT GROWTH REGULATORS ON TALL FESCUE APPLIED USING APPLICATION PLACEMENT EQUIPMENT. A.C. Hixson, T.W. Gannon, and F.H. Yelverton, North Carolina State Univ., Raleigh.

ABSTRACT

Field research was conducted to evaluate plant growth regulator (PGR) applications through application placement technologies in which pesticides are placed directly onto cut surfaces of plants during a mowing operation. Specially designed mowers equipped with a fluid application system allow for low-volume PGR application from the mower blades allowing mowing and pesticide applications to be completed in a single pass. A wet-blade, wick-type, and broadcast sprayer were used to apply imazapic at three rates (8.8, 35.1, and 52.6 g ai/ha), and melfluidide + chlorsulfuron tank mix at 6.6 + 140.2 g ai/ha. Studies were conducted on tall fescue roadsides during a two-year period (2003 and 2004). Application placement equipment did not improve PGR efficacy when compared to a foliar broadcast spray. Tall fescue was slightly injured and discolored by all treatments, but recovered by one month after treatment. Imazapic at 52.6 g ai/ha suppressed plant growth for three months after treatment compared to the nontreated (17 cm of growth) when applied with the wick application and broadcast sprayer (6.8 and 2.5 cm respectively). When compared with nonmowed treatments, all treatments applied with the wet-blade failed to cause a reduction in tall fescue growth. In 2003, seedheads were completely suppressed by all treatments throughout the study. Seedheads were not completely suppressed in 2004, ranging from 76 to 100% reduction of seedheads when compared to the nontreated with the lowest rate of imazapic applied with the wet-blade machine providing the lowest seedhead control.

TURFGRASS TOLERANCE AND WEED CONTROL WITH MESOTRIONE. T.W. Gannon, F.H. Yelverton, and L.S. Warren, North Carolina State Univ., Raleigh.

ABSTRACT

Much research has recently been completed investigating the applications of mesotrione for weed control in warm- and cool-season turfgrass environments. Research trials were initiated to investigate select annual grass control and turfgrass tolerance with mesotrione applied at various timings.

Research trials were initiated in early April to investigate preemergence smooth crabgrass control with mesotrione and included July treatments to evaluate postemergence crabgrass control. At the July application, smooth crabgrass averaged two tillers. Evaluated treatments included mesotrione (4 SC) applied at 0.31 or 0.62 lb ai/A and postemergence treatments included a non-ionic surfactant. Applied preemergence, mesotrione did not provide smooth crabgrass control. However, applied postemergence, mesotrione (0.31 or 0.62 lb ai/A) provided 78 and 95% smooth crabgrass control, respectively at four weeks after treatment. Further, at eight weeks after treatment, the same treatments provided 71 and 86% control, respectively. In a separate trial initiated at the same time, 0.33 or 0.5 lb ai/A mesotrione applied postemergence provided 73 or 90% smooth crabgrass control, respectively, at four weeks after treatment and 60 or 83% control, respectively, at eight weeks after treatment.

Evaluated preemergence for goosegrass control, 0.31 or 0.62 lb ai/A mesotrione provided 25 or 50% goosegrass control, respectively, mid-August. By mid-September control remained at 25 and 44% control, respectively. In a separate trial initiated at the same time, 0.33 or 0.5 lb ai/A mesotrione applied preemergence provided 38 and 20% goosegrass control, respectively, mid-August while control decreased by mid-September. Applied early postemergence to goosegrass averaging two leaves, one application of mesotrione (0.19 or 0.25 lb ai/A) provided 11 and 38% control, respectively, at four weeks after treatment while control decreased at eight weeks after treatment. Two applications (0.19 or 0.25 lb ai/A) provided 60 and 75% control, respectively at 4 and 8 weeks after treatment.

Tolerance trials were also initiated to investigate the tolerance of tall fescue to mesotrione applied at spring or fall seeding as well as applied to established tall fescue. With mesotrione applied (0.15, 0.2, 0.25 lb ai/A) at spring seeding and six weeks after seeding, no reductions in tall fescue cover were observed, compared to the nontreated. With mesotrione (0.125, 0.25, or 0.5 lb ai/A) applied to established tall fescue, no phytotoxicity was observed at any evaluation time. These data indicated mesotrione will provide a measure for selective weed control in cool-season turfgrass environments.

SILVERY THREAD MOSS CONTROL ON BENTGRASS PUTTING GREENS WITH CARFENTRAZONE. F.H. Yelverton, T.W. Gannon, and L.S. Warren, North Carolina State Univ., Raleigh.

ABSTRACT

Silvery thread moss (*Bryum argenteum*) has become an increasing weed problem of putting greens possibly due to lower mowing heights and discontinued use of mercury-based fungicides. The consequence of moss invasion is reduced turfgrass quality as well as a nonuniform putting surface. Silvery thread moss encroachment occurs first in thin and weak turf including crowns of undulated putting greens that suffer from repeated scalping and spreads to remaining areas readily by sexual and asexual reproduction.

Control measures for silvery thread moss in bentgrass putting greens have been researched minimally due to the recent spread of the problem. Previous research suggests silvery thread moss can be suppressed in golf course putting greens with iron and nitrogen-containing fertilizers as well as with chlorothalonil.

Research trials were initiated to evaluate carfentrazone on bentgrass putting greens for moss control. Carfentrazone recently received registration and is available alone or in mixes with broadleaf herbicides. Trials were initiated May 2004 and included 1, 2, or 3 applications of carfentrazone (Quicksilver 1.9 EW) applied at 1.03 or 2.06 fl oz/A. Sequential applications were applied 3 wk after the previous application. Additional trials were initiated in July 2005 evaluating carfentrazone alone or with a non-ionic surfactant. Rates evaluated in 2005 included 6.7 or 12.7 fl oz/A applied once or twice. Each trial included 2 applications of chlorothalonil applied at 174.2 fl oz/A. At 4 wk after initial application in 2004, single applications of carfentrazone were providing less than 5% control while two or three applications were providing minimal control ranging from 30 – 40%. Additionally, two applications of chlorothalonil provided no control at four weeks after initial treatment. At eight weeks after initial treatment, three applications of carfentrazone provided 10 – 20% silvery thread moss control while other treatments provided no control.

In 2005 trials, one or two applications of carfentrazone (6.7 fl oz/A) provided 38 and 100% control, respectively, at four weeks after initial treatment. One or two applications of carfentrazone (12.7 fl oz/A) provided 53 and 93% silvery thread moss control, respectively at four weeks after initial treatment. At six weeks after initial treatment, one application (6.7 fl oz/A) provided 50% silvery thread moss control while two applications provided 100% control. One or two applications of carfentrazone (12.7 fl oz/A) provided 100% silvery thread moss control while two applications of chlorothalonil provided 75% control. The addition of a non-ionic surfactant did not increase silvery thread moss control at any observation date.

Additionally, research trials were initiated that evaluated one or two applications of carfentrazone (6.7 or 12.7 fl oz per acre applied alone or with non-ionic surfactant) for bentgrass tolerance on A1, A4, L93 and Crenshaw bentgrass. No bentgrass phytotoxicity was observed at any time. These data indicate carfentrazone provides a viable option for silvery thread moss control in bentgrass putting greens.

CARFENTRAZONE FOR SELECTIVE STAR-OF-BETHLEHEM CONTROL. S.D. Askew and J.B. Willis, Virginia Tech, Blacksburg.

ABSTRACT

Star-of-Bethlehem (*Ornithogalum umbellatum*, L.) is a bulbous perennial that resist mowing and is difficult to control. Plants reproduce primarily by small bulbs that are spread by plowing and watershed. Plants are poisonous and disrupt turfgrass uniformity and reduce sod value. Star-of-Bethlehem is tolerant to most herbicides, including glyphosate, and research at Virginia Tech has tested over 30 chemicals for its control in the past five years. Early research suggest that Gramoxone (paraquat) applied twice at 2.5 to 3 pints per acre effectively controls star-of-Bethlehem. However, selective control measures are still not available. Our work suggests that high rates of dicamba may control the majority of star-of-Bethlehem plants without harming tall fescue and research conducted in Tennessee reported partial control with bromoxynil at normal labeled rates. Better selective controls are needed. Our goal was to evaluate carfentrazone and bromoxynil in various combinations with dicamba to improve selective star-of-Bethlehem control.

Experiments were conducted in April 2005 in Nelson County, VA to evaluate combinations and rates of dicamba, bromoxynil, and carfentrazone. Dicamba was applied at 2.2 or 4.4 kg ae/ha, bromoxynil at 0.56 or 1.12 kg ai/ha, and carfentrazone at 0.03 or 0.06 kg ai/ha. Various combinations, such as dicamba followed by bromoxynil, were also evaluated. Plots were visually rated for effects on tall fescue turf and star-of-Bethlehem one month later and plots have been marked for evaluation next year. Our comparison treatments included paraquat applied twice at 1.3 kg ae/ha and a nontreated control.

As in previous years, paraquat controlled star-of-Bethlehem 96% but also injured tall fescue 95%. Treating with dicamba one week before treating with bromoxynil did increase the level of star-of-Bethlehem control by 20% compared to either a single treatment of dicamba or bromoxynil but the best control observed with a combination of the two was 63% at one month after initial treatment. An unexpected result of this research was that carfentrazone at 4 fluid ounces per acre controlled star-of-Bethlehem 96% one month after treatment. Combinations of dicamba followed one week later with two treatments of carfentrazone, each at 2 fluid ounces per acre, also controlled the weed 96%. Carfentrazone, dicamba, and bromoxynil did not injure tall fescue.

RESPONSE OF JAPANESE STILTGRASS AND NATIVE PLANT POPULATIONS FOLLOWING THREE YEARS OF SELECTIVE AND NONSELECTIVE CONTROL.

C.A. Judge and J.C. Neal, North Carolina State Univ., Raleigh.

ABSTRACT

Japanese stiltgrass is a nonnative, invasive plant occupying a wide range of habitats in the eastern United States. To determine the best recommendations for long-term Japanese stiltgrass control and native plant restoration, conventional Japanese stiltgrass control methods were compared with alternative control methods. The two experimental sites were mixed pine-hardwood forests in central North Carolina with four replications of each treatment per site arranged in a randomized complete block. Treatments included conventional control recommendations of hand-removal, weed-whacking, or one application of glyphosate (1.1 kg ai/ha) late in the growing season compared with alternative control methods of fenoxaprop-P (0.19 kg ai/ha), a grass selective herbicide, or selective hand-removal of Japanese stiltgrass as needed throughout the growing season. The experiment was initiated in 2002 and treatments were imposed annually for three years. Percent cover data by species were recorded each year and pooled into classes including Japanese stiltgrass cover, native broadleaf herbaceous cover, native monocot cover, native woody plant cover, and other exotic plant cover. Soil cores were also extracted each spring, seeds were germinated in a greenhouse, and seedlings were counted, identified, and pooled into classes previously described. Data were pooled across locations and transformed as relative percent cover or seedling emergence from soil cores compared to nontreated plots. The seed bank of Japanese stiltgrass decreased over time similarly in all treatments compared to nontreated plots. Averaged across treatments, seed bank populations decreased 93% after three seasons of management treatments. As a result, Japanese stiltgrass cover decreased 82% after three seasons of management treatments with all treatments. It is important to recognize that Japanese stiltgrass populations were not completely eradicated after three seasons of management; thus, more than three years of management are required to deplete a population. Decreasing competition from Japanese stiltgrass increased native broadleaf herbaceous plant recruitment and establishment. After three seasons of Japanese stiltgrass management, native broadleaf herbaceous plant cover increased 325% with all management treatments compared to nontreated plots. This trend was also observed in the seed bank populations. Native monocot plant cover also increased with all Japanese stiltgrass management treatments over time compared to nontreated plots. However, the glyphosate treatment resulted in only 4% increase, which was significantly less than the other treatments that resulted in 128 to 265% increase. Relative native woody plant cover significantly decreased 10 to 31% with the nonselective Japanese stiltgrass management treatments, glyphosate and mechanical removal. However, the selective management treatments, fenoxaprop-P or hand-removal, significantly increased relative woody plant cover 64 to 114%. No treatment differences or differences among years were detected for native monocot or woody plant cover, relative to nontreated plots, from soil core data. Over time, there were no differences in relative cover of other exotic plants. Thus, eliminating one exotic plant did not increase populations of other exotic

plants. Based on number of species present in vegetation surveys recorded each summer, species richness increased significantly after three years of management with all treatments except for the nontreated and glyphosate treatment. For the nontreated and glyphosate treatments, species richness was nine species per treatment; whereas, the other treatments ranged from 15 to 17 in species richness. Prior to any treatments, species richness ranged from 6 to 8 in all treatments. In summary, all management treatments reduced Japanese stiltgrass populations similarly; however, selective management treatments were more conducive for native plant recruitment, establishment, and increasing overall species richness.

TOTAL VEGETATION CONTROL WITH IMAZAPIC-BASED COMBINATIONS. D.D. Beran, BASF Corporation, Research Triangle Park, NC.

ABSTRACT

Total vegetation control is required in several noncropland environments such as road shoulders, utility substations, railroad yards, and other industrial sites. Total vegetation control in these situations often requires older herbicide chemistries, high application rates, and the use of herbicide combinations to overcome tolerant and resistant weed biotypes. Furthermore, herbicide options in many sites are limited due to the presence of desirable and potentially sensitive vegetation in adjacent areas. Imazapic is an imidazolinone herbicide that has residual soil activity with limited lateral and vertical movement, controls a wide range of grass and broadleaf species, and has minimal activity on tree and shrub species. These properties make imazapic a viable candidate for total vegetation control in both traditional industrial sites and areas that may have nearby sensitive vegetation. A series of trials were initiated in 2004 and 2005 to evaluate imazapic-based combinations in a variety of industrial bareground sites. On a railroad site in Council Bluffs, IA, imazapic applied in combination with flumioxazin was screened on kochia (*Kochia scoparia*), Russian thistle (*Salsola iberica*), and waterhemp (*Amaranthus* sp.). Imazapic applied at 0.188 lb ai/A in combination with flumioxazin at 0.25 lb ai/A resulted in 95% control or greater of these species when evaluated 100 days after treatment. The imazapic plus flumioxazin combination maintained 82% total vegetation control 140 days after treatment. In contrast, sulfometuron methyl applied at 0.14 lb ai/A in combination with flumioxazin at 0.25 lb ai/A maintained only 37% vegetation control 140 days after treatment. On a similar railroad site in Fort Dodge, IA, imazapic was applied in combination with sulfentrazone at 0.375 lb ai/A, flumioxazin at 0.25 lb, or diuron at 8.0 lb ai/A. These combinations resulted in 97, 93, and 92% control, respectively, of Russian thistle when evaluated 140 days after treatment. At a third site in southwest Nebraska, the imazapic-based combinations with sulfentrazone, flumioxazin, and diuron performed similarly and averaged 96% control of kochia, 100% control of Russian thistle, and 83% control of waterhemp when evaluated 140 days after treatment.

KIH-485 POTENTIAL IN THE NORTHEAST.

P.J. Porpiglia, Y. Yamaji, H. Honda, K. Takama, and O. Watanabe, Kumiai America, White Plains, NY.

ABSTRACT

KIH-485 has demonstrated excellent pre-emergence annual grass control over several years in numerous Northeast herbicide trials. In addition, a wide range of broadleaf weeds appears sensitive to KIH-485. Results from Northeastern states have been generally similar to other corn growing regions in the United States. KIH-485 has also demonstrated good crop tolerance in soybeans, winter wheat, peas, sunflower and several other broadleaf crops. Use rates in Northeast soils will range from 125 g. ai/ha to 250 g. ai/ha, depending on soil texture. Due to the high sensitivity of a wide range of weed species as well as significant residual soil activity, KIH-485 application timings in corn production systems will likely range from early pre-plant to early post-emergence. KIH-485 is a development candidate from Kumiai Chemical Industry Company, Ltd. and Ihara Chemical Industry Company, Ltd. and is being evaluated extensively across all major corn producing areas in North America.

WEED RESISTANCE MANAGEMENT: EVALUATING APPROACHES TO PRODUCT STEWARDSHIP. M.R. Starke, H.L. Glick, and G.A. Elmore, Monsanto Company, St. Louis, MO.

ABSTRACT

Product stewardship is a fundamental component of responsible customer service in every business. Glyphosate weed resistance management is a critical element of glyphosate herbicide stewardship, and is important to Monsanto both for customer satisfaction and to sustain the utility of the product. One of the first cases of a glyphosate resistant weed in the U.S. was a horseweed (*Conyza canadensis* (L.) Cronq.) biotype in the year 2000. Monsanto has implemented several management and mitigation strategies to help farmers control glyphosate resistant horseweed. These strategies include continuing education of growers, as well as extensive internal and external research on this weed species. Now, some five years later, we have the ability to take a retrospective look at the occurrence of this resistant weed, and the management and mitigation strategies put in place for it.

WEED CONTROL WITH AE 0172747 IN CORN. M. Mahoney and J. Allen, Bayer CropScience, Oxford, MD and Research Triangle Park, NC.

ABSTRACT

AE 0172747 is a 4-HPPD inhibitor that provides post-emergence control of annual broadleaf and grass weeds in field corn, sweet corn, and popcorn. Field studies were conducted to determine the spectrum of weed control with AE 0172747 from 2001-2005 across the corn belt. AE 0172747 at a 1X rate has shown to provide similar broadleaf weed control to mesotrione at the post-emergence labeled rate. AE 0172747 has proven superior grass activity when compared to mesotrione.

TOPRAMEZONE: A NEW ACTIVE FOR POSTEMERGENCE WEED CONTROL IN CORN.

R.M. Porter, P.D. Vaculin, J.E. Orr, J.A. Immaraju, and W.B. O'Neal, AMVAC Chemical Corporation, Newport Beach, CA.

ABSTRACT

Topramezone is a novel 4-HPPD inhibitor herbicide for postemergence weed control in corn (*Zea mays* L.). AMVAC Chemical Corporation has licensed from BASF AG exclusive rights for this usage in North America. Topramezone is effective against the major broadleaf weed species, and also active against several grass weed species common to US and Canadian corn production. This compound is formulated as a 2.8 lb ai/gal suspension concentrate (SC). Topramezone has been field tested for several years in numerous industry and university research programs. These trials have demonstrated that topramezone at rates of 0.011 to 0.016 lb ai/A applied with recommended spray additives such as methylated seed oil and nitrogen fertilizer source, provides excellent weed control coupled with exceptional tolerance to all types of corn. Topramezone will be used as a sequential application to preemergence soil applied treatments or in a total postemergence program in mixtures with other herbicides. Topramezone was reviewed as part of a Joint Review with the US Environmental Protection Agency and the Canadian Pest Management Regulatory Agency. The agencies concluded that the use of topramezone and its end use product in accordance with the label does not entail an unacceptable risk of harm to man or the environment. The crop tolerances of topramezone and EPA registration for uses in field corn, seed corn, sweet corn and popcorn were received in August 2005. Topramezone will be marketed under the brand name Impact in the USA and Canada. Impact herbicide will be launched and available for commercial use during the 2006 corn season.

EFFECT OF APPLICATION TEMPERATURE ON WINTER BROADLEAF WEED CONTROL. T. Serensits and J. Derr, Virginia Tech, Virginia Beach.

ABSTRACT

Application of herbicides in cool weather is generally thought to be less effective than treatments applied during warmer conditions. Several recently developed products containing carfentrazone may be effective for broadleaf weed control in winter or early spring. The objective of this research was to compare the effectiveness of carfentrazone applied alone or in combination with systemic broadleaf herbicides for turf weed control. A combination product containing sulfentrazone was also included in the research conducted.

Two identical trials were conducted in order to determine the efficacy of carfentrazone applied alone (0.016 lb ai/A), Speedzone (carfentrazone plus 2,4-D plus MCPP plus dicamba at 0.020, 0.67, 0.2 and 0.06 lb ai/A, respectively), Speedzone Southern (carfentrazone plus 2,4-D plus MCPP plus dicamba at 0.020, 0.26. 0.10, and 0.025 lb ai/A, respectively), Powerzone (carfentrazone plus MCPA plus MCPP plus dicamba at 0.018, 0.97, 0.19, and 0.10 lb ai/A respectively), Surge (sulfentrazone plus 2,4-D plus MCPP plus dicamba at 0.024, 0.57, 0.20, and 0.09 lb ai/A, respectively) compared to Trimec Classic (2,4-D plus MCPP plus dicamba at 0.80, 0.22, 0.22, and 0.09 lb ai/A, respectively) on winter broadleaf weeds.

The first trial was conducted in well-maintained tall fescue (*Festuca arundinacea* Schreb.). The cool weather treatment was applied at 46 F and the warm weather application was made at 67 F. Control of ivyleaf speedwell (*Veronica hederifolia* L.), common chickweed (*Stellaria media* L. Vill.), and henbit (*Lamium amplexicaule* L.) was determined. The second trial was conducted in a stand of dormant common bermudagrass. The cool temperature treatment was applied at 44 F while the warm temperature application was made at 64 F. Along with ivyleaf speedwell and common chickweed, control of purple deadnettle (*Lamium purpureum* L.) and wild garlic (*Allium vineale* L.) was determined.

In trial one, warm weather applications resulted in greater initial control at 5 days after treatment (DAT) than cold weather application. However, by approximately 17 DAT, similar results were seen between cool and warm temperature applications of each herbicide. At this time, all herbicides applied in both weather conditions with the exception of Trimec Classic provided 92% or greater control of ivyleaf speedwell and 82% or greater control of henbit. Trimec Classic provided less than 50% control of both ivyleaf speedwell and henbit. At both temperature regimes, Trimec Classic and carfentrazone controlled common chickweed about 55% at this time. Common chickweed control with Surge, Speedzone, Speedzone Southern, and Powerzone at both application timings was similar, ranging from 68% to 78%.

At 34 DAT in both temperature regimes, all herbicides provided 96% or greater control of ivyleaf speedwell and 84% or greater control of henbit, with the exception of Trimec Classic (approximately 58% control of ivyleaf speedwell at both temperatures and 34 and 68% henbit control for warm and cold temperature applications, respectively). Common chickweed control with a given herbicide was similar at both

temperature regimes. All treatments except carfentrazone provided good to excellent control of common chickweed.

At approximately 2 months after treatment, all treatments at both temperatures gave 97% or greater control of ivleaf speedwell and henbit, except for Trimec Classic, which gave about 85% control of ivyleaf speedwell and about 60% henbit control. All treatments except carfentrazone gave excellent common chickweed control.

In trial two, similar control trends were observed, although overall weed control was lower than in the first trial. At 7 DAT, warm weather treatments resulted in generally greater weed control. At 14 DAT, control of ivyleaf speedwell was similar between warm and cold temperature applications for a given herbicide. Control of common chickweed and purple deadnettle tended to higher with warm applications compared to cold applications for all treatments except Surge. By approximately 37 DAT, generally similar control was seen when comparing the effectiveness of a given herbicide applied at cold versus warm temperature application. Powerzone and Speedzone were the overall most effective treatments in the second study.

Application of these herbicides under warm conditions resulted in faster symptom development in broadleaf weeds, but long-term control was generally similar between warm and cold temperature applications. Better weed control in the first trial may be the result of younger plants (treated in mid-December) and competition from tall fescue. Trial two was in an area not regularly mowed and weeds were older and more mature (trial treated in early March). In general, Speedzone and Powerzone were more effective than Trimec Classic, which could be due to the presence of carfentrazone and/or due to the use of an ester form of 2,4-D and MCPA in Speedzone and Powerzone, respectively, compared to an amine form of 2,4-D in Trimec Classic.

PLANT GROWTH REGULATOR EVALUATIONS IN 2005. M.B. Naedel, J.A. Borger, M.D. Soika, and T.L Watschke, Penn State Univ., University Park.

ABSTRACT

This study was conducted on a mature stand of creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) at the Valentine Turfgrass Research Center, Penn State Univ., University Park, Pa. The objective of the study was to determine the efficacy of a fungicide, plant growth regulators alone or in combination with a liquid fertilizer using color ratings, dollar spot (*Sclerotinia homeocarpa*) incidence, measurements of plant height, and fresh weight foliar yield. This study was a randomized complete block design with three replications. Treatments were applied on June 8 (SUMMER), and July 12, 2005 (28 DAT) using a three foot CO_2 powered boom sprayer calibrated to deliver 40 gpa using two, flat fan, 11004 nozzles at 40 psi. The test site was maintained similar to that of a golf course fairway with respect to irrigation, fertilization and mowing. Turfgrass height was measured using a Turfcheck 1 prism. Turfgrass color was rated nine times during the study. None of the treated or untreated turfgrass was rated below acceptable (7.0) during the study. Turfgrass height was evaluated ten times during the study. On the June 22nd rating date turfgrass treated with Trimmit alone or in combination and Primo Maxx alone had significantly lower height than untreated turfgrass. On the June 29th rating date turfgrass treated with Trimmit alone, Primo MAXX at the 11 oz/A rate, and Trimmit at 32 oz/A plus ECO-N (24-0-0) had significantly lower height than untreated turfgrass. On the July 20th rating date turfgrass treated with Trimmit combined with Primo Maxx alone or with ECO-N (24-0-0) had significantly lower height than untreated turfgrass. On the July 28th rating date turfgrass treated with Trimmit at 32 oz/A alone or combined with ECO-N (24-0-0) and Trimmit at 16 oz/A plus Primo MAXX plus ECO-N (24-0-0) had significantly lower height than untreated turfgrass. On the August 4th rating date turfgrass treated with Trimmit alone, Primo MAXX alone, Trimmit at 16 oz/A plus ECO-N (24-0-0), and Primo MAXX at 11 oz/A plus ECO-N (24-0-0) had significantly lower height than untreated turfgrass. On this date turfgrass treated with Banner MAXX had significantly higher height than untreated turfgrass. Finally, on the August 17th rating date turfgrass treated with Trimmit at 16 oz/A plus Primo MAXX plus ECO-N (24-0-0) had significantly higher height than untreated turfgrass. Turfgrass fresh clipping weights were collected six times during the study. On the June 22nd rating date only turfgrass treated with ECO – N (24-0-0) had significantly more fresh clipping weight than untreated turfgrass. On the June 29th rating date turfgrass treated with Trimmit at 32 oz/A and Trimmit at 16 oz/A plus Primo MAXX plus ECO-N (24-0-0) had significantly less fresh clipping weight than untreated turfgrass. On the July 12th rating date turfgrass treated with Trimmit at 32 oz/A plus ECO – N and Trimmit plus Primo MAXX had significantly more fresh clipping weight than untreated turfgrass. Finally, on the August 17th rating date turfgrass rebound was apparent on some of the treated turfgrass. The percent dollar spot was rated five times during the study. On three rating dates; July 14th, 20th, and August 4th turfgrass treated with Banner MAXX had significantly less dollar spot than untreated turfgrass. On the July 14th and August 4th rating dates turfgrass treated with Trimmit at 16 oz/A plus Primo MAXX plus ECO-N (24-0-0) had significantly less dollar spot than untreated turfgrass. Finally on the August 4th rating date turfgrass treated with ECON – N (24-0-0) had significantly more dollar spot than untreated turfgrass.

USING BLACK SAND AND GDD50 TO IMPROVE TIMING OF ANNUAL BLUEGRASS SEEDHEAD SUPPRESSION. S.D. Askew, J.B. Willis, D.B. Ricker, and D.S. McCall, Virginia Tech, Blacksburg.

ABSTRACT

Creeping bentgrass (*Agrostis stolonifera* L.) (CBG) putting greens are often infested with annual bluegrass (*Poa annua* L.) (ABG), which is hard to control and disrupts uniformity and ball roll during seedhead production in spring. Superintendents use plant growth regulators (PGR) such as mefluidide, trinexapac ethyl, and ethephon to improve uniformity and suppress ABG seedhead formation. A mixture of trinexapac ethyl and ethephon is widely used for this purpose but is dependent on proper application timing for effective ABG seedhead suppression. Previous research was aimed at predicting optimal application timing using growing degree days (GDD_{50}) and found that approximately 50 GDD_{50} was an optimal timing in Virginia and Pennsylvania in 2004. However, GDD_{50} are accumulated at varying times in early spring and differences occur each year in how and when GDD_{50} are accumulated. Thus, proper application timing for trinexapac ethyl plus ethephon is still difficult to determine. Black sand has been used to melt snow and ice on putting greens and found to improve early greenup. We hypothesized that black sand top dressing could increase T and GDD_{50} accumulation and allow a more predictable initiation of ABG seedhead production and improved application timing for PGR.

A study was initiated at the Virginia Tech Golf Course in Blacksburg on March 15. Four replications were used in a randomized complete block design and treatments were arranged in a split plot with two main plots (with and without 896 kg/ha black sand) and 5 application timings for trinexapac ethyl + ethephon (nontreated, Mar 25, Mar 31, Apr 8, and Apr 15). Ethephon and trinexapac ethyl were applied at 2.29 and 0.05 kg ai/ha, respectively initially at the aforementioned times and again one month later. ABG cover, seedhead cover, and CBG injury were visually estimated as a percentage of total plot area. Turfgrass color and quality were rated on a scale of 1 to 9 where 1 is dead turf, 5 is acceptable, and 9 is dark color or uniform and dense quality turf. Relative chlorophyll content was assessed with a CM1000 chlorophyll analyzer. Surface T was evaluated with an infrared analyzer and subsurface T was logged at just below surface and 7 cm deep with Hobo probes set to record every 30 min.

Black sand increased surface T on Mar 18 and 25 and increased GDD_{50} accumulation rate. Turfgrass color and quality was improved by black sand for all plots evaluated on Mar 25, Apr 1, and Apr 7 but differences were no longer apparent on Apr 15 and beyond. Thus, putting green “greenup” occurred 21 d earlier when black sand was applied. ABG seedhead cover was first observed on Mar 25 in selected black sand plots at ≤1%. On Apr 1, ABG seedhead cover differed and was 7-10% in black sand plots and 0 to 1% in plots that were not top-dressed. On Apr 22, ABG seedheads covered 25-33% of nontreated plots and the 2 earlier application timings were more effective than later timings. Ethephon + trinexapac ethyl treatments were more effective when black sand was not applied. Seedhead control was rated 56, 80, 13, and 39% as application times increased in black sand plots and 75, 88, 51, and 3% as application timings increased in normal plots. Seedhead suppression was acceptable and equivalent between all treated plots on May 17 after sequential treatments had been applied.

SELECTIVE POSTEMERGENCE PERENNIAL GRASS CONTROL. J.A. Borger, T.L. Watschke, and M.B. Naedel, Penn State Univ., University Park.

ABSTRACT

Phytotoxicity and tolerance evaluations were conducted on a stand of mature fairway height 'Penneagle' creeping bentgrass (*Agrostis stolonifera*), fairway height 'Winter Play' rough bluegrass (*Poa trivialis*), lawn height 'Plantation' tall fescue (*Festuca arundinacea S.*), lawn height 'Jet-Elite' perennial ryegrass (*Lolium perenne L*.), and lawn height 'Park' Kentucky bluegrass (*Poa pratensis*) at the Valentine Turfgrass Research Center, Penn State University, University Park, Pa. The objective of the study was to determine the phytotoxicity and tolerance of selected materials on CBG (CBG), rough bluegrass, tall fescue, perennial ryegrass (PR), and Kentucky bluegrass.

The study was a randomized complete block design with 3 replications. Treatments were applied on June 23 (JUNE), July 12 (2 WAT/3 WAT), July 21 (4 WAT), August 4 (6 WAT), and September 2, 2005 (9 WAT) using a three foot CO_2 powered boom sprayer calibrated to deliver 40 gpa using two, flat fan, 11004 nozzles at 40 psi. The CBG and rough bluegrass were mowed with a reel mower at one half inch with clippings removed and the tall fescue, PR, and Kentucky bluegrass were mowed at one and one half inches with clippings returned to the site. Turfgrass phytotoxicity was evaluated eight times.

CBG treated with mesotrione twice, had unacceptable phytotoxicity until the August 14, 2005 rating date. CBG treated three times with mesotrione had unacceptable phytotoxicity on all eight rating dates. Rough bluegrass treated with MON 44951 or Velocity at any rate or time or application schedule had unacceptable phytotoxicity. Rough bluegrass treated with mesotrione had unacceptable phytotoxicity on three rating dates (June 28, July 6, and Aug 14). Tall fescue treated with MON 44951 had unacceptable phytotoxicity on all but the first rating date except for the 0.25, 0.3, and 0.5 oz/A rate applied four times (July 6 rating date). Tall fescue treated with Velocity 80WP had unacceptable phytotoxicity on July 6 and July 21 rating dates. Following applications of Velocity 17.6WG phytotoxicity was unacceptable on the July 21 rating date. Tall fescue treated with mesotrione three times had unacceptable phytotoxicity on the August 1 rating date. PR treated with MON 44951 or Velocity at any rate or application schedule had unacceptable phytotoxicity on the July 21 rating date. Additionally, PR treated with MON 44951 at the 0.25 oz/A rate and applied four times had unacceptable phytotoxicity on the August 1 rating date. Only Kentucky bluegrass treated with any formulation of Velocity had unacceptable phytotoxicity on all rating dates except June 28.

The percent green vegetation was rated once during the study on October 6, 2005. CBG treated with mesotrione had significantly less green vegetation than untreated. Only rough bluegrass treated with MON 44951 at 0.25 oz/A applied twice or any rate of mesotrione had green vegetation that was not significantly different than untreated. Only tall fescue treated with any formulation of Velocity or any rate of mesotrione had green vegetation that was not significantly different than untreated. PR treated with MON 44951 at 0.5 oz/A applied 3X or 4X and MON 44951 at 0.3 oz/A applied 4X had significantly less green vegetation than untreated. Only Kentucky bluegrass treated with any formulation of Velocity had significantly less green vegetation than untreated.

SELECTIVE TALL FESCUE AND QUACKGRASS CONTROL IN KENTUCKY BLUEGRASS TURF. D.S. McCall, J.B. Willis, D.B. Ricker, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Tall fescue (*Festuca arundinacea* Schreb.) is often used as the turfgrass of choice in many home lawns throughout the Mid-Atlantic region. However, when other turfgrass species or finer textured varieties are used, tall fescue can become an unsightly weed, due primarily to clumps formed by tillering. The current recommendation for tall fescue control in Kentucky bluegrass (*Poa pratensis* L.) is sequential applications of chlorsulfuron or spot-treatment with glyphosate. Quackgrass [*Elytrigia repens* (L.) Nevski] is similar in appearance to tall fescue but has a rhizomatous growth pattern, unlike tall fescue that grows in clumps by tillering. Chlorsulfuron does not selectively control quackgrass, leaving spot-treatment with glyphosate as the only control option.

A trial was established on a Kentucky bluegrass soccer field infested with clumpy tall fescue and quackgrass in Covington, Virginia. Rates of flazasulfuron were 4.37, 8.74, and 17.5 g ai/ha. Three applications were made at 21-day intervals, beginning on April 28. Chlorsulfuron was applied once at 260 g ai/ha on April 28 as a comparison for tall fescue control. Flazasulfuron at all rates tested completely controlled both tall fescue and quackgrass 19 days after the final application. Chlorsulfuron did not control either weed species. Chlorsulfuron likely would have controlled tall fescue had sequential treatments been applied. Six days after the second flazasulfuron application, plots were rated for seedhead suppression. The percent reduction, from lowest to highest rate of flazasulfuron, was 90, 98, and 99. Growth of Kentucky bluegrass was regulated, although no discoloration occurred.

At another site, flazasulfuron and mesotrione were tested for quackgrass control in Kentucky bluegrass. Applications were made on May 11 and May 27. Rates of flazasulfuron were the same as in the previous study. Mesotrione was applied at 0.28 kg ai/ha as a comparison for quackgrass control. Twenty-one days after the final treatment, the level of control was 81, 91, 93% as flazasulfuron rates increased and 83% with mesotrione. However, by 44 days after the final application, the level of control had decreased to 59, 79, 89% for increasing flazasulfuron rates and 54% for mesotrione. Only the highest rate of flazasulfuron tested provided extended control of quackgrass. Results in this study indicated that both flazasulfuron and mesotrione had activity on quackgrass, but flazasulfuron caused far too much injury to Kentucky bluegrass to be commercially acceptable. Kentucky bluegrass cultivar, cultural practices between sites, later application timing, and shorter application interval may have contributed to the observed differences in Kentucky bluegrass injury by flazasulfuron between the two trials.

PARTIAL FAIRWAY TRANSITION AS A NOVEL APPROACH TO IMPROVE TRANSITION AESTHETICS. S.D. Askew, D.S. McCall, J.B. Willis, and D.B. Ricker, Virginia Tech, Blacksburg.

ABSTRACT

Golf course fairways and athletic fields are often overseeded with perennial ryegrass (PR) in Virginia's transition zone climate. Tournaments, graduations, or other events often delay the decision to transition back to a bermudagrass (BG) monoculture. Delayed transition limits BG growing season and ultimately may reduce BG density over several seasons. Managers desire methods to partially or "slowly" transition the fairway while maintaining aesthetics. Past attempts with reduced rates of sulfonylurea herbicides and repeated treatments have been marginally successful. Typically, these herbicides cause severe discoloration each time they are applied, thus decreasing turfgrass aesthetics. This injury is contrary to the manager's purpose for delaying transition in the first place, which is to maintain turfgrass visual appeal. Recent research in VA and KS has demonstrated establishment of seeded BG cultivars by creating narrow strips in existing turf using herbicides. When viewed from a vantage point perpendicular to killed strips, existing turfgrass has visual quality equal to nontreated turf and strips allow for establishing seeded BG without limiting use of existing turf. Studies conducted in Blacksburg applied this concept to transition of overseeded BG using a selective herbicide to partially control PR.

Two RCB studies were conducted at the VA Tech Golf Course that consisted of 'Riviera' BG overseeded the previous fall with 'Field General' PR and on a fairway at Stoney Creek Golf Course, Wintergreen, VA that consisted of 'Vamont' BG overseeded with a mix of PR and Kentucky bluegrass. The first study evaluated partial PR control by applying foramsulfuron at 0.029 kg ai/ha on 16.6% of turf in 5-cm strips spaced every 30 cm, vertical mowing 3X at 2-wk intervals, and fertilizing at 1.1 kg N/ha using 10-10-10 fertilizer 3X at 2-wk intervals. Treatments included nontreated, fertilizer alone, fertilizer + verticut, fertilizer + strip kill, and fertilizer + verticut + strip kill. In a separate study, strips were killed in the same way at 2.5 and 5 cm widths and varying frequencies so that 16.6, 20, 25, 33, and 50% PR was selectively controlled on Apr 29 and May 2 at Wintergreen and Blacksburg, respectively. Plots were evaluated for turfgrass quality at a viewing angle of 0, 45, and 90 degrees relative to the direction of killed strips and a distance of 8 m.

In the first study, strip kill statistically improved BG cover in Blacksburg on May 27, Jun 21, and Aug 1 and in Wintergreen on May 25, Jun 6, Jun 28, and Jul 27 compared to verticut, fertilizer, or nontreated plots. Verticut and fertilizer did not increase BG cover compared to nontreated plots at any rating. Turfgrass quality was always equivalent when viewed perpendicular to killed strips but strip kill plots had reduced quality during the first month when viewed along strips. When strips were killed, BG cover on Aug 1 was 93% and 97% when plots were also fertilized and fertilized plus verticut, respectively. Nontreated turf was 83% BG and fertilizer plus verticut turf was 88% BG late season. When strips were killed in different frequencies in the second study, BG cover increased with increasing percentage kill at both locations. On Aug 1, BG cover was 55, 80, 93, 99, 98, and 97% when strip kill frequencies resulted in 0, 16.6, 20, 25, 33, and 50% PR control, respectively. Results indicate that strip killing PR in early summer allows rapid increase in BG cover without decreasing turfgrass quality as viewed perpendicular to strips.

YOU BETTER WATCH OUT!! – HERBICIDE/ORNAMENTAL COMBINATIONS TO AVOID. J.F. Derr, Virginia Tech, Virginia Beach.

ABSTRACT

Preememergence and postemergence herbicides are effective tools for managing weeds in nursery production. These chemicals can injury certain nursery crops, depending on the specific herbicide and formulation, specific nursery crop, ornamental growth stage, soil type, and weather conditions. This presentation will focus on ways to reduce the potential for injury associated with herbicide application.

Bedding plants and herbaceous perennials: Certain herbicides cannot be used on most annual bedding plants and herbaceous perennials. This list includes the oxyfluorfen-containing products Goal, Rout, OH2, and Regal O-O. Dichlobenil (Casoron, Barrier), simazine (Princep, others), flumioxazin (BroadStar, SureGuard) and oxadiazon-containing herbicides (Ronstar, RegalStar, and Pre Pair) also cannot be used on most herbaceous ornamental species. Isoxaben-containing products (Gallery, Snapshot) can only be used on certain herbaceous perennials. Do not apply isoxaben to Danes rocket, oxeye daisy, the mustard family, sedum, ajuga, lambsear or Veronica. As with all herbicides, check the label for specific use restrictions.

Sprayable formulations of the dinitroaniline herbicides (pendimethalin, prodiamine, oryzalin, and trifluralin), especially oil-based (EC) formulations, can stunt bedding plants and reduce flowering. It is best to use granular forms of these products in bedding plants and herbaceous perennials. Pennant Magnum, an emulsifiable concentrate form of metolachlor, can burn tender foliage, especially in herbaceous ornamentals. Use directed sprays when possible and avoid applications during high temperature/high humidity conditions. Avoid herbicides altogether on *Phlox paniculata*.

Currently no preemergence herbicides are registered for use in greenhouses or other enclosed structures such as over-wintering houses. Herbicide vapors could be trapped around ornamental foliage, resulting in nursery crop damage. Do not apply preemergence herbicides in enclosed structures; this applies to both herbaceous and woody ornamentals. The last application for the year should be applied at least 2 weeks prior to covering over-wintering houses.

Woody nursery crops: The granular products containing oxyfluorfen, oxadiazon, or flumioxazin should not be applied to plants with wet foliage since they can cause a contact burn. Wet foliage causes the granules to stick and then release the herbicide, resulting in spotting of foliage. Since these chemicals are contact herbicides, these granules should not be applied to plants that could catch and funnel granules to their base, such as yucca. Avoid applications during budbreak since tender foliage is more susceptible to damage. Another concern with these products is injury following splashing of treated soil onto foliage. Applying a layer of mulch after application could make these products safer when applied to young plants growing in field soil. This could also be beneficial with herbicides that could cause injury through volatilization, such as oxyfluorfen.

Use lower rates when applying preemergence herbicide to sandy soils low in organic matter. Generally higher preemergence herbicide rates are needed in clay soils higher in organic matter.

Emulsifiable concentrate formulations should not be applied overtop nursery crop foliage, especially during hot, humid weather. This applies to products such as Pendulum EC, Pennant Magnum, and the postemergence grass herbicides (Envoy, Fusilade/Ornamec, and Vantage). Avoid adding oil adjuvants to overtop applications during summer – use nonionic surfactants instead. For Fusilade/Ornamec, check the label for juniper, azalea and other cultivar restrictions

Do not apply oryzalin (Surflan) to Douglas fir, hemlock, or true firs, especially on seedbeds, liner beds, and young plants. Isoxaben (Gallery) can injure dwarf burning bush (*Euonymus alata compacta*), hydrangea, and lilac. Simazine can injure dwarf burning bush, lilac, and mock orange.

BroadStar can injure wax myrtle, privet, butterfly bush, hydrangea, spiraea, and viburnum, although there may be differences in cultivar sensitivity and newly planted liners probably are more susceptible than older plantings. Do not apply SureGuard overtop broadleaf ornamentals; only conifers have tolerance to overtop application, and then primarily after new growth has hardened off or when plants are dormant. It is preferable to apply SureGuard or Goal to dormant shade trees.

Dichlobenil (Casoron) can injure hemlock, fir, spruce or pines, especially if treated when young. Clopyralid (Lontrel, Stinger) can severely injure members of the aster, legume, and nightshade families, including such species as asters, mums, coreopsis, redbud, and locust, along with damaging English ivy.

Certain species tend to be sensitive in general to herbicides. Test cultivar sensitivity using a few plants prior to widespread use for herbicide application to azalea, barberry, hydrangea, and dwarf burning bush.

Supplement

to the

Proceedings

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of the

Northeastern Weed Science Society

Capital Hilton
Washington, DC
January 3-6, 2005

Hilary A. Sandler, Editor
University of Massachusetts-Amherst Cranberry Station
East Wareham, MA

Supplemental Abstracts

(presented in alphabetical order)

NEW HERBICIDES FOR ANNUAL AND ROUGHSTALK BLUEGRASS CONTROL: TRANSITION ZONE PERSPECTIVE. S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Bispyribac (Velocity) and sulfosulfuron (not yet registered in Northeastern Turfgrass) are new herbicides that can be used to control or reduce competitiveness of annual and roughstalk bluegrass in creeping bentgrass. Several field trials were conducted between 2002 and 2004 to evaluate these herbicides in creeping bentgrass maintained as Golf fairways on several golf courses in Virginia. Studies indicate that both herbicides can control roughstalk bluegrass but turfgrass injury is probable. Sequential treatments are typically needed to control annual or roughstalk bluegrass. Typically, creeping bentgrass is discolored by treatments within one week of application and symptoms may persist for a few days to over a week. Preliminary data and observations indicate that these two herbicides may increase severity of Pythium blight in creeping bentgrass in areas where a suitable preventative fungicide has not been applied and conditions for Pythium prevail. Bluegrass control can range from slight to severe and bare areas may result from aggressive treatment. Both herbicides are useful tools for annual and roughstalk bluegrass control in creeping bentgrass, but onsite evaluation or preliminary research is suggested before large-scale use is implemented on the golf course.

DEGREE DAY FOR PREDICTING ANNUAL BLUEGRASS SEEDHEAD EMERGENCE.
S.D. Askew, D.R. Spak, W.L. Barker, J.B. Willis, and D.B. Ricker, Virginia Tech, Blacksburg.

ABSTRACT

Determining proper timing of plant growth regulators (PGR's) for annual bluegrass (*Poa annua*) is difficult. The most common plant growth regulators (PGR's) used to suppress annual bluegrass seedheads on golf putting greens include ethephon (Proxy) and mefluidide (Embark). Mefluidide, although effective for AB seedhead suppression, consistently discolors desirable creeping bentgrass. Recent research has indicated that mixtures of ethephon and trinexapac ethyl (Primo) (E+T) can suppress AB seedheads and improve putting green aesthetics in a single treatment. Although potentially effective for AB seedhead suppression, E+T can be inconsistent and ineffective when applied too early or too late. A mixed creeping bentgrass and AB putting green in Blacksburg, VA and Fairway in Lancaster, PA was treated with E+T at different times and both soil temperature and Forsythia (*Forsythia x intermedia*) bloom phenology were evaluated. Our objective was to determine biological indicators of AB bloom initiation and optimal timing for PGR treatment and to compare on-site soil temperature data to local weather station data for GDD estimation. AB first bloomed upon sustained soil temperatures of greater than 13 C on April 15 in VA and April 20 in PN. Soil and air DD50 values varied by only two days for predicting annual bluegrass seedhead emergence. First annual bluegrass bloom occurred at both locations when GDD50 reached a cumulative value between 61 and 90. At this time, Forsythia blooms on north-facing slopes first began to drop and Forsythia blooms on south-facing slopes had dropped 50%. Treatments applied within two weeks of seedhead production were most effective for AB seedhead suppression. Preliminary estimates are that E+T should be applied at a cumulative GDD50 of 50 or when Forsythia is in full bloom but bloom drop has not occurred.

RE-EVALUATION OF PARAQUAT IN ASSESSING RISK OF A CANDIDATE WEED BIOLOGICAL CONTROL AGENT. C.A. Cavin and W.L. Bruckart, USDA-ARS-FDWSRU, Ft. Detrick, MD.

ABSTRACT

Colletotrichum gloeosporioides is the active ingredient in two registered mycoherbicides in North America, 'Collego' for control of northern jointvetch (*Aeschynomene virginica*) and 'Mallet W.P' for control of roundleaf mallow (*Malva pusilla*). Each of the isolates is very damaging to its target and does not affect other plants. However, species of *Colletotrichum* are known also to cause symptomless (or latent) infections that sometimes result in a delayed disease response (i.e., hemibiotrophic). These infections are very difficult to detect and manifestation of the pathogen in infected plants often occurs during senescence or ripening. This phenomenon with *Colletotrichum* species raises significant issues from the regulatory perspective. The herbicide paraquat (1,1'-dimethyl-4,4'-bipyridinium ion) was reported to induce plant senescence and, for this reason, was considered useful in detecting latent infections of *Colletotrichum* species in inoculated plants (Cerkauskas, 1988). Cerkauskas proposed that the paraquat procedure be included in risk assessments of *Colletotrichum* species that are candidates for biological control of weeds. Currently, an isolate of *C. gloeosporioides* (*Cg*) from Hungary is under evaluation for biological control of Russian thistle (RT, *Salsola tragus*) in the U.S.

Host range tests suggest the RT *Cg* isolate is host specific; it does not cause symptoms on a closely related *Salsola* species or on other non-target plants, does not visibly affect biomass of these plants, and does not sporulate in symptomless tissue, even under moist chamber conditions. However, paraquat treatment of symptomless tissue from three species of unrelated, non-target plants resulted in sporulation by *Cg* in moist chambers. To understand whether these plants are truly infected without symptoms or if there is another mechanism by which treatment with paraquat leads to manifestation of *Cg*, soybean plants were inoculated with 10^6 conidia/ml *Cg* from RT, given dew (18 hr at 25C), incubated in a standard greenhouse, either sampled directly or surface sterilized with a sodium hypochlorite solution (0.5% NaOCl for 5 min), and then treated with paraquat. Leaf disks removed from plants subject to each of the treatments were placed in moist chambers and observed for presence or absence of spore masses from acervuli. Results show that surface sterilization prior to treatment with paraquat greatly reduces the number and rate of formation of acervuli, compared to untreated controls (i.e., treated with paraquat without prior surface sterilization). The current hypothesis is that conidia survive on the leaf surface (i.e., do not infect the plant) and as a saprophyte, colonize tissue killed by the paraquat.

Cerkauskas RF. 1988. Latent colonization by *Colletotrichum* spp.: Epidemiological considerations and implications for mycoherbicides. Can. J. Plant Path. 10: 297-310

PEST RESISTANCE MANAGEMENT, EPA’S EXPERIENCE AND PERSPECTIVE.

S.R. Matten, USEPA Office of Pesticide Programs, Washington DC.

ABSTRACT

Under the auspices of the North American Free Trade Agreement (NAFTA), the United States (Environmental Protection Agency) and Canada (Pest Management Regulatory Agency) published guidelines for voluntary pesticide resistance management labeling for implementation in North America: Pesticide Registration (PR) Notice 2001-5 and Directive 99-06, respectively. Both countries believe that a harmonized approach to resistance management based on rotation of target site/mode of action would help reduce the evolution of pest resistance. Pesticide resistance and its management have become increasingly more important. The status of implementation of these guidelines will be discussed.

MANAGING INVASIVE AQUATIC PLANTS IN FLORIDA TO PROTECT AND ENHANCE ENDANGERED SPECIES. J. Schardt, Florida Dept. of Environmental Conservation, Tallahassee, FL.

ABSTRACT

The Florida Department of Environmental Protection (DEP) is responsible for controlling invasive aquatic plants in more than 1.27 million acres of public lakes and rivers. The DEP coordinates aquatic plant control operations in these waters with agencies and groups concerned with endangered and threatened species and species of special concern. Listed species include plants and animals that live, nest, or forage in or near waters in which invasive aquatic plants are managed on a routine (recurring) basis.

Invasive aquatic plant management intersects with endangered species concerns on a variety of levels. The most obvious is developing plant control programs that will not harm listed species. Examples are excluding copper-based herbicides used for controlling the submersed plant hydrilla (*Hydrilla verticillata*) from manatee (*Trichechus manatus latirostris*) aggregation areas, and locating and establishing setbacks from Everglades Kite (*Rostrhamus sociabilis*) nests so spray boats or harvesters do not disturb nesting or foraging. Management programs are also designed to protect or enhance listed species' prey. For example, timing dewatering for invasive plant management either before or after apple snail (*Pomacea paludosa*) breeding. Apple snails are fed on by several listed species including; Everglades kites, wood storks (*Mycteria americana*), and limpkins (*Aramus guarauna*).

Invasive aquatic plants are also managed to preserve endangered species food and habitat. For example, hydrilla is controlled in the Crystal River manatee refuge to keep it from overwhelming native eel grass (*Vallisneria americana*), and water hyacinth (*Eichhornia crassipes*) is controlled in Lake Okeechobee to prevent rafts of plants from knocking over snail kite nests and covering apple snails from this site-feeding predator. In some cases, the numbers of endangered manatees overwhelm food resources in historic feeding areas, so management of invasive plants that are fed upon by this endangered species is curtailed to provide food until manatees move on. Examples include: a winter/summer hydrilla management plan in the warm spring-fed waters of Crystal River that limits hydrilla control in winter months so manatees do not have to forage into cold waters of the Gulf of Mexico. A similar arrangement exists among plant and manatee managers in Blue Springs where water hyacinth control is curtailed during winter months in the adjacent St Johns River so manatees only need to leave the warm-water refuge for short distances and periods to forage.

Plant and listed species managers also work together to develop general use patterns for aquatic registered compounds in Florida. Herbicide companies work with the USEPA, the Florida Department of Agriculture and Consumer Services, and other environmental and health agencies in the registration process for labeling herbicides for use in Florida waters. A recent example is label language that requires users of Escort (Metsulfuron methyl) herbicide in and around Lake Okeechobee to contact representatives of the South Florida Water Management District to locate populations of the endangered Okeechobee gourd (*Cucurbita okeechobeensis*) to avoid inadvertent damage during invasive Old World climbing fern (*Lygodium microphyllum*) control.

PRESIDENTIAL ADDRESS

59th Annual Meeting
Capital Hilton, Washington DC
January, 2005

Robin R. Bellinder
Cornell University

THE FUTURE OF WEED SCIENCE

At the October EC meeting I was told that I had until the Program went to press to come up with a title for this Presidential Address. I procrastinated and procrastinated and the Program went to press 'sans' title. I thought that I'd set a precedent. Then one day last week I reviewed the last 20 yrs of presidential addresses given at these meetings and found that I was in good company!

In reviewing the past 20 Presidential Addresses, I found that concern about the 'state', 'status', or 'future' of Weed Science was the focus of 9 of them. In 1984, Dr. Tom Watschke reviewed the preceding 25 yrs and reported that most of these also focused on this concern. This recurring theme reflects the nature of Presidential Addresses—our need to talk about what we believe are important general issues in the field, but it also reflects a persistent concern about the role of agriculture and weed science in a rapidly changing society.

I don't know how all of you are dealing with the current atmosphere of negativity that seems to permeate academia, or should I say the Land Grant Universities. Declining budgets, positions left unfilled, doing more with less, increased demand for outside funding and increased competition for that funding……etc. Colleagues in private industry are coping with consolidations and similar demands on time and effort distributions.

My particular negative bent, regarding the state of Weed Science, began last spring when I read an article in the IWSS newsletter by Dr. Steve Duke. In that article he warned we must reinvent ourselves or as he closed the message "without needed changes, Weed Science will be relegated to the dustbin of history—an extinct discipline." While I largely agree with Dr. Duke that we have to make some important changes is Weed Science is to remain relevant, I don't believe that things are as grim as the picture he painted. Over the last two months I've reflected on this message and studied it from several angles. I've focused on three components of the quotation: discipline, history, and change. I'll try to convey my view of these components as they relate to the broader area of agriculture as well as the discipline of Weed Science because we do not work in a vacuum but in a multi-faceted, interconnected world framework that is growing more complex by the year.

<u>Component I—Discipline</u>. We are in a comparatively young discipline. Unlike Entomology and Plant Pathology which have long been identified as disciplines, Weed Science as we know it appeared on the scene with the advent of herbicides. In fact, Weed Science is occasionally not identified as a discipline in the U.S, and in many other countries it is not even an area of study in agricultural universities. I've found that in many countries we are 'specialized' agronomists. This lack of recognition of Weed Science as its own discipline may be due in part to ambiguity about what a weed is. I looked for the origins of the word 'weed' and found that it is from Old English meaning herb or grass. Spanish and Italian also use a term meaning herb or grass. A translation of the French for 'weed' is 'bad herb'. In German and Scandinavian languages the translation is something like 'non-plant' and in Portuguese the translation is 'little mischief herb'.

Part of the frustration for Dr. Duke in his article and for all of us is that so few people outside of agriculture appreciate the impact of weeds on crop production. In the U.S., I can understand this lack of appreciation since the general populous experiences insects and need controls. They experience disease and need medicines. They do not experience malnutrition in any real sense.

I have jokingly told my Entomologist and Pathologist colleagues that I envied them their being able to focus on a single family of insects or a single pathogen. It would be like me devoting my research to hairy galinsoga for example. If however, the ability to specialize, in other words, focus on a single aspect of study defines a mature 'discipline' then, in my opinion, Weed Science has moved in this direction successfully, with our current research on invasive and endangered plants. We have returned to our 'roots' as I identify them, namely botany and taxonomy. I disagree with Dr. Duke's statement that we must reinvent ourselves or become an extinct discipline. Weed Scientists have been reinventing themselves in these areas as well as in weed biology and ecology for the last 15 years. Currently, many Weed Science students are studying in these areas.

As a discipline we need to continue to adapt but fundamentally our work will always be relevant because weeds, no matter how you define them, are not going away and humans will always seek to understand and control them. I believe that our fundamental problem is not irrelevance, but a more boring one--that we are very poor at public relations. If our work is to be properly valued we need to do a better job of conveying the importance of what we do to policy makers, funders, and the general public. This is another area that past NEWSS Presidents have frequently bemoaned and that can be overcome with some concerted effort and resources.

Component II--History. I've recently been reading books on the history of canning and that played in the background as I read a book by Steven Blank called "The End of Agriculture in the American Portfolio". I'm sure some of you have also read it. Depending on whether one is intrigued by or threatened by change, he presents a startling picture of 'industrialization' of U.S. agriculture in the future. He describes a general system of 'development' that has four stages and may be applied to agriculture, manufacturing, and other areas of the economy. I had a long talk with a large farmer in western New York in December who provided a clear example of what Blank was describing. This farmer, trained in agricultural economics, told me that "one may not like Blank's conclusions but it's hard to argue with his economics." He then proceeded to describe the four step process of 'development' that occurred in his town, and that is analogous to what is happening in agriculture now.

"Once upon a time we all made our own shoes in Batavia. "

Development Step 1. Then a man stepped forward and volunteered to make shoes for the village. He became the village cobbler and was paid in food/grain, etc. The town grew, time passed.

Development Step 2. Another resident suggested that he and several others would make a factory and together would make shoes for the village. They could make them faster, offer more variety, and presumably costs would be less. This became the Batavia Shoe Factory. The cobbler went out of business. Moving on…..department stores appeared, featuring many items, were able to bring in cheaper shoes from outside New York.

Development Step 3. The shoe factory, to survive, created a highly specialized line of orthopedic shoes and did very well.

Development Step 4. The Batavia Shoe Factory now has entered the fourth stage of development. They now create the orthopedic designs, master the flow of orders/goods, but the shoes are made outside the U.S.

This same farmer has for five years or more been describing a bimodal distribution in agricultural production in the U.S., with very large farms on the one end and small, niche ‘specialty’ producers on the other and this could be the logical outcome if one accepts Blank’s conclusions. Presuming the cost of fuel and shipping remain low, the fourth step in this process for agriculture may ultimately see that the bulk of food consumed in the U.S. is produced outside the U.S.

For Weed Scientists this historical development trend challenges us to develop ourselves as resources to agricultural producers and researchers wherever production is taking place.

Component III—Change. Steven Blank envisions a significant reduction in the need/support for land grant institutions as agricultural production patterns shift. He is not alone in this, as it has been discussed in CAST, and within the Land Grants themselves. Instead of a Land Grant college in every state, strong, vibrant agricultural universities will become hubs within regions. In my view this is not all bad but we should be actively thinking about this potential now, not when it’s forced on us. There are synergies to be achieved with collegial cooperation across regions.

It has been suggested by many that U.S. educational institutions will be the source of continued agricultural technologies that will be used in global agriculture. Additionally, we may also be the source of education and training for the world’s agriculturalists. This conversation has already begun at Cornell. Our new President, Dr. Jeffrey Lehman, has stated that the University will be “trans-national” and has taken significant steps to partner with educational institutions in Lebanon, Kuwait, and China. He has recently sent the Dean of the College of Agriculture and Life Sciences on a six-week trip to India and China. Other American universities are also moving in this direction. As a discipline we now need to be developing global skills in tomorrow’s agricultural leaders.

In closing, as my farmer said, “there will always be weeds, hence need for Weed Scientists.” There are challenges ahead but I feel that we as a ‘discipline’ are resilient and flexible and can adapt to change. Our recent successes in the areas of invasive species and ecological research are evidence of our will, drive, and enthusiasm. With an openness to change there’s no telling what the Weed Science discipline can accomplish!

Minutes for the 59th Annual Business Meeting of the NORTHEASTERN WEED SCIENCE SOCIETY

Capital Hilton, Washington, DC
January 5, 2005

1) Call to order

President Robin Bellinder called the annual business meeting to order at 4:55 pm on January 5, 2005.

2) Approval of Minutes

Scott Glenn moved that we accept the minutes of the 58th annual business meeting. Jeff Derr seconded the motion, and without further discussion, the motion passed unanimously.

3) Meeting Comments

Robin commented on the meeting, noting that it had been a successful meeting so far. She thanked all those who helped organize the meeting and thanked the hotel staff for their professionalism and assistance. She mentioned that we had met our room block, which would save us a significant charge from the hotel. She also commented that attendance at the meeting was good.

4) Necrology Report

Brian Manley reported that the following associate has passed away since the last meeting: Dr. George Hamilton, Penn State University. Brian asked if there were additional members that should be recognized, and Dr. Jack Arbor was mentioned. There was a moment of silence in honor of Drs. Arbor and Hamilton.

5) Executive Committee Reports

All of the executive committee reports were compiled and available to the membership.

a) President's Comments – Robin Bellinder

Robin thanked the many people that helped her and the society. She thanked the society for the opportunity, the sustaining members for their support, the executive committee for their hard work and support, and the past presidents (especially Scott Glenn) for their guidance. She congratulated the award winners and the weed contest winners. She also thanked David Monks, Carrie Judge and the rest of the North Carolina State staff that organized and hosted a successful weed contest. She thanked Brent Lackey for his efforts in improving the newsletter with some of the latest technology.

b) Secretary / Treasurer Update – Brian Manley

Brian reported that 253 had pre-registered for the meeting. Meeting attendance was 326 including 190 NEWSS members, 17 invited speakers, 63 attending only the Invasive species workshop, and 56 attending only the turfgrass workshop. This was up significantly from our 58th annual meeting in Cambridge, MA. Brian reported that our expenses for 2004 were $29,290.46 and our income was $32,871.49 resulting in a net gain of $3,581.03. Our current net worth is $47,218.30, which is up from $43,637.27 in 2003.

c) Audit Committee Report – Brian Manley

Brian reported that members Russell Hahn and Grant Jordan audited the books and signed the financial statement. Russ then confirmed that he had conducted the audit, and that the books were accurate and the financial statement was correct.

d) Archives Committee – Dan Kunkel

Dan reported that the archive records were now located at IR-4 headquarters at Rutgers University in New Jersey. Dan Kunkel is the new archivist. Dan indicated that additional support had upgraded the capabilities at IR-4 and the archive facilities were state of the art. Dan had received all necessary archive information.

e) Awards Committee – Scott Glenn

Scott reported that some of the awards were presented during the General Session. He commented about the number of nominees, and encouraged people to nominate their colleagues. Scott mentioned that the Awards Committee consists of the five most recent Past Presidents.

i) Distinguished member – Scott announced that Dr. David Vitolo, with Syngenta Crop Protection was awarded the distinguished member award.
ii) Award of Merit – Scott announced that Dr. Thomas Watschke, with Pennsylvania State University, received the Award of Merit.
iii) Outstanding Educator – Scott announced that Dr. Antonio DiTommaso, with Cornell University, received the Outstanding Educator Award.
iv) Outstanding Researcher – Scott announced that Dr. Bradley Majek, with Rutgers University, was awarded the Outstanding Researcher Award.
v) Collegiate Weed Contest Winners – Scott announced the winners of the 2004 Collegiate Weed Contest. Scott thanked all of those involved including participants, organizers and volunteers. The winners are listed below

<u>Graduate Division:</u>

Teams:

First:	North Carolina State University – team A
	Ian Burke, Whitnee Barker, Wesley Everman
Second:	Guelph University – team A

		Kris Mahoney, Shawn Winter, Kevin Dutton
	Third:	Cornell University
		Jacob Barney, Larissa Smith, Jonathon Kapwyk
Individuals:		
	First:	John Willis, Virginia Tech
	Second:	Jacob Barney, Cornell University
	Third:	Ian Burke, North Carolina State University

Undergraduate Division:

Teams:		
	First:	University of Guelph – team C
		Leslie Eccles, Jenny English, Julie Laplante, Joshua Vyn
	Second:	State University of New York at Cobleskill
		Jim Fitzpatrick, Dan Demers, Alden Page
	Third:	Nova Scotia Agricultural College – team B
		Pamela Craig, Kathy Pickle, Jonathan Costain, Veronique Comeau
Individuals:		
	First:	Jenny English, Univ. of Guelph-C
	Second:	Joshua Vyn, Univ. of Guelph-C
	Third:	Alden Page, SUNY-Cobleskill

vi) Graduate Student Presentation Awards – David Mayonado

Dave thanked the other judges: Joe Neal, Scott Glenn, Jeff Derr, and Dave Vitolo. He also discussed the benefits on the contest for the students in spawning competition and demonstrating to them areas to focus on to give a quality presentation. He also commented on the quality of the presentations and thanked the students for their efforts. Dave also reviewed the evaluation criteria before going into the results. There were 22 presentations, and the average score was 77%. The second place winner was Steven Mirsky with a score of 87.8, and the first place winner was Jacob Barney with a score of 91.8. Dave congratulated the winners. The primary areas for improvement that came out across most of the presentations included too much information on a slide and students talking to the screen rather than the audience. Dave thanked BASF for once again sponsoring the awards. Gar Thomas from BASF presented the awards.

1st place:

Historic Distribution of Two Invasive Species in North America: What Have We Learned?. Jacob Barney and T. Whitlow, Cornell University, Ithaca, NY.

2nd place:

Evaluating Effects of Increasing Cover Crop Intensity on Weed Seed Bank Dynamics: A Systems Approach. Steven Mirsky, D. Mortensen, and W. Curran, Pennsylvania State Univ., University Park.

vii) Research Poster Contest – Paul Stachowski

Paul commented that the rules were changed for this year's poster contest, and only students' posters were evaluated in the contest. The number of entrants in the poster session was still good in spite of the changed rules, but there were only two student posters. Paul thanked the rest of the judging committee, which included Thomas Hines, Sandra Shinn, Dave Johnson, and Barbara Scott. The second place winner was John Willis, and the first place winner was Amanda Shearin. Paul congratulated the winners.

1st place:

Cover Crop Management Impacts on the Weed Seed Predator Harpalus rufipes.. Amanda Shearin, S. Reberg-Horton, E. Gallandt, and F. Drummond, University of Maine, Orono.

2nd place:

Carfentrazone, Quinclorac, and Trifloxysulfuron Effects on Seeded Bermudagrass Establishment and Crabgrass Control. John Willis, D. Ricker, and S. Askew, Virginia Tech, Blacksburg.

viii) Photo Contest – Grant Jordan

Grant thanked the remainder of the judging committee, which included Greg Armel and Toni DiTommaso. He mentioned that there 16 photographs submitted by 4 contestants, and that the photos could be viewed in the poster session room if desired.

1st place:

Bindweed Flower close up. **Gerald Henry**, North Carolina State University

2nd place:

Mullin leaf hairs. **Randy Prostak**, University of Massachusetts.

3rd place:

Climbing milkweed. **Larissa Smith**, Cornell University.

Scott Glenn then asked all of the award winners to come forward for photographs.

Robin Bellinder then announced and presented a special Presidential award for long term attendance. Henry Lohman is a grower in New York State that had attended all but one annual meeting in the last 50 years.

6) Old Business

a) There was no old business.

7) Officer Changeover and Presentation of the Gavel

Robin Bellinder mentioned some of the highlights from 2004. Major accomplishments during 2004 included changing the rules for the paper contest to include only graduate students, the establishment of a herbicide-resistant plant committee, a committee appointed to implement changes to the collegiate weed contest to incorporate more weed biology and invasive species, and a joint initiative with the WSSA and other regional societies to consider ways to address declining membership in the societies. She also commented on significant challenges encountered in moving and revising our website. Improvements are occurring, but it is not as complete as the EC would like. She mentioned the new EC members including Hilary Sandler as editor, Brian Manley as Secretary/Treasurer, and Jacob Barney as the graduate student representative. Robin mentioned that her experience as President of the Society has been extremely positive and thanked the membership for the opportunity. She also challenged the membership to be more involved in the Society. Robin then passed the gavel to incoming President, Timothy Dutt. Tim then presented a plaque to Robin in recognition for her service to the society.

8) New Business – Tim Dutt

a) **Resolutions Committee – Chris Becker**: Chris presented a resolution entitled 'Adoption of a Glyphosate Stewardship Policy by the Northeastern Weed Science Society'. Chris mentioned that the resolution might be controversial and that the discussion would be guided by Roberts Rules. Chris read the resolution, and asked for a motion. Dave Yarborough made a motion to accept the resolution, and Dave Vitolo seconded the motion. Joe Neal then asked for time to read the stewardship policy, and Chris Becker read the policy. The following discussion then ensued.

Mark Van Gessel: as Chair of the committee, commented on the background of the committee and justification for policy.

Ron Ritter: Raised concern about turf and alfalfa – not addressed in policy.

Joe Neal: The policy should not be limited to glyphosate – rather, it should be more general herbicide resistance statement.

Todd Mervosh: The crop selection statement should use "crop system" rather than "Roundup Ready crop system".

Rich Bonanno: Raised concern that this resolution/policy could 'grow legs and take off'. The concern is that it is too restrictive to glyphosate tolerant crops, and that it could become regulation. Rich indicated that the policy should include more options. He then offered a motion to send the policy back to the committee.

Scott Glenn seconded Rich's motion.

Chris Becker indicated that that there were two options to handle the resolution – approve as is or send back to the committee.

Scott Glenn: He is in favor of the second motion since there was not enough time to evaluate the resolution and policy.

Dave Vitolo clarified that the resolution and policy were published in the November newsletter.

Scott Glenn indicated that there was not enough time to get feedback to the committee.

Dave Mortensen: commended the committee on their efforts and recommended we move it forward.

Mark Van Gessel: Asked for a method to modify and vote quickly. He pointed out that HRAC has general guidelines, but none specific to glyphosate.

Dave Vitolo: Asked if we could vote to change the by-laws to allow email voting.

Jim Steffel: indicated that we don't want the policy to slow down the technology.

Bob Sweet: he seconded Scott Glenn's comments and indicated that we would have trouble if we spelled out too many details.

Joe Neal: called for the question

Tim Dutt then called for the vote on the second motion to send the policy back to the committee for resolution. There were 56 in favor and 15 opposed.

Mark Van Gessel then asked for a mechanism to get the vote out within 60 days in order to expedite finalizing the resolution and policy.

Joe Neal: suggested we establish a process to authorize items by vote electronically.

Tim Dutt asked to add Dave Mayonado to the committee.

Mark Van Gessel asked to add Rob Hedberg.

Betty Marose asked the committee to involve the membership in the revision of the policy.

Jeff Derr moved that the membership provide comments to the committee within 2 months and that we vote electronically within 3 months. Annamarie Pennucci seconded the motion. Brent Lackey modified the motion to remove the need to vote electronically. The motion passed unanimously.

b) **Nominating Committee – Rick Schmenk**: Rick presented Grant Jordan and Renee Keese as candidates for Vice-President. Grant Jordan declined the nomination leaving Renee Keese as the sole candidate.

c) **Election of Vice President**: Tim Dutt called for nominations from the floor, and there were none. Scott Glenn moved to close nominations, and Dave Yarborough seconded the motion. The motion passed unanimously making Renee Keese the new Vice President.

d) **Appointment (2) and Election (3) of the 2004 Nominating Committee**: Tim Dutt appointed Dave Mortensen to chair the committee and Greg Armel as a member of the committee. Both agreed to appointments. Paul Stachowski, Peter Porpiglia, and Ben

Coffman were also nominated from the floor. All accepted the nominations. The motion was approved unanimously.

e) **Resolutions Committee Appointments**: Russ Hahn, Tommy Hines, and Mike Fidanza were appointed to the resolutions committee with Russ Hahn as the Chair. All accepted the appointments.

f) **2005 Weed Contest**: Tim announced that Dave Johnson at Penn State University would host the 2005 weed contest. The contest would be held on July 26, 2005 in Landisville, PA.

g) **Meeting Site for 2006**: Tim announced that 2006 annual meeting would be held at the Providence Westin in Providence Rhode Island. He pointed out that we would be meeting jointly with the Northeastern Aquatic Plant Management Society.

9) Presentation of the 2005 Executive Committee

The 2005 Executive Committee was presented by President Tim Dutt.

President Elect, William Curran

Vice President, Renee Keese

Secretary/Treasurer, Brian Manley

Past President, Robin Bellinder

CAST representative, Robert Sweet

Editor, Hilary Sandler

Graduate Student representative, Jacob Barney

Legislative representative, Dan Kunkel

Public relations, Brent Lackey

Research & Education, Kathie Kalmowitz

Sustaining membership, Susan Rick

WSSA representative, Jeffrey Derr.

10) Adjourn

Scott Glenn moved to close the meeting and Rich Bonanno seconded the motion. The meeting was closed at 6:25 pm.

Executive Committee Report of the NORTHEASTERN WEED SCIENCE SOCIETY

PRESENTED AT THE 59th ANNUAL MEETING CAPITAL HILTON, WASHINGTON, D.C. JANUARY 6, 2005

PRESIDENT
Robin Bellinder

The year 2004 got off to a great start with 58th meeting of the Society being held at the Marriott Cambridge Center in Cambridge, MA. Together, Scott Glenn and Tim Dutt planned and orchestrated a perfect convention. Our sessions were multi-faceted and very well attended (97% of the membership). The *Microstegium* workshop and the General Symposium ("Weed Management in the Future") drew large audiences. We have enjoyed partnering with the Northeastern Branch of American Society for Horticulture Science and look forward to meeting with them again in 2005. Partnerships are beneficial to all. We will be meeting with the Northeastern Aquatic Plant Management Association in 2006 in Providence, RI. The Executive Committee has been discussing other partnership possibilities as well.

I would like to extend my congratulations to our Award recipients: Dr. Ben Coffman and Dr. Joe Neal (Distinguished Members), Dr. Ed Beste and Dr. Jim Graham (Awards of Merit), Dr. William Curran (Outstanding Educator), and Dr. Mark VanGessel (Outstanding Researcher). Thanks to all of you for your dedicated service to the Society, the Weed Science discipline, and to our stakeholders.

Congratulations are also extended to the winning contestants of the Collegiate Weed Contest. This year undergraduate team 1st, 2nd and 3rd place awards were won by Guelph-C, SUNY Cobleskill, and NSAC-B teams, respectively. Undergrad individual awards went to Jenny English (Guelph-C) 1st , Joshua Vyn (Guelph-C) 2nd, and Alden Page (SUNY Cobleskill) 3rd. In the graduate division 1st, 2nd, and 3rd awards went to NCSU-A, Guelph-A, and Cornell, respectively. Graduate individual awards went to John Willis (VaTech) 1st, Jacob Barney (Cornell) 2nd, and Ian Burke (NCSU) 3rd.

I would like to thank Dr. David Monks for orchestrating a challenging and well thought out Weed Contest for the students. Despite the long drive from parts of the region to North Carolina, a good time was had by all based on the comments I heard. To Carrie Judge, Roger Batts, Joe Neal, and John Wilcut, to name but a few of the people who helped with this effort, the Society extends its thanks for a job well done under difficult weather conditions. Thanks to Sue Rick, Sustaining Membership Chair, for assisting in this huge program effort.

During 2004 the EC has carried on discussions on a range of topics. These include:

1. Changing the rules for the poster contest—it was discussed and approved by the membership, to limit the award to graduate student participants only. Posters may be submitted by all but only those of students will be in the contest.

2. A herbicide-resistant plant committee was established for the Society. This committee prepared a resolution recommending glyphosate stewardship for the membership to vote on at the 59th Annual Meeting.

3. A process has begun to revise the Collegiate Weed Contest—broadening its base so that the focus is wider than its current emphasis on agronomic crops weed management.

4. Discussions with WSSA and sister societies about declining memberships, joint meetings, etc. The current WSSA president, Dr. Carol Mallory-Smith, will be attending the NEWSS 59th meeting and it will be interesting to discuss these issues with her.

5. The development of the Website hit serious snags first in mid-spring and again in early autumn. While it appears that the problems have been corrected, the site development is still not quite finished. We expect that this will be accomplished by early 2005.

I want to thank all of the EC members for their hard work and help as we have gone through my Presidential year. We welcomed new members to the EC in 2004: Brian Manley, Secretary/Treasurer, Hilary Sandler, Editor, and Jacob Barney, Grad. Student Representative. Everyone worked together and helped where needed. Despite our difficulties with the Website, Brent Lackey has produced an outstanding format for our newsletters and we've received many compliments on them. Hilary, Brent, and Brian were able to handle getting the meeting information out to the membership and put together despite the lack of on-line submissions. Thanks too, to Dan Kunkel's, Rob Hedberg's, and Bob Sweet's efforts to keep the Society appraised of issues relevant to the Society that are on-going in Washington, D.C. and beyond. One member of the EC is rotating off, Art Gover, our Research and Education Coordinator. He has struggled mightily with some of our states' regulators to obtain recertification credits, which are much appreciated by me. Thanks! Art has also led efforts to bring invasive species to the forefront and has been highly successful.

Last but not least, I extend my heart felt thanks to Scott Glenn, Past President for his continuing good humor while mentoring me through this eventful year. I can't thank him enough! The process continues……I encourage every member to become involved with the Society, at any level. It's fun and rewarding. Thanks, for entrusting me with this responsibility. I've enjoyed serving the Society.

PRESIDENT – ELECT
Timothy Dutt

There were very favorable reviews on the 2004 meeting held at the Marriott Hotel in Cambridge, Massachusetts. Appreciation letters were sent to section chairs as well as to general session and symposium speakers. New section chairs and chair-elects for the 2005 program committee were forwarded to the in-coming Vice President, Bill Curran. Also forwarded to the in-coming Vice President and Program Chair were general attendance numbers and topic suggestions for each of the meeting sessions.

Agreement was reached to have a joint meeting in 2006 with the Northeast Aquatic Plant Management Society (NEAPMS). A conference call was held on March 1 with NEAPMS members (Amy Smagula – President-Elect, Marc Bellaud and Ron Lemin) to organize and develop a joint space and amenity needs document for the meeting. It was decided to target Providence, Rhode Island as the site for the meeting, and hotels were identified to submit proposals. A group from both societies (NEWSS - Tim Dutt and Brian Manley; NEAPMS-Marc Bellaud and Ron Lemin) visited the hotels on May 21. The Westin Providence Hotel was selected and contract negotiations were initiated. A very good room rate of $109.00 was negotiated along with many other hotel concessions. Both NEWSS and NEAPMS board of directors approved the hotel contract, and it was finalized and signed on August 12, 2004. The joint meeting will be held on January 3-6, 2006.

Dave Johnson agreed to host the 2005 Collegiate Weed Contest at the Penn State Southeast Research Farm in Landisville, Pennsylvania. Jacob Barney, Graduate Student Representative, submitted a very thorough report on coaches and student comments regarding the weed contest. Based on the report, the Executive Committee voted to evaluate and redefine the Weed Contest Committee and the criteria for the event. The President-Elect will chair a committee to evaluate the current weed contest criteria and revise it as appropriate. The committee will meet at the 2005 annual meeting to begin the process.

Kathie Kalmowitz agreed to serve as Research and Education Coordinator on the NEWSS Executive Committee. She will be replacing Art Gover who initiated many outreach activities on invasive species during his years of service.

VICE PRESIDENT
William Curran

As everyone now knows, the 59th Annual NEWSS meeting is being held at the Capital Hilton Hotel in Washington D.C. on January 3 to 6, 2005. The theme of the meeting is "*Finding Solutions for Managing Today's Weeds*". We are meeting this year in D.C. in conjunction with the Northeastern branch of the American Society of Horticultural Science. I believe the program came together nicely as we anticipate a number of excellent oral breakout sessions as well as a poster session targeting Agronomy; Conservation, Forestry, and Industrial; Ornamentals; Turfgrass; Vegetables and Fruit; and Weed Biology and Ecology research and education. For 2005, we have 22 posters and 99 oral presentations (121 total) lined up with 22 student papers being judged. Program Section Chairs and Chair-Elects for the 2005 meeting include Sandra Shinn and Hiwot Menbere for Agronomy, Todd Mervosh and Rick Iverson for Conservation, Forestry, and Industrial, Annamarie Pennucci and Robert Richardson for Ornamentals, John Jemison and Steve King for Posters, Peter Dernoeden and Mike Fidanza for Turfgrass and Plant Growth Regulators, Marija Arsenovic and Chris Becker for Vegetables and Fruit, and Hilary Sandler and Eric Gallandt for Weed Biology and Ecology.

In addition, we have three symposia this year including the General Symposium on Wednesday afternoon entitled, "*Status and Future of Herbicide Resistant Weeds*" which features several experts from across the country, a second symposium organized by Mr. Rob Hedberg on Tuesday afternoon entitled, "*Managing Invasive Species while Protecting Endangered Species*" which will address an increasingly important issue, and on Wednesday morning, there will be a turfgrass symposium organized by Drs. Peter Dernoeden and Shawn Askew entitled "*Advances in Annual and Roughstalk Bluegrass Control in Golf Course Turf*", an ever increasing problem for the golf course industry.

Finally, the Capital Hilton and surrounding Washington DC promise to be an excellent venue for our 59th annual meeting and I appreciate the ideas and help with the symposia and program and I look forward to seeing everyone in January.

SECRETARY-TREASURER
Brian Manley

2004 Financial Report: November 1, 2003 to October 31, 2004
Respectfully Submitted by: Brian S. Manley

The 2004 annual meeting was held at the Cambridge Center Marriott in Cambridge, MA on January 5-8, 2004. The meeting was attended by 202 people including: 14 distinguished members, 135 regular members, 34 student members, 2 retired members, 8 invited speakers, and 8 people registered for the Microstegium Workshop. Additionally, there were 30 NEASHS members, who attended the concurrent horticulture meetings. The total NEWSS membership for 2004 is 191.

Category	Amount ($)
Revenue	
Annual Meeting Registration	$9,999.00
BASF (Annual Meeting Awards)	$300.00
Coffee Break Support	$1,200.00
Individual Membership	$5,550.00
Interest	$575.95
Microstegium Workshop	$790.84
NEASHS	$1,197.02
Proceedings	$4,248.68
Sustaining Membership	$1,750.00
Weed Contest	$5,500.00
XID Software Sales	$1,760.00
Total Revenue	***$32,871.49***
Expenses	
Administration	$927.89
Annual Meeting	$9,541.40
Annual Meeting Awards	$1,699.60
CAST	$569.00
Newsletter	$242.96
Proceedings	$3,571.69
Programs (Annual Meeting)	$1,565.00
Student Room Reimbursement	$1,873.16
Website	$1,124.50
Weed Contest	$2,434.40
WSSA Director of Science Policy	$4,000.00
XID Software	$1,740.86
Total Expenses	***$29,290.46***
Total Revenue – Expenses (Excess or Deficit)	***$3,581.03***
October 31, 2003 Savings Certificate Accounts (IDS-American Express)	$21,713.94
October 31, 2003 UM Credit Union Savings	$21,623.47
October 31, 2003 UM Credit Union Checking	$299.86
Total Net Worth October 2003	***$43,637.27***
October 31, 2004 Savings Certificate Accounts (IDS-American Express)	$22,098.58
October 31, 2004 Bank of America Savings Account	$24,675.64
October 31, 2004 Bank of America Checking Account	$444.08
Total Net Worth October 2004	***$47,218.30***

Past President
Scott Glenn

The annual meeting at the Cambridge Marriott in Cambridge, Massachusetts was very successful. The meeting and symposiums were well attended and the quality of the presentations was very good. The society made a slight profit in 2003/4, bucking a short-term trend of deficits. The Awards Committee, Photo Contest Committee, and Poster Contest Committee were charged with preparing for their activities at the 2005 meeting in Washington, DC. All five Past Presidents that make up the Awards Committee indicated that they would be at the meeting to judge the Graduate Student Paper Contest. The Awards Committee forwarded nominees for the Distinguished Member, Merit, Outstanding Educator, and Outstanding Researcher Award to the Executive Board for their vote. Grant Jordan completed his Photo Contest Committee by adding Greg Armel to that committee. The Chair of the Poster Contest Committee, Paul Stachowski, and his committee rewrote the Poster Contest rules and rating system. The NEWSS Executive Committee approved these changes. The Committee of Past Presidents has been asked to help at the registration desk at the annual meeting. Materials from my Presidential year have been accumulated and will be forwarded to Dan Kunkel, the NEWSS Archivist. I have truly enjoyed my time as a member of the NEWSS Executive Board and wish to thank the NEWSS membership for this opportunity.

CAST
R. D. Sweet

This past year CAST produced its usual number of reports, issue papers, etc. Most related to biotechnology. This gigantic upheaval in the scientific world seems to be moving towards the human health arena and away from agricultural production. CAST has already published a couple of short papers on these newer aspects.

Two major situations have occurred this year. First, the operating budget has been balanced in spite of agricultural business contributions continuing to decrease. This was accomplished by careful “penny pinching” and by more detailed planning as to the projects to be undertaken.

The second major event was the designation effective December 1st of the EVP Dr. Teresa Gruber. A temporary replacement is Dr. Richard Stuckey. He was a highly successful CAST EVP who had retired immediately prior to Dr. Gruber’s employment.

EDITOR
Hilary Sandler

Two publications were produced for the 2005 Annual Meeting. The program was 54 pages long with 155 titles (includes 13 from NEASHS) and 550 programs were printed. Approximately 370 were mailed by the editor with first class postage. The proceedings were 217 pages long and 250 copies were printed. One hundred and sixteen abstracts were printed along with the Presidential address from the 2004 meeting were published as a supplement to the proceedings. Two indices were compiled: an Authors Index and a Main Subject Index, which combined the previously stand-alone Herbicides, Weeds, Crops, Non-crops, and Subject indices into one index. In 2005, approximately 82% of the authors who submitted titles also submitted abstracts. Instructions for Authors were only modified slightly from the previous year.

We commenced activity to move the NEWSS web site to a new server, serviced by Host Depot. The contract was signed and submitted in mid-August 2004. Many attempts were made by members of the NEWSS Executive Committee to provide information and data to enable Host Depot to establish the new site in time for members to submit titles and abstracts for the 2005 meeting electronically. Due to internal administrative difficulties at Host Depot, the web site was not ready by the deadlines; titles and abstracts were submitted by electronic mail to the Vice-President and the Editor. At the time of this writing, a prototype web site has been submitted by Host Depot and we anticipate the new web site to be functioning by early 2005.

GRADUATE STUDENT REPRESENTATIVE
Jacob Barney

My position began at the annual meeting in Cambridge, MA replacing Carrie Judge (NC State) as graduate student representative. As student representative I was in charge of compiling all of the comments and suggestions from the annual Collegiate Weed Contest sponsored by NEWSS. After the contest this year it was decided by the Executive Committee that a format change for the contest was in order after 15 or so years unaltered. I solicited comments/suggestions from all team coaches, all NEWSS students, and the Executive Committee. The few replies I did receive all indicated that change was in order, with many suggestions to alter the weed identification and farmer problem sections of the contest. I compiled all of the suggestions and will present these to the newly formed Weed Contest Committee, which my position is now involved. The committee will review the suggestions and determine the best means for implementing them.

For the graduate student mixer to be held in Washington, DC at the annual meeting I have organized a theme of "How do I choose which journal to publish my research?" I contacted the editorial board of Science, Nature, the Ecological Society of America, and the Weed Science/Weed Technology soliciting speakers. A representative from ESA mentioned they would send a member of the editorial board, but they ended correspondence unexpectedly. I have Dr. John Wilcut, Associate Editor for Weed Technology, scheduled to speak with us.

PUBLIC RELATIONS
Brent Lackey

Board conference call: March 25, 2004:

- Took photos at the 58th NEWSS Annual Meeting; will include in the April 2004 newsletter
- Requested articles from for April newsletter (Deadline = Apr 5)
- Discussed need for advertising the NEWSS – is it necessary?

Board Meeting: July 28, 2004

The April 2004 newsletter was completed and submitted to our web master for publication to **newss.org** on Friday, April 16, 2004. The newsletter was <u>not</u> published to the web site until July 6th, 2004.

In an effort to avoid further delay, I attempted to e-mail the newsletter file to the membership directly on June 23, 2004. I had roughly 40 of the messages returned as undeliverable for various reasons (address unrecognized, spam filters, file size limitations, etc.) In light of this, e-mailing the newsletter directly to the membership remains a last resort.

Robin, Jeff, Hilary, and myself were all involved in discussions with Shawn Askew (web master) and Dobraslav Kolev to ascertain the reasons for the delay. Jeff was the most successful in these efforts.

The bottom line here is that we need better cooperation and timeliness to make the electronic communications of the society function smoothly. Ideally, multiple content managers with administrative rights (primarily PR, Editor, and perhaps Sec-Treas) will have access to newss.org and the ability to add and remove content as needed. A division of labor along these lines will go far in preventing the bottle-neck we suffered this spring.

On a positive note, several members who successfully received the April newsletter via e-mail replied back to me as to how much they enjoyed the content and design.

Have had inquiries as to why the NEWSS events are not showing up on the WSSA calendar - plan to contact David Shaw about this.

Board Meeting: Oct 19-20, 2004

- Notified WSSA of NEWSS Annual Meeting - announcement posted on WSSA web site
- August newsletter was delayed by about 2 weeks due to software problems and author constraints. Due to web site turmoil, newsletter was e-mailed to the membership, then posted to the old web site within a few days. In spite of the delay, we received positive feedback on the quality of the newsletter - thanks to all contributors
- Due to delays in new web site development, title submission was restricted to downloadable forms (e-mailed & posted)
- Articles requested for November 2004 newsletter (Deadline = Nov 9):

November newsletter published (i.e., sent to membership via e-mail on Nov 16) NEWSS MOP sections updated and sent to Scott Glenn. Produced copies of 2004 Proceedings in CD format for annual meeting.

RESEARCH AND EDUCATION
Art Gover

Recertification Summary for the 2004 and 2005 Annual Meetings

The 2004 meeting was the second year I arranged for pesticide applicator and CCA recertification credits, and the process established the year before, it was relatively straightforward.

As of this date, the process for the 2005 meeting went even a little more smoothly. I have drafted a 'how-to' document for my successor describing the procedures for each state.

Recertification is a time-consuming process. I suspect that the role of the Research & Education Chair (REC) will be an ongoing consideration for the Executive Committee, but currently, taking the time to arrange for recertification credits seems to be a valid task. The CCA recertification credits are in demand, and a small segment of NEWSS members rely on the meeting to garner pesticide recertification credits.

Extracurricular Programming for 2005

The EC elected at its March 2004 meeting to pursue a symposium focusing on the potential conflicts and creative solutions created by the regulatory pressures to manage invasive species and protect endangered species. Rob Hedberg spearheaded this effort, and put together an interesting and provocative program that should be of great interest to the governmental/quasi-governmental audience in the D.C. area, as well as our Society.

The Turfgrass & Plant Growth Regulator section took the initiative to assemble a symposium addressing management of troublesome *Poa* species in bentgrass, and put together an extremely informative session.

Role of the REC

These two symposia mentioned above required little and no input, respectively, on my part. Programming time is very limited and my *perception* is that evening or post-meeting programming on Thursdays does not attract a suitable audience, or interest from Society. With these symposia in place, there was little else for me to do as REC other than provide input at EC meetings and oversee recertification.

I would suggest that the EC re-evaluate the role of the Research & Education Chair in the next few years. The Society is looking increasingly at joint meetings with other pest management societies, and therefore tending towards a re-organization of the traditional meeting format. The REC can play a useful role in this process, but this may be better facilitated through redefining the responsibilities of the position.

WSSA REPRESENTATIVE
Jeffrey Derr

I represented NEWSS at the 2004 WSSA meeting. There were approximately 550 in attendance in Kansas City, with about 30 in the invasives workshop. Awards presented in Kansas City were: Peter Dotray at Texas Tech was awarded the Outstanding Young Weed Scientist; Outstanding Research award to John O'Donovan, Alberta Research Council; Outstanding Extension Award to Neil Rhodes, Univ. Tennessee; Outstanding Industry award to Phil Banks, Marathon Consulting; Outstanding Teacher to Bruce Maxwell, Montana State; Outstanding Graduate Student to Ian Cristofer Burke, North Carolina State. Outstanding paper in Weed Science was awarded to Marisha Stanislaus and C. Cheng, Univ. Iowa while the Outstanding paper in Weed Technology was awarded to Hugh Beckie and K. Kirkland, Saskatoon, Canada. Honorary member was Aldo Alves from Brazil. New WSSA fellows were: Barry Brecke, Univ. Florida, James Griffin, LSU, Arthur Miller, APHIS, Mahesh Upadhyaya, Univ. British Columbia. None of the award winners are from the northeast. We need to ensure that our members are nominated for WSSA awards so keep that in mind when the requests go out for nominations.

The 2005 WSSA meeting will be February 6-10, 2005 in Honolulu, Hawaii and the 2006 meeting will be February 5-9, 2006 in New York City. The 2007 meeting will be in Texas, most likely San Antonio. The 2008 International Weed Science Society (IWSS) meeting is scheduled for Vancouver. The Western Society of Weed Science will meet next on March 8-10, 2005 at the Hyatt Regency, Vancouver, BC. The North Central Weed Science Society will meet December 13-16, 2004 in Columbus, OH. NCWSS will sell the SWSS Weed ID DVD at their annual meeting in Columbus. The Aquatic Plant Management Society will meet in San Antonio in July, 2005.

Based on my request, the board agreed to delay Title/Abstract submission by one month, moving the deadline from September to October. The WSSA board approved $6,000 for the 2005 WSSA calendar. Although it has lost money the past 2 years, the calendar project is useful promotion for the society (Rob Hedberg can pass this out in DC.) The board approved an approximate 12% increase in Rob Hedberg's salary to bring his salary in line with similar individuals working for societies in DC.

Phil Banks chaired the grant from APHIS to work on the glyphosate and glufosinate-resistant creeping bentgrass project. The WSSA report, prepared by Phil Banks, Bruce Branham, Kent Harrison, Tom Whitson, and Ian Heap, can be downloaded from the WSSA website.

The WSSA board has recognized the graduate student organization as a special committee of WSSA, with travel funds provided for the GSO rep to attend the summer board meeting. The WSSA Graduate Student Organization has developed a proposed Manual of Operating Procedures. Contact Cody Gray at Mississippi State if you wish input on this document.

Arnold Appleby provided a rough draft of the History of the WSSA, which will be reviewed. An estimate for printing 750 copies will be solicited. The 50th anniversary committee still needs a chair. Mike Chandler, Bob Parker, and Will Carpenter have volunteered to serve on that committee.

The Southern Weed Science Society has developed the "Interactive Encyclopedia of North American Weeds" DVD and has asked WSSA to help market this publication. It contains photographs, species descriptions, distribution maps, and identification keys for 430 weed species. SWSS will sell this DVD for $59.95 with no volume discounts, plus $5.00 shipping and handling per copy to U.S. customers.

There is interest within the regionals for more discussion topics instead of fixed 15 minute presentations. The WSWS does incorporate discussion topics into their program. SWSS is changing its meeting format, and will have all posters presentations except for graduate student talks. Section chairs will develop in-depth topics for their sessions that will include invited speakers and more time for discussion. The next SWSS meeting will be January 26-28, 2005 in Charlotte, NC.

We received a better deal on the XID weed identification software at the NEWSS meeting than was available at the WSSA meeting. No special rate was set for WSSA attendees. We sold a total of 41 copies at the Cambridge meeting.

John Jachetta, who is on the WSSA E4 Federal Noxious & Invasive Weed Committee, suggested a workshop for the 2005 NEWSS meeting in DC. The committee appreciated the need for endangered species protection, the risk assessment expertise of EPA, and the movement of this consultation process to EPA from F&WL/NMFS. Rob Hedberg has developed a symposium for the NEWSS meeting to address this issue

Regional President's Breakfast

Brian Manley and I attended the regional presidents' breakfast at the WSSA meeting. There was a lot of good discussion among the reps from the different regions. NCWSS had another drop in attendance, as did SWSS, at their annual meeting. They are looking for ideas on meeting with other organizations, both within and outside their region. NCWSS has a deal with Hyatt hotels, where the hotel chain sponsors an undergraduate award for the society as well as providing favorable contract terms. The NCWSS meets in mid December, a slow time for hotels.

Interestingly, the other regions, just like NEWSS, have seen an increase in the ratio of presentations versus attendees - i.e. - most of those who attend present a paper or poster. What has been lost is those who attend but do not present. A general feeling was that the loss in attendance was due to declining industry attendance, but the regions did not have data on that. There was interest in comparing attendance over the last 5 years for each region.

NCWSS membership has declined from 802 in 1999 to 640 in 2003. Attendance at their 1999 annual meeting was 603, with 381 in attendance in 2003.

There was no interest in dissolving any of the regionals into WSSA, or alternating a regional and national meeting each year. Likewise, there was no proposal on merging any of the regionals. There was some discussion on participation of the Canadian group with the regionals. The aquatic plant management society intends to stay small, focusing on their core group.

There was discussion on changing the format of the summer weed contest to include other types of students (eliminate sprayer calibration, for example). Brian mentioned the difficulty we have had in finding hosts for the contest.

Al Hamill, who is now past president of WSSA, is interested in continuing these discussions, perhaps at the summer board meeting for the NCWSS. If I hear any more on this, I will let the EC know.

NEAPMS

I met with the NEAPMS (Northeast Aquatic Plant Management Society) board at their annual meeting in Saratoga Springs. Their board voted to meet with NEWSS in 2006. I sent four of the board members copies of our 2004 program.

They had approximately 140 people attend their 2004 conference, an increase over previous meetings, with about 15 commercial displays. They only had 3 students and very few university people in attendance. They only used one room for talks, plus a foyer for displays. They received a grant to help cover travel costs for some of the attendees. They received over $8,000 from industry towards the cost of their 2003 meeting. If you add approximately $12,000 in registration fees, they have over $20,000 to spend on the annual meeting.

I did not hear anything negative from the NEAPMS board concerning a joint meeting. Their general response was - we talked about this 2 years ago, we agreed to this a year ago, now is the time to do it. Their members who attended our 2003 meeting felt they were warmly received by our group. Several of their board members came up to me later and said they liked the concept of a joint meeting since they worked on wetland weeds where the focus of NEAPMS is lakes and ponds.

One of their important issues was to try to keep the room rate under $100 per night. Their room rate in Sturbridge, MA (2003 meeting) was $82 single and $99 double and was $89 in Saratoga Springs, NY for the 2004 meeting. Their meeting preregistration for the 2003 and 2004 meetings was $125. Although their preregistration fee is higher than ours, I think that price included 2 breakfasts, 2 lunches, and one dinner. Since they do not meet in downtown hotels, they are getting better rates than us. Considering the meals they receive, their registration fee is low.

SUSTAINING MEMBERSHIP
Susan K. Rick

The number of Sustaining Memberships in 2004 was up from the previous year. We currently have support from 16 sustaining members. Six of those members were also graciously helped fund the coffee breaks at the 2004 annual meeting: BASF, Dow, DuPont, FMC, Monsanto and Syngenta.

Several of our Sustaining members also provided generous support for the summer weed contest that was hosted by NCSU. A total of $4500 was received from BASF, Bayer, DuPont, Dow, Monsanto and Syngenta. Many industry members also donated many hours of their time to help NCSU host a successful contest.

At the summer board meeting, the executive committee voted to increase the dues from $125 to $150 per year. The suggested contributions for the coffee break however was to remain at $200. Unfortunately, I was remiss in changing the fall dues notice letter and they went out at the old rate.

Newsletter items were included in each issue with updates for the Sustaining membership including inviting each member to bring a display for the annual meeting, how to make arrangement for hospitality suites, etc.

MOP's were review midyear and several suggestions were given to Jeff Derr to update duties according to the MOP for Sustaining Member Chairperson.

Placement service forms for 'Position Desired' and 'Position Announcement" were placed in the fall newsletter. Blank copies and notebooks were set up in a placement room at the annual meeting. Copies of both forms will be taken to the 2005 WSSA meeting.

NEWSS PAST PRESIDENTS

Gilbert H. Ahlgren	1947-49
Robert D. Sweet	1949-50
Howard L. Yowell	1950-51
Stephen M. Raleigh	1951-52
Charles E. Minarik	1952-53
Robert H. Beatty	1953-54
Albin O. Kuhn	1954-55
John Van Geluwe	1955-56
L. Danielson	1956-57
Charles L. Hovey	1957-58
Stanford N. Fertig	1958-59
Gordon Utter	1959-60
E. M. Rahn	1960-61
Lawrence Southwick	1961-62
Donald A. Shallock	1962-63
Anthony J. Tafuro	1963-64
Robert A. Peters	1964-65
Gideon D. Hill	1965-66
Richard D. Ilnicki	1966-67
John E. Gallagher	1967-68
John A. Meade	1968-69
Homer M. Lebaron	1969-70
John F. Ahrens	1970-71
George H. Bayer	1971-72
Arthur Bing	1972-73
Ralph Hansen	1973-74
Walter A. Gentner	1974-75
Henry P. Wilson	1975-76
Richard J. Marrese	1976-77

C. Edward Beste	1977-78
James D. Riggleman	1978-79
James V. Parochetti	1979-80
M. Garry Schnappinger	1980-81
Raymond B. Taylorson	1981-82
Stephan Dennis	1982-83
Thomas L. Watschke	1983-84
James C. Graham	1984-85
Russell R. Hahn	1985-86
Edward R. Higgins	1986-87
Maxwell L. McCormack	1987-88
Roy R. Johnson	1988-89
Stanley F. Gorski	1989-90
John B. Dobson	1990-91
Prasanta C. Bhowmik	1991-92
Stanley W. Pruss	1992-93
Ronald L. Ritter	1993-94
Wayne G. Wright	1994-95
Bradley A. Majek	1995-96
Thomas E. Vrabel	1996-97
Joseph C. Neal	1997-98
David B. Vitolo	1998-99
A. Richard Bonanno	1999-00
Brian D. Olson	2000-01
Jeffrey F. Derr	2001-02
David J. Mayonado	2002-03
D. Scott Glenn	2003-04
Robin R. Bellinder	2004-05

AWARD OF MERIT

1971	Gilbert H. Ahlgren	Rutgers University
	Homer Neville	L.I. Ag. & Tech, Farmingdale, NY
	Claude E. Phillips	University of Delaware
	M. S. Pridham	Cornell University
	Stephen A. Raleigh	Penn State University
1972	Robert Bell	University of Rhode Island
	Stuart Dunn	University of New Hampshire
	Alfred Fletcher	NJ State Dept. of Health
	Frank N. Hewetson	Penn Fruit Res. Lab.
	Madelene E. Pierce	Vassar College
	Collins Veatch	West Virginia University
	Howard L. Yowell	Esso Research Lab.
1973	Moody F. Trevett	University of Maine
1974	Robert H. Beatty	Amchem Products, Inc.
	Arthur Hawkins	University of Connecticut
1975	Philip Gorlin	NY City Environ. Cont.
	Herb Pass	CIBA-GEIGY Corp.
	Robert D. Sweet	Cornell University
1976	C. E. Langer	University of New Hampshire
	Charles E. Minarik	US Dept. of Agriculture-ARS
	Herb Pass	CIBA-GEIGY Corp.
1977	L. L. Danielson	US Dept. of Agriculture-ARS
	Madelene E. Pierce	Vassar College
	Lawrence Southwick	Dow Chemical Company
	John Stennis	US Bureau of Fish & Wildlife
1978	None Awarded	
1979	Carl M. Monroe	Shell Chemical Company
	Charles Joseph Noll	Penn State University
	Jonas Vengris	University of Massachusetts
1980	Otis F. Curtis, Jr.	NY Agricultural Experiment Sta.
	Theodore R. Flanagan	University of Vermont
	Oscar E. Shubert	Virginia University
1981	Dayton L. Klingman	US Dept. of Agriculture-ARS
	Hugh J. Murphy	University of Maine
	John Van Geluwe	CIBA-GEIGY Corp.
1982	Robert D. Shipman	Penn State University
1983	Arthur Bing	Cornell University
	William E. Chappel	Virginia Tech
	Barbara H. Emerson	Union Carbide Agricultural Prod.
1984	William H. Mitchell	University of Delaware
	Roger S. Young	West Virginia University
1985	John A. Jagschitz	University of Rhode Island
1986	John R. Havis	University of Massachusetts
1987	None Awarded	

1988	J. Lincoln Pearson	University of Rhode Island
1989	Robert A. Peter	University of Connecticut
1990	Bryant L. Walworth	American Cyanamid Co.
1991	Don Warholic	Cornell University
1992	Robert Duel	Rutgers University
	Richard Ilnicki	Rutgers University
	William V. Welker	USDA/ARS
1993	None Awarded	
1994	John F. Ahrens	CT Agricultural Experiment Sta.
	John B. Dobson	American Cyanamid
	J. Ray Frank	USDA-ARS/IR-4
1995	Francis J. Webb	University of Delaware
1996	Robert M. Devlin	University of Massachusetts
	Wilber F. Evans	Rhone-Poulenc Ag. Co.
	Raymond B. Taylorson	University of Rhode Island
	S. Wayne Bingham	Virginia Tech
1997	Jean P. Cartier	Rhone-Poulenc Ag. Co.
1998	Stan Pruss	Novartis Crop Protection
	Max McCormack, Jr.	University of Maine
1999	None Awarded	
2000	Richard J. Marrese	Hoechst-NorAm
2001	Nathan L. Hartwig	Penn State University
	Edward R. Higgins	Novartis Crop Protection
2002	Garry Schnappinger	Syngenta Crop Protection
2003	None Awarded	
2004	C. Edward Beste	University of Maryland-Emeritus
	James C. Graham	Monsanto (retired)
2005	Thomas L. Watschke	Penn State University

DISTINGUISHED MEMBERS

1979	George H. Bayer	Agway, Inc.
	Robert A. Peters	University of Connecticut
	Robert D. Sweet	Cornell University
1980	John F. Ahrens	CT Agricultural Experiment Sta.
	John E. Gallagher	Union Carbide Agric. Prod.
	Richard Ilnicki	Rutgers University
1981	Robert H. Beatty	Amchem Products, Inc.
	Arthur Bing	Cornell University
	John A. Meade	Rutgers University
1982	Walter A. Gentner	US Dept. of Agriculture-ARS
	Hugh J. Murphy	University of Maine
1983	L. L. Danielson	US Dept. of Agriculture-ARS
1984	Barbara H. Emerson	Union Carbide Agric. Prod.
	Henry P. Wilson	Virginia Tech
1985	None Awarded	
1986	Chiko Haramaki	Penn State University
	Dean L. Linscott	USDA-ARS/Cornell University
1987	Gideon D. Hill	E. I. DuPont DeNemours
	Williams V. Welker	US Dept. of Agric-ARS
1988	Wendell R. Mullison	Dow Chemical
	James V. Parochetti	US Dept. of Agriculture-CSRS
1989	None Awarded	
1990	Robert M. Devlin	University of Massachusetts
1991	John (Jack) B. Dobson	American Cyanamid
	Robert D. Shipman	Penn State University
1992	Gary Schnappinger	Ciba-Geigy Corp.
1993	Steve Dennis	Zeneca Ag. Products
	James Graham	Monsanto Ag. Co.
1994	Russell Hahn	Cornell University
	Maxwell McCormick	University of Maine
1995	Richard Ashly	University of Connecticut
	Richard Marrese	Hoechst-NorAm
1996	Roy R. Johnson	Waldrum Specialist Inc.
	Edward R. Higgins	Ciba Crop Protection
1997	Raymond B. Taylorson	UDSA-ARS
	Wayne G. Wright	DowElanco
	Stanley F. Gorski	Ohio State University
1998	Prasanta Bhowmik	University of Massachusetts
1999	C. Edward Beste	University of Maryland
2000	J. Ray Frank	IR-4 Project
	Stanley W. Pruss	Ciba Crop Protection
2001	Ronald L. Ritter	University of Maryland
2002	Bradley A. Majek	Rutgers University

	Thomas L. Watschke	Penn State University
2003	Nathan L. Hartwig	Penn State University
2004	C. Benjamin Coffman	USDA
	Joseph C. Neal	North Carolina State Univ.
2005	David Vitolo	Syngenta Crop Protection

OUTSTANDING RESEARCHER AWARD

1999	Garry Schnappinger	Novartis Crop Protection
2000	Prasanta C. Bhowmik	University of Massachusetts
2001	Robin Bellinder	Cornell University
2002	Jerry J. Baron	IR-4 Project, Rutgers University
2003	Arthur E. Gover	Penn State University
2004	Mark J. VanGessel	University of Delaware
2005	Bradley A. Majek	Rutgers University

OUTSTANDING EDUCATOR AWARD

1999	Douglas Goodale	SUNY Cobleskill
2000	Thomas L. Watschke	Penn State University
2001	C. Edward Beste	University of Maryland
2002	E. Scott Hagood	Virginia Tech University
2003	Andrew F. Senesac	Cornell University
2004	William S. Curran	Pennsylvania State University
2005	Antonio DiTomasso	Cornell University

OUTSTANDING GRADUATE STUDENT PAPER CONTEST

1979	1	Bradley Majek	Cornell University
	2	Betty J. Hughes	Cornell University
1980	1	John Cardi	Penn State University
	2	Timothy Malefyt	Cornell University
1981	1	A. Douglas Brede	Penn State University
	2	Ann S. McCue	Cornell University
1982	1	Thomas C. Harris	University of Maryland
	2	Barbara J. Hook	University of Maryland
	HM	L. K. Thompson	Virginia Tech
	HM	Timothy Malefyt	Cornell University
1983	1	Anna M. Pennucci	University of Rhode Island
	2	Michael A. Ruizzo	Ohio State University
	HM	I. M. Detlefson	Rutgers University
1984	1	Robert S. Peregoy	University of Maryland
	2	Ralph E. DeGregorio	University of Connecticut
1985	1	Stephan Reiners	Ohio State University
	2	Erin Hynes	Penn State University
1986	1	Elizabeth Hirsh	University of Maryland
	2 (tie)	Ralph E. DeGregorio	University of Connecticut
	2 (tie)	Avraham Y. Teitz	Ohio State University
1987	1	Russell W. Wallace	Cornell University
	2 (tie)	Daniel E. Edwards	Penn State University
	2 (tie)	Frank J. Himmelstein	University of Massachusetts
1988	1	William K. Vencill	Virginia Tech
	2	Lewis K. Walker	Virginia Tech
	HM	Scott Guiser	Penn State University
	HM	Frank J. Himmelstein	University of Massachusetts
1989	1	Frank S. Rossi	Cornell University
	1	Amy E. Stowe	Cornell University
1990	1	William J. Chism	Virginia Tech
	2	Russell W. Wallace	Cornell University
1991	1	Elizabeth Maynard	Cornell University

	2	Daniel L. Kunkel	Cornell University
1992	1	J. DeCastro	Rutgers University
	2	Ted Blomgren	Cornell University
	3	Fred Katz	Rutgers University
1993	1	Eric D. Wilkens	Cornell University
	2	Henry C. Wetzel	University of Maryland
1994	1	Jed B. Colquhoun	Cornell University
	2	Eric D. Wilkins	Cornell University
1995	1	Sydha Salihu	Virginia Tech
	2	John A. Ackley	Virginia Tech
	HM	Jed B. Colquhoun	Cornell University
1996	1	Dwight Lingenfelter	Penn State University
	2	Mark Issacs	University of Delaware
	HM	Jed B. Colquhoun	Cornell University
1997	1	David Messersmith	Penn State University
	2	Sowmya Mitra	University of Massachusetts
	HM	Mark Issacs	University of Delaware
1998	1	Dan Poston	Virginia Tech
	2	Travis Frye	Penn State University
	3	David B. Lowe	Clemson University
1999	1	Hennen Cummings	North Carolina State University
	2	John Isgrigg	North Carolina State University
2000	1	Matthew Fagerness	North Carolina State University
	2	Steven King	Virginia Tech
	3	Gina Penny	North Carolina State University
2001	1	Robert Nurse	University of Guelph
	2 (tie)	W. Andrew Bailey	Virginia Tech
	2 (tie)	Steven King	Virginia Tech
2002	1.	G. Michael Elston	University of Massachusetts
	2.	Caren A. Judge	North Carolina State University
2003	1.	Matt Myers	Penn State University
	2.	J. Scott McElroy	North Carolina State University
	3.	Robert Nurse	Cornell University

2004	1.	Whitnee L. Barker	Virginia Poly Inst. & State Univ.
	2.	Caren A. Judge	North Carolina State University
	3.	Erin R. Haramoto	University of Maine
2005	1.	Jacob Barney	Cornell University
	2.	Steven Mirsky	Penn State University

COLLEGIATE WEED CONTEST WINNERS

1983 - Wye Research Center, Maryland

Graduate Team: University of Guelph
Undergraduate Team: Penn State University
Graduate Individual: Mike Donnelly, University of Guelph
Undergraduate Individual: Bob Annet, University of Guelph

1984 - Rutgers Research and Development Center, Bridgeton, New Jersey

Graduate Team: University of Guelph
Undergraduate Individual: D. Wright, University of Guelph
Graduate Individual: N. Harker, University of Guelph

1985 – Rohm and Haas, Spring House, Pennsylvania

Graduate Team: University of Maryland
Undergraduate Individual: Finlay Buchanan, University of Guelph
Graduate Individual: David Vitolo, Rutgers University

1986 - FMC, Princeton, New Jersey

Graduate Team:
Undergraduate Team: University of Guelph
Graduate Individual: R. Jain, Virginia Tech
Undergraduate Individual: Bill Litwin, University of Guelph

1987 - DuPont, Newark, Delaware

Graduate Team: University of Guelph
Undergraduate Team: University of Guelph
Graduate Individual: Lewis Walker, Virginia Tech
Undergraduate Individual: Allen Eadie, University of Guelph

1988 - Ciba-Geigy Corp., Hudson, New York

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Undergraduate Individual: Del Voight, Penn State University
Graduate Individual: Carol Moseley, Virginia Tech

1989 - American Cyanamid, Princeton, New Jersey

Graduate Team: Cornell University
Undergraduate Team: SUNY Cobleskill
Graduate Individual: Paul Stachowski, Cornell University
Undergraduate Individual: Anita Dielman, University of Guelph

1990 - Agway Farm Research Center, Tully, New York

Graduate Team: Virginia Tech
Undergraduate Team: SUNY Cobleskill
Graduate Individual: Brian Manley, Virginia Tech
Undergraduate Individual: Dwight Lingenfelter, Penn State University

1991 - Rutgers University, New Brunswick, New Jersey

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Carol Moseley, Virginia Tech
Undergraduate Individual: Tim Borro, University of Guelph

1992 - Ridgetown College, Ridgetown, Ontario, CANADA

Graduate Team: Michigan State University
Undergraduate Team: Ohio State
Graduate Individual: Troy Bauer, Michigan State University
Undergraduate Individual: Jeff Stackler, Ohio State University

1993 - Virginia Tech, Blacksburg, Virginia

Graduate Team: Virginia Tech
Undergraduate Team: SUNY Cobleskill
Graduate Individual: Brian Manley, Virginia Tech
Undergraduate Individual: Brian Cook, University of Guelph

1994 - Lower Eastern Shore Research and Education Center, Salisbury, Maryland

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Brian Manley, Virginia Tech
Undergraduate Individual: Robert Maloney, University of Guelph

1995 - Thompson Vegetable Research Farm, Freeville, New York

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Dwight Lingenfelter, Penn State University
Undergraduate Individual: Jimmy Summerlin, North Carolina State University

1996 - Penn State Agronomy Farm, Rock Springs, Pennsylvania

Graduate Team: Michigan State University
Undergraduate Team: SUNY, Cobleskill
Graduate Individual: John Isgrigg, North Carolina State University
Undergraduate Individual: Mark Brock, University of Guelph

1997 - North Carolina State University, Raleigh, North Carolina

Graduate Team: Michigan State University
Undergraduate Team: University of Guelph
Graduate Individual: Brett Thorpe, Michigan State University

1998 - University of Delaware, Georgetown, Delaware

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Shawn Askew, North Carolina State University
Undergraduate Individual: Kevin Ego, University of Guelph

1999 - Virginia Tech, Blacksburg, Virginia

Graduate Team: North Carolina State University
Undergraduate Team: Nova Scotia Agricultural College
Graduate Individual: Rob Richardson, Virginia Tech
Undergraduate Individual: Keith Burnell, North Carolina State University

2000 - University of Guelph, Guelph, Ontario, CANADA

Graduate Team: Virginia Tech
Undergraduate Team: Ohio State University
Graduate Individual: Shawn Askew, North Carolina State University
Undergraduate Individual: Luke Case, Ohio State University

2001 - University of Connecticut, Storrs, Connecticut

Graduate Team: North Carolina State University
Undergraduate Team: Penn State University
Graduate Individual: Matt Myers, Penn State University
Undergraduate Individual: Shawn Heinbaugh, Penn State University

2002 - ACDS Research Facility, North Rose, New York

Graduate Team: North Carolina State University
Undergraduate Team: North Carolina State University
Graduate Individual: Scott McElroy, North Carolina State University
Undergraduate Individual: Sarah Hans, North Carolina State University

2003 – Syngenta Crop Protection, Eastern Region Technical Center, Hudson, NY

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: Andrew MacRae, North Carolina State University
Undergraduate Individual: Jonathan Kapwyk, University of Guelph

2004 – North Carolina University, Raleigh, NC

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: John Willis, Virginia Tech
Undergraduate Individual: Jenny English, University of Guelph

2005 – Pennsylvania State University, Landisville, PA

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: John Willis, Virginia Tech
Undergraduate Individual: Gerard Pynenborg, University of Guelph

RESEARCH POSTER AWARDS

1983 1. Herbicide Impregnated Fertilizer of Weed Control in No-Tillage Corn - R. Uruatowski and W. H. Mitchell, Univ. of Delaware, Newark

2. Effect of Wiper Application of Several Herbicides and Cutting on Black Chokeberry - D. E. Yarborough and A. A. Ismail, Univ. of Maine, Orono

HM. Corn Chamomile Control in Winter Wheat - R. R. Hahn, Cornell Univ., Ithaca, New York and P. W. Kanouse, New York State Cooperative Extension, Mt. Morris

1984 1. Herbicide Programs and Tillage Systems for Cabbage - R. R. Bellinder, Virginia Tech, Blacksburg, and T. E. Hines and H. P. Wilson, Virginia Truck and Ornamental Res. Station, Painter

2. Triazine Resistant Weeds in New York State - R. R. Hahn, Cornell Univ., Ithaca, NY

HM. A Roller for Applying Herbicides at Ground Level - W. V. Welker and D. L. Peterson, USDA-ARS, Kearneysville, WV

1985 1. No-Tillage Cropping Systems in a Crown Vetch Living Mulch - N. L. Hartwig, Penn State Univ., University Park

2. Anesthetic Release of Dormancy in *Amaranthus retroflexus* Seeds - R. B. Taylorson, USDA-ARS, Beltsville, MD and K. Hanyadi, Univ. of Agricultural Science, Keszthely, Hungary

2. Triazine Resistant Weed Survey in Maryland - B. H. Marose, Univ. of Maryland, College Park

HM. Wild Proso Millet in New York State - R. R. Hahn, Cornell Univ., Ithaca, NY

1986 1. Discharge Rate of Metolachlor from Slow Release Tablets - S. F. Gorski, M. K. Wertz and S. Refiners, Ohio State Univ., Columbus

2. Glyphosate and Wildlife Habitat in Maine - D. Santillo, Univ. of Maine, Orono

1987 1. Mycorrhiza and Transfer of Glyphosate Between Plants - M. A. Kaps and L. J. Khuns, Penn State Univ., University Park

2. Redroot Pigweed Competition Study in No-Till Potatoes - R. W. Wallace, R. R. Bellinder, and D. T. Warholic, Cornell Univ., Ithaca, NY

1988 1. Growth Suppression of Peach Trees With Competition - W. V. Welker and D. M. Glenn, USDA-ARS, Kearneysville, WV

2. Smooth Bedstraw Control in Pastures and Hayfields - R. R. Hahn, Cornell Univ., Ithaca, NY

1989 1. Burcucumber Responses to Sulfonylurea Herbicides - H. P. Wilson and T. E. Hines, Virginia Tech, Painter, VA
2. Water Conservation in the Orchard Environment Through Management - W. V. Welker, Jr., USDA-ARS Appalachian Fruit Res. Sta., Kearneysville, WV

1990 1. Reduced Rates of Postemergence Soybean Herbicides - E. Prostko, J. A. Meade, and J. Ingerson-Mahar, Rutgers Coop. Ext. Mt. Holly, NJ
2. The Tolerance of Fraxinus, Juglans, and Quercus Seedings to Imazaquin and Imazethapyr - L. J. Kuhns and J. Loose, Penn State Univ., University Park

1991 1. Johnsongrass Recovery from Sulfonylurea Herbicides - T. E. Hines and H. P. Wilson, Virginia Tech, Painter, VA
2. Growth Response to Young Peach Trees to Competition With Several Grass Species - W. V. Welker and D. M. Glenn, USDA-ARS, Kearneysville, WV

1992 1. Teaching Weed Identification with Videotape - B. Marose, N. Anderson, L. Kauffman-Alfera, and T. Patten, Univ. of Maryland, College Park
2. Biological Control of Annual Bluegrass (*Poa annua* L. *Reptans)* with *Xanthomonas campestris* (MYX-7148) Under Field Conditions - N. D. Webber and J. C. Neal, Cornell Univ., Ithaca, NY

1993 1. Development of an Identification Manual for Weeds of the Northeastern United States - R H. Uva and J. C. Neal, Cornell Univ., Ithaca, NY
2. Optimum Time of Cultivation for Weed Control in Corn - Jane Mt. Pleasant, R. Burt and J. Frisch, Cornell Univ., Ithaca, NY

1994 1. Herbicide Contaminant Injury Symptoms on Greenhouse Grown Poinsettia and Geranium - M. Macksel and A. Senesac, Long Island Horticultural Res. Lab, Riverhead, NY and J. Neal, Cornell Univ., Ithaca, NY
2. Mow-kill Regulation of Winter Cereals Grown for Spring No-till Crop Production - E. D. Wilkins and R. R. Bellinder, Cornell Univ., Ithaca, NY

1995 1. A Comparison of Broadleaf and Blackseed Plantains Identification and Control - J. C. Neal and C. C. Morse, Cornell Univ., Ithaca, NY
2. Using the Economic Threshold Concept as a Determinant for Velvetleaf Control in Field Corn - E. L. Werner and W. S. Curran, Penn State Univ., University Park

1996 1. Preemergence and Postemergence Weed Management in 38 and 76 cm Corn - C. B. Coffman, USDA-ARS, Beltsville, MD
2. Common Cocklebur Response to Chlorimuron and Imazaquin - B. S. Manley, H. P. Wilson and T. E. Hines, Virginia Tech, Blacksburg, VA

1997 None Awarded

1998 1. Weed Control Studies with Rorippa sylvestris - L. J. Kuhns and T. Harpster, Penn State Univ., University Park, PA
2. Postemergence Selectivity and Safety of Isoxaflutole in Cool Season Turfgrass - P. C. Bhowmik and J. A. Drohen, Univ. of Massachusetts, Amherst, MA

1999 1. Winter Squash Cultivars Differ in Response to Weed Competition - E. T. Maynard, Purdue Univ., Hammond, IN
2. Effectiveness of Row Spacing, Herbicide Rate, and Application Method on Harvest Efficiency of Lima Beans - S. Sankula, M. J. VanGessel, W. E. Kee, and J. L. Glancey, Univ. of Delaware, Georgetown, DE

2000 1. Weed Control and Nutrient Release With Composted Poultry Litter Mulch in a Peach Orchard - P. L. Preusch, Hood College, Frederick, MD; and T. J. Tworkoski, USDA-ARS, Hearneysville, WV
2. The Effect of Total Postemergence Herbicide Timings on Corn Yield - D. B. Vitolo, C. Pearson, M. G. Schnappinger, and R. Schmenk, Novartis Crop Protection, Hudson, NY
2 . Pollen Transport From Genetically Modified Corn - J. M. Jemison and M. Vayda, Univ. of Maine, Orono, ME

2001 1. Evaluation of methyl bromide alternatives for yellow nutsedge control in plasticulture tomato - W. A. Bailey, H. P. Wilson, and T. E. Hines, VA Tech, Painter, VA.
2. Evaluation of alternative control methods for annual ryegrass in typical Virginia crop rotations - S. R. King and E. S. Hagood, Virginia Tech, Blacksburg, VA.

2002 1. Effectiveness of mesotrione to control weeds in sweet corn. J. M. Jemison, Jr. and A. Nejako, Univ. Maine, Orono.
2. Flufenacet plus metribuzin for italian ryegrass control in Virginia wheat. W. A. Bailey, H. P. Wilson, and T. E. Hines, Virginia Tech, Painter.

2003 1. Comparison of two methods to estimate weed populations in field-scale agricultural research. R. D. Stout, M. G. Burton, and H. M. Linker, North Carolina State Univ.
2. Diquat plus glyphosate for rapid-symptom vegetation control in turf. W. L. Barker, S. D. Askew, J. B. Beam, Virginia Tech, Blacksburg; and D. C. Riego, Monsanto Co., Carmel, IN.

2004 1. Biology of the invasive plant pale swallow-wort. L. Smith, S. Greipsson, and A. DiTommaso. Cornell University.

2. Evaluating perennial groundcovers for weed suppression: Roadside trials and demonstrations. A. Senesac, I. Tsontakis-Bradley, J. Allaire, and L. Weston. Cornell University.

2005 1. Cover crop management impacts on the weed seed predator, *Harpalus rufipes*. A. Shearin, S.C. Reberg-Horton, E. Gallandt, and F. Drummond, Univ. Maine, Orono.

2. Carfentrazone, quinclorac, and trifloxysulfuron effects on seeded bermudagrass establishment and crabgrass control. J. Willis, D.B. Ricker, and S.D. Askew. Virginia Tech, Blacksburg.

INNOVATOR OF THE YEAR

1986	Nathan Hartwig	Penn State University
1987	Thomas Welker	USDA/ARS Appl. Fruit Res. Sta.
1988	None Awarded	
1989	John E. Waldrum	Union Carbide Agric. Prod.
1990	None Awarded	
1991	Thomas L. Watschke	Penn State University
1992	E. Scott Hagood	Virginia Tech
	Ronald L. Ritter	University of Maryland
1993	None Awarded	
1994	George Hamilton	Penn State University
1995	Kent D. Redding	DowElanco
1996	James Orr	Asplundh Tree Expert Co.
1997	George Hamilton	Penn State University
1998	None Awarded	
1999	Award Discontinued	

OUTSTANDING APPLIED RESEARCH IN FOOD AND FEED CROPS

1991	Russell R. Hahn	Cornell University
1992	Henry P. Wilson	Virginia Tech
1993	None Awarded	
1994	Robin Bellinder	Cornell University
1995	None Awarded	
1996	E. Scott Hagood	Virginia Tech
1997	Ronald L. Ritter	University of Maryland
1998	None Awarded	
1999	Award Discontinued	

OUTSTANDING APPLIED RESEARCH IN TURF, ORNAMENTALS, AND VEGETATION MANAGEMENT

1991	Wayne Bingham	Virginia Tech
1992	John F. Ahrens	CT Agricultural Experiment Sta.
1993	Joseph C. Neal	Cornell University
1994	Prasanta C. Bhowmik	University of Massachusetts
1995	Andrew F. Senesac	Long Island Hort. Research Lab
1996	Larry J. Kuhns	Penn State University
1997	Jeffrey F. Derr	Virginia Tech
1998	None Awarded	
1999	Award Discontinued	

OUTSTANDING PAPER AWARDS

1954	Studies on Entry of 2,4-D into Leaves - J. N. Yeatman, J. W. Brown, J. A. Thorne and J. R. Conover, Camp Detrick, Frederick, MD
	The Effect of Soil Organic Matter Levels on Several Herbicides - S. L. Dallyn, Long Island Vegetable Research Farm, Riverhead, NY
	Experimental Use of Herbicides Impregnated on Clay Granules for Control of Weeds in Certain Vegetable Crops - L. L. Danielson, Virginia Truck Expt. Station, Norfolk, VA
	Cultural vs. Chemical Weed Control in Soybeans - W. E. Chappell, Virginia Polytechnical Institute, Blacksburg, VA
	Public Health Significance of Ragweed Control Demonstrated in Detroit - J. H. Ruskin, Department of Health, Detroit, MI
1955	A Comparison of MCP and 2,4-D for Weed Control in Forage Legumes - M. M. Schreiber, Cornell Univ., Ithaca, NY
1956	None Awarded
1957	Herbicidal Effectiveness of 2,4-D, MCPB, Neburon and Others as Measured by Weed Control and Yields of Seedling Alfalfa and Birdsfoot Trefoil - A. J. Kerkin and R. A. Peters, Univ. of Connecticut, Storrs
	Progress Report #4 - Effects of Certain Common Brush Control Techniques and Material on Game Food and Cover on a Power Line Right-of-Way - W. C. Bramble, W. R. Byrnes, and D. P. Worley, Penn State Univ., University Park
1958	Effects of 2,4-D on Turnips - C. M. Switzer, Ontario Agricultural College, Guelph, Canada
	Ragweed Free Areas in Quebec and the Maritimes - E. E. Compagna, Universite Laval at Ste-Anne-de-la-Pocatiere, Quebec, Canada
1959	Yields of Legume-Forage Grass Mixtures as Affected by Several Herbicides Applied Alone or in a Combination During Establishment - W. G. Wells and R. A. Peters, Univ. of Connecticut, Storrs
	Influence of Soil Moisture on Activity of EPTC, CDEC and CIPC - J. R. Havis, R. L. Ticknor and P. F. Boblua, Univ. of Massachusetts, Amherst

1960 The Influence of Cultivation on Corn Yields When Weeds are Controlled by Herbicides - W.F. Meggitt, Rutgers Univ., New Brunswick, NJ

1961 Preliminary Investigation of a Growth Inhibitor Found in Yellow Foxtail *(Setaria glauca* L.) - H.C. Yokum, M.J. Jutras, and R.A. Peters, Univ. of Connecticut, Storrs

1962 The Effects of Chemical and Cultural Treatment on the Survival of Rhizomes and on the Yield of Underground Food Reserves of Quackgrass - H.M. LeBaron and S.N. Gertig, Cornell Univ., Ithaca, NY

Observations on Distribution and Control of Eurasian Watermilfoil in Chesapeake Bay, 1961 - V.D. Stotts and C. R. Gillette, Annapolis, MD

1963 The Relation of Certain Environmental Conditions to the Effectiveness of DNBP of Post-Emergence Weed Control in Peas - G. R. Hamilton and E. M. Rahn, Univ. of Delaware, Newark

The Influence of Soil Surface and Granular Carrier Moisture on the Activity of EPTC. J.C. Cialone and R.D. Sweet, Cornell Univ., Ithaca, NY

The Determination of Residues of Kuron in Birdsfoot Trefoil and Grasses - M. G. Merkle and S. N. Fertig, Cornell Univ., Ithaca, NY

1964 Control of Riparian Vegetation with Phenoxy Herbicides and the Effect on Streamflow Quality - I. C. Reigner, USDA-Forest Service, New Lisbon, NJ; W. E. Sopper, Penn State Univ., University Park; and R. R. Johnson, Amchem Products, Inc., Ambler, PA

EPTC Incorporation by Band Placement and Standard Methods in Establishment of Birdsfoot Trefoil - D. L. Linscott and R. D. Hagin, Cornell Univ., Ithaca, NY

1965 1. Corn Chamomile *(Anthemis arvensis* L.) Responses to Some Benzoic Acid Derivatives - Barbara M. Metzger, Judy K. Baldwin and R. D. Ilnicki, Rutgers Univ., New Brunswick, NJ

2. The Physical Properties of Viscous Sprays for Reduction of Herbicide Drift - J.W. Suggitt, The Hydro-Electric Power Commission of Ontario, Canada

1966 1. Weed Control Under Clear Plastic Mulch - Carl Bucholz, Cornell Univ., Ithaca, NY

2. A Chemical Team For Aerial Brush Control on Right-of-Way - B. C. Byrd and C. A. Reimer, Dow Chemical Co

1967 1. Influence of Time of Seeding on the Effectiveness of Several Herbicides Used for Establishing an Alfalfa-Bromegrass Mixture - R. T. Leanard and R. C. Wakefield, Univ. of New Hampshire, Durham

2. Weed Competition in Soybeans - L. E. Wheetley and R. H. Cole, Univ. of Delaware, Newark

1968 None Awarded

1969 1. Weed and Crop Responses in Cucumbers and Watermelons - H. P. Wilson and R. L. Waterfield, Virginia Truck and Orn. Res. Sta., Painter

2. Effect of Several Combinations of Herbicides on the Weight and Development of Midway Strawberry Plants in the Greenhouse - O. E. Schubert, West Virginia Univ., Morgantown

1970 1. Effects of RH-315 on Quackgrass and Established Alfalfa - W. B. Duke, Cornell Univ., Ithaca, NY

1971 1. Activity of Nitralin, Trifluralin and ER-5461 on Transplant Tomato and Eggplant - D. E. Broaden and J. C. Cialone, Rutgers Univ., New Brunswick, NJ

2. Field Investigations of the Activities of Several Herbicides for the Control of Yellow Nutsedge - H. P. Wilson, R. L. Waterfield, Jr., and C. P. Savage, Jr., Virginia Truck and Orn. Res. Sta., Painter

1972 1. Study of Organisms Living in the Heated Effluent of a Power Plant - M. E. Pierce, Vassar College and D. Allessandrello, Marist College

2. Effect of Pre-treatment Environment on Herbicide Response and Morphological Variation of Three Species - A. R. Templeton and W. Hurtt, USDA-ARS, Fort Detrick, MD

1973 1. A Simple Method of Expressing the Relative Efficacy of Plant Growth Regulators - A. R. Templeton and W. Hurtt, USDA-ARS, Fort Detrick, MD

2. Agronomic Factors Influencing the Effectiveness of Glyphosate for Quackgrass Control – F. E. Brockman, W. B. Duke, and J. F. Hunt, Cornell Univ., Ithaca, NY

1974 1. Weed Control in Peach Nurseries - O. F. Curtis, Cornell Univ., Ithaca, NY

2. Persistence of Napropamide and U-267 in a Sandy Loam Soil - R. C. Henne, Campbell Institute for Agr. Res., Napoleon, OH

1975 1. Control of Jimsonweed and Three Broadleaf Weeds in Soybeans - J. V. Parochetti, Univ. of Maryland, College Park

HM. The Influence of Norflurazon on Chlorophyll Content and Growth of *Potomogeton pectinatus* - R. M. Devlin and S. J. Karcyzk, Univ. of Massachusetts, East Wareham

HM. Germination, Growth, and Flowering of Shepherdspurse - E. K. Stillwell and R. D. Sweet, Cornell Univ., Ithaca, NY

1976 1. Top Growth and Root Response of Red Fescue to Growth Retardants - S. L. Fales, A. P. Nielson and R. C. Wakefield, Univ. of Rhode Island, Kingston

HM. Selective Control of *Poa annua* in Kentucky Bluegrass - P. J. Jacquemin, O. M. Scott and Sons, and P. R. Henderlong, Ohio State Univ., Columbus

HM. Effects of DCPA on Growth of Dodder - L. L. Danielson, USDA ARS, Beltsville, MD

1977 1. The Effects of Stress on Stand and Yield of Metribuzin Treated Tomato Plants - E. H. Nelson and R. A. Ashley, Univ. of Connecticut, Storrs

HM. The Influence of Growth Regulators on the Absorption of Mineral Elements - R. M. Devlin and S. J. Karcyzk, Univ. of Massachusetts, East Wareham.

HM. Quantification of S-triazine Losses in Surface Runoff: A Summary - J. K. Hall, Penn State Univ., University Park

1978 1. Annual Weedy Grass Competition in Field Corn - Jonas Vengris, Univ. of Massachusetts, Amherst

HM. Metribuzin Utilization with Transplanted Tomatoes - R. C. Henne, Campbell Institute of Agr. Res., Napoleon, OH

1979 1. Herbicides for Ground Cover Plantings - J. F. Ahrens, Connecticut Agric. Expt. Station, Windsor

2. Weed Control Systems in Transplanted Tomatoes - R. C. Henne, Campbell Institute of Agr. Res. Napoleon, OH

1980 1. Integrated Weed Control Programs for Carrots and Tomatoes - R. C. Henne and T. L. Poulson, Campbell Institute of Agr. Res. Napoleon, OH

2. Suppression of Crownvetch for No-Tillage Corn - J. Carina and N. L. Hartwig, Penn State Univ., University Park

HM. Effect of Planting Equipment and Time of Application on Injury to No-tillage Corn from Pendimethalin-Triazine Mixtures - N. L. Hartwig, Penn State Univ., University Park

1981 1. Weed Control in Cucumbers in Northwest Ohio - R. C. Henne and T. L. Poulson, Campbell Institute of Agr. Res. Napoleon, OH

2. Prostrate Spurge Control in Turfgrass Using Herbicides - J. A. Jagschitz, Univ. of Rhode Island, Kingston

HM. Some Ecological Observations of Hempstead Plains, Long Island - R. Stalter, St. John's Univ., Jamaica, NY

1982 1. Differential Growth Responses to Temperature Between Two Biotypes of *Chenopodium album* - P. C. Bhowmik, Univ. of Massachusetts, Amherst

2. Chemical Control of Spurge and Other Broadleaf Weeds in Turfgrass - J. S. Ebdon and J. A. Jagschitz, Univ. of Rhode Island, Kingston

HM. Influence of Norflurazon on the Light Activation of Oxyfluorfen - R. M. Devlin, S. J. Karczmarczyk, I. I. Zbiec and C. N. Saras, Univ. of Massachusetts, East Wareham

HM. Analysis of Weed Control Components for Conventional, Wide-row Soybeans in Delaware - D. K. Regehr, Univ. of Delaware, Newark

1983 1. Comparisons of Non-Selective Herbicides for Reduced Tillage Systems - R. R. Bellinder, Virginia Tech, Blacksburg and H. P. Wilson, Virginia Truck and Orn. Res. Station, Painter

2. The Plant Communities Along the Long Island Expressway, Long Island, New York - R. Stalter, St. John's Univ., Jamaica, NY

HM. Effect of Morning, Midday and Evening Applications on Control of Large Crabgrass by Several Postemergence Herbicides - B. G. Ennis and R. A. Ashley, Univ. of Connecticut, Storrs

1984 1. Pre-transplant Oxyfluorfen for Cabbage - J. R. Teasdale, USDA-ARS, Beltsville, MD

2. Herbicide Programs and Tillage Systems for Cabbage - R. R. Bellinder, Virginia Tech, Blacksburg and T. E. Hines and H. P. Wilson, Virginia Truck and Orn. Res. Station, Painter

1985 1. Peach Response to Several Postemergence Translocated Herbicides - B. A. Majek, Rutgers Univ., Bridgeton, NJ

1986 1. Influence of Mefluidide Timing and Rate on *Poa annua* Quality Under Golf Course Conditions - R. J. Cooper, Univ. of Massachusetts, Amherst; K. J. Karriok, Univ. of Georgia, Athens, and P. R. Henderlong and J. R. Street, Ohio State Univ., Columbus

2. The Small Mammal Community in a Glyphosate Conifer Release Treatment in Maine - P. D'Anieri, Virginia Tech, Blacksburg; M. L. McCormack, Jr., Univ. of Maine, Orono; and D. M. Leslie, Oklahoma State Univ., Stillwater

HM. Field Evaluation of a Proposed IPM Approach for Weed Control in Potatoes - D. P. Kain and J. B. Sieczka, Cornell Univ., Long Island Horticultural Research Laboratory, Riverhead, NY and R. D. Sweet, Cornell Univ., Ithaca, NY

1987 None Awarded

1988 1. Bentazon and Bentazon-MCPB Tank-mixes for Weed Control in English Pea - G. A. Porter, Univ. of Maine, Orono; A. Ashley, Univ. of Connecticut, Storrs; R. R. Bellinder and D. T. Warholic, Cornell Univ., Ithaca, NY; M. P. Mascianica, BASF Corp., Parsippany, NJ; and L. S. Morrow, Univ. of Maine, Orono

2. Effects of Herbicide Residues on Germination and Early Survival of Red Oak Acorns - R.D. Shipman and T. J. Prunty, Penn State Univ., University Park

2. Watershed Losses of Triclopyr after Aerial Application to Release Spruce Fir - C. T. Smith, Univ. of New Hampshire, Durham and M. L. McCormack, Jr., Univ. of Maine, Orono

1989 None Awarded

1990 None Awarded

1991 Award Discontinued

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HERBICIDE NAMES: COMMON, TRADE, AND CHEMICAL

Common and Chemical Names of Herbicides Approved by The Weed Science Society of America

Common Name	Trade Name	Chemical Name
acetochlor	Harness, Surpass, Topnotch, Degree	2-chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphe nyl) acetamide
acifluorfen	Blazer, Status Blazer Ultra	5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenz oic acid
alachlor	Intrro, MicroTech, Partner; many	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl) acetamide
alloxydim	Clout	methyl 2,2-dimethyl-4,6-dioxo-5-[1-[(2-propenyloxy)amino]butylidene]cyclohexanecarboxy late
ametryn	Evik	N-ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triaz ine-2,4- diamine
amicarbozone	Dinamic	4-amino-N-(1,1-dimethylethyl)-4,5-dihydro-3-(1-methylethyl)-5-oxo-1H-1,2,4-triazole-1-carboxamide
aminopyralid	Milestone Milestone VM	2-pyridine carboxylic acid, 4-amino-3,6-dichloro- 2-pyridinecarboxylic acid
asulam	Asulox	methyl[(4-aminophenyl)sulfonyl]carbamate
atrazine	Aatrex, many	6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
azimsulfuron	Gulliver	N-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-1 -methyl-4-(2-methyl-2H-tetrazol-5-yl)-1H-pyrazole-5-sulfonamide
beflubutamid		2-[4-fluoro-3-(trifluoromethyl)phenoxy]-*N*-(phenylmethyl)butanamide
benefin	Balan	N-butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl) benzenamine
bensulfuron	Londax	2-[[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl] amino]sulfonyl]methyl]benzoic acid
bensulide	Bensumec, Betasan, Prefar	O,O-bis(1-methylethyl)S-[2-[(phenylsulfonyl)amino] ethyl]phosphorodithioate

Common Name	Trade Name	Chemical Name
bentazon	Basagran T/O, Basagran Forte, Result B, Lescogran	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H) -one 2,2-dioxide
benzfendizone		methyl 2-[2-[[4-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)pyrimidinyl)phenoxy]methyl]-5-ethylphenoxy]propanoic acid
bispyribac-sodium	Velocity, Regiment	2,6-bis[(4,6-dimethoxy-2-pyrimidinyl)oxy]benzoic acid
bromacil	Hyvar	5-bromo-6-methyl-3-(1-methylpropyl)-2,4(1H, 3H)pyrimidinedione
bromoxynil	Brominal, Buctril, Moxy	3,5-dibromo-4-hydroxybenzonitrile
butafenacil	Inspire	2-chloro-5-(3-methyl-2,6,dioxo-4-triflouromethyl-3,6-dihydro-2H-pyrimidyl)-benzoic acid 1-allylocycarbonyl-1-methyl-ethyl-ester
butralin	AMEX-820, TAMEX	4-(1,1-dimethylethyl)-N-(1-methylpropyl)-2,6-dinitrobenzenamine
butylate	Sutan+, Genate Plus	S-ethyl bis(2-methylpropyl)carbamothioate
cacodylic acid	Cotton-aide, Montar, Phytar 560	dimethyl arsinic acid
carfentrazone	Aim, Affinity, QuickSilver IVM, Stingray	α,2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl] -4-fluorobenzenepropanoic acid
chlorflurenol	Maintain, CF 125	2-chloro-9-hydroxy-9H-fluorene-9-carboxylic acid
chlorimuron	Classic	2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl)amino]carbonyl]a-mino]sulfonyl]benzoic acid
chlorsulfuron	Corsair, Glean, Telar, Glean,Lesco TFCr	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) amino]carbonyl] benzenesulfonamide
clethodim	Prism, Select, Envoy, Select Max	(E,E)-(±)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
clomazone	Command	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone
clopyralid	Reclaim, Stinger, Transline, Lontrel	3,6-dichloro-2-pyridinecarboxylic acid

Common Name	**Trade Name**	**Chemical Name**
cloransulam	FirstRate	3-chloro-2-[[(5-ethoxy-7-fluoro[1,2,4]triazolo[1,5-c] pyrimidin-2yl)sulfonyl]amino]benzoic acid
copper sulfate	Copper Sulfate	copper sulfate
cycloate	Ro-Neet	S-ethyl cyclohexylethylcarbamothioate
cyclosulfamuron	Ichiyonmaru, Nebiros	N-[[[2-(cyclopropylcarbonyl)phenyl]amino]sulfonyl]-N'-(4,6-dimethoxy-2- pyrimidinyl)urea
cyhalofop	Clincher	(R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propanoic acid
2,4-D	many	(2,4-dichlorophenoxy)acetic acid
dazomet	Basamid	tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione
2,4-DB	Butoxone, Butyrac	4-(2,4-dichlorophenoxy)butanoic acid
DCPA	Dacthal	dimethyl 2,3,5,6-tetrachloro-1,4-benzenedicarboxylate
desmedipham	Betanex	ethyl[3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate
dicamba	Banvel, Clarity, Vanquish	3,6-dichloro-2-methoxybenzoic acid
dichlobenil	Barrier, Casoron, Dyclomec, Norosac	2,6-dichlorobenzonitrile
dichlorprop	Weedone 2,4-DP	(±)-2-(2,4-dichlorophenoxy)propanoic acid
diethatyl	Antor	N-(chloroacetyl)-N-(2,6-diethylphenyl)glycine
diclofop	Hoelon, Illoxan	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy]propanoic acid
diclosulam	Strongarm	N-(2,6-dichlorophenyl)-5-ethoxy-7-fluoro[1,2,4]triazolo[1,5-c] pyrimidine-2-sulfonamide
difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium
diflufenzopyr		2-[1-[[[(3,5-difluorophenyl)amino]carbonyl]hydrazono]ethyl]-3-pyridinecarboxylic acid
dimethenamid	Frontier	2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
dimethenamid-P	Outlook	(S)-2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
diphenamid	Enide	N,N-dimethyl-a-phenyl benzeneacetamide
diquat	Diquat, Reglone, Reward	6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediiumion

Common Name	Trade Name	Chemical Name
dithiopyr	Dimension	S,S-dimethyl 2-(difluoromethyl)-4-(2-methylpropyl)-6-trifluoromethyl)- 3,5-pyridinedicarbothioate
diuron	Karmex, Direx	N'-(3,4-dichlorophenyl)-N,N-dimethylurea
DSMA	Ansar, many	disodium salt of MAA
endothall	Aquathol, Accelerate, Desicate, H-273	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
EPTC	Eptam, Eradicane Extra, Genep, Genep Plus	S-ethyl dipropyl carbamothioate
ethalfluralin	Sonalan, Curbit, Edge	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoro-methyl)benzenamine
ethametsulfuron	Muster	2-[[[[4-ethoxy-6-(methylamino)-1,3,5-triazin-2-yl]amino] carbonyl]amino]sulfonyl]benzoic acid
ethofumesate	Nortron	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
fenoxaprop	Acclaim, Horizon, Puma, Whip	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propanoic acid
flazasulfuron	Mission	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(trifluoromethyl)-2-pyridinesulfonamide
florasulam	Primus, Boxer	N-(2,6-difluorophenyl)-8-fluoro-5-ethoxy[1,2,4]triazolo[1,5-c]pyrimidine-2-sulfonamide
fluazifop	Fusilade, Horizon, Ornamec	(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]-propanoic acid
flucarbazone	Everest	4,5-dihydro-3-methoxy-4-methyl-5-oxo-N-[[2-(trifluoromethoxy)phenyl]sulfonyl]-1H-1,2,4-triazole-1-carboxamide
flufenacet	Define	N-(4-fluorophenyl)-N-(1-methylethyl)-2-[[5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl]oxy]acetamide
flumetsulam	Python	N-(2,6-difluorophenyl)-5-methyl[1,2,4]triazolo[1,5-a] pyrimidine-2-sulfonamide
flumiclorac	Resource	[2-chloro-4-fluoro-5-(1,3,4,5,6,7-hexahydro-1,3-dioxo-2H- isoindol-2-yl)phenoxy]acetic acid

Common Name	Trade Name	Chemical Name
flumioxazin	Broadstar, Chateau, Flumizin, Encompass, Sumisoya, Valor, SureGuard	2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2H-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1H-insoindole-1,3(2H)- dione
fluometuron	Cotoran	N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]urea
flupoxam		1-[4-chloro-3-[(2,2,3,3,3-pentafluoropropoxy)methyl]- phenyl]-5-phenyl-1H-1,2,4-triazole-3-carboxamide
flupropacil		1-methylethyl 2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)-pyrimidinyl]benzoate
flupyrsulfuron		2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-6-trifluoromethyl)-3-pyridinecarboxylic acid
fluridone	Avast, Sonar	1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)- pyridinone
fluroxypyr	Starane, Spotlight, Tomahawk, Vista	[(4-amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy]acetic acid
fluthiacet	Action, Appeal	[[2-chloro-4-fluoro-5-[(tetrahydro-3-oxo-1*H*,3*H*-[1,3,4]thiadiazolo[3,4-a]pyridazin-1-ylidene)amino]phenyl]thio]acetic acid
fomesafen	Reflex, Flexstar	5-[2-chloro-4-(trifluoromethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide
foramsulfuron	Option, Revolver	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-4-(formylamino)-*N,N*-dimethylbenzamide
fosamine	Krenite	ethyl hydrogen (aminocarbonyl)phosphonate
glufosinate	Finale, Liberty, Rely	2-amino-4-(hydroxymethylphosphinyl)butanoic acid
glyphosate	Glyphomax, Glyphos, Roundup, Touchdown; many	N-(phosphonomethyl)glycine
halosulfuron	Permit, Sandea, Sledgehammer	3-chloro-5-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-1-methyl-1H-pyrazole-4-carboxylic acid

Common Name	Trade Name	Chemical Name
hexazinone	Pronone, Velpar	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-tria zine-2,4(1H,3H)-dione
imazamethab enz	Assert	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo -1H- imidazol-2-yl]-4(and 5)-methylbenzoic acid (3:2)
imazamox	Raptor, Beyond	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imiazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid
imazapic	Cadre, Plateau	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid
imazapyr	Arsenal, Chopper, Stalker, Habitat	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo -1H -imidazol-2-yl]-3-pyridinecarboxylic acid
imazaquin	Scepter, Image	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imidazol-2-yl]-3-quinolinecarboxylic acid
imazethapyr	Pursuit, Newpath	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid
iodosulfuron	Husar	4-iodo-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoic acid
isoproturon		N,N-dimethyl-N'-[4-(1-methylethyl)phenyl]urea
isoxaben	Gallery	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dim eth- oxybenzamide
isoxaflutole	Balance, Balance Pro	(5-cyclopropyl-4-isoxazolyl)[2-(methylsulfonyl)-4-(trifluoromethyl)-phenyl]methanone
ketospiradox		2-[(2,3dihydro-5,8-dimethyl-1,1-dioxidospiro[4H-1-benzothiopyran-4,2'-[1,3]dioxolan]-6-yl)carbonyl]-1,3-cyclohexanedione ion(1-)
lactofen	Cobra, Phoenix	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenz oate
linuron	Lorox, Linex, Afolan	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea
maleic hydrazide	Royal MH30, Royal Slo-Gro	1,2-dihydro-3,6-pyridazinedione
MCPA	many	(4-chloro-2-methylphenoxy)acetic acid
MCPB	Cantrol, Thistrol	4-(4-chloro-2-methylphenoxy)butanoic acid
mecoprop	Mecomec, Super Chickweed Killer	(±)-2-(4-chloro-2-methylphenoxy)propanoic acid

Common Name	**Trade Name**	**Chemical Name**
mefluidide	Embark, Vistar	N-[2,4-dimethyl-5-[[(trifluoromethyl)sulfonyl]amino] phenyl]acetamide
mesotrione	Callisto	2-(4-mesyl-2-nitrobenzoyl)-3-hydroxycyclohex-2-enone
metamifop		(*R*)-2-[4-(6-chloro-1,3-benzoxazol-2-yloxy)phenoxy]-2′-fluoro-*N*-methylpropionanilide
metham	Vapam	methylcarbamodithioic acid
metolachlor	Dual, Pennant	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1- methylethyl)acetamide
s-metolachlor	Cinch, Dual Magnum Pennant Magnum	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1- methylethyl)acetamide, S-enantiomer
metosulam	Barko	N-(2,6-dichloro-3-methylphenyl)-5,7-dimethoxy[1,2,4] triazolo[1,5-a]pyrimidine-2- sulfonamide
metribuzin	Sencor	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
metsulfuron	Ally, Blade, Cimarron, Escort, Manor	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]benzoic acid
molinate	Ordram	S-ethyl hexahydro-1H-azepine-1-carbothioate
MSMA	Ansar, Bueno, Daconate	monosodium salt of MAA
napropamide	Devrinol	N,N-diethyl-2-(1-naphthalenyloxy)propanamide
naptalam	Alanap	2-[(1-naphthalenylamino)carbonyl]benzoic acid
nicosulfuron	Accent	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino] sulfonyl]-N,N-dimethyl-3-pyridinecarboxamide
norflurazon	Evital, Solicam, Predict, Zorial	4-chloro-5-(methylamino)-2-(3-(trifluoromethyl)phenyl)-3 (2H)-pyridazinone
oryzalin	Surflan	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide
oxadiargyl	TopStar	3-[2,4-dichloro-5-(2-propynyloxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3*H*)-one
oxadiazon	Ronstar	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2-(3H)-one
oxaziclomefone		3-[1-(3,5-dichlorophenyl)-1-methylethyl]-2,3-dihydro-6-methyl-5-phenyl-4*H*-1,3-oxazin-4-one
oxyfluorfen	Goal GoalTender	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl) benzene

Common Name	**Trade Name**	**Chemical Name**
paraquat	Boa, Cyclone, Gramoxone, Starfire	1,1'-dimethyl-4,4'-bipyridiniumion
pebulate	Tillam	S-propyl butylethylcarbamothioate
pelargonic acid	Scythe	nonanoic acid
pendimethalin	Pentagon, Prowl, PendiMax; Pendulum, Prowl H2O, many	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzena mine
penoxsulam	Granite, Grasp	2-(2,2-difluoroethoxy)-N-(5,8-dimethoxy [1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl) benzenesulfonamide
phenmedipham	Spin-Aid	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl)carbamate
picloram	Tordon, Grazon	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid
primisulfuron	Beacon, Rifle	2-[[[[[4,6-bis(difluoromethoxy)-2-pyrimidinyl]amino] carbonyl]amino]sulfonyl]benzoic acid
prodiamine	Barricade, Factor, RegalKade	2,4 dinitro-N3,N3-dipropyl-6-(trifluoromethyl)-1,3-benzenediamine
prometon	Pramitol	6-methoxy-N,N'-bis(1-methylethyl)-1,3,5-triazine-2, 4- diamine
prometryn	Caparol, Cotton Pro	N,N'-bis(1-methylethyl)-6-(methylthio)-1,3,5-triazin e-2,4- diamine
pronamide	Kerb	3,5-dichloro (N-1,1-dimethyl-2-propynyl)benzamide
propachlor	Ramrod	2-chloro-N-(1-methylethyl)-N-phenylacetamide
propanil	Propanil, Stam, Superwham	N-(3,4-dichlorophenyl)propanamide
prosulfuron	Peak	*N*-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]-2-(3,3,3-trifluoropropyl)benzenesulfonamide
pyraflufen	ET	[2-chloro-5-[4-chloro-5-(difluoromethoxy)-1-methyl-1*H*-pyrazol-3-yl]-4-fluorophenoxy]acetic acid
pyrazon	Pyramin	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone
pyribenzoxium		diphenylmethanone *O*-[2,6-bis[(4,6-dimethoxy-2-pyrimidinyl)oxy]benzoyl]oxime

Common Name	Trade Name	Chemical Name
pyridate	Lentagran, Tough	O-(6-chloro-3-phenyl-4-pyridazinyl) S-octyl carbonothioate
pyrithiobac	Staple	2-chloro-6-[(4,6-dimethoxy-2-pyrimidinyl)thio]benzo ic acid
quinclorac	Drive, Facet, Impact	3,7-dichloro-8-quinolinecarboxylic acid
quizalofop	Assure II, Targa	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy]prop anoic acid
rimsulfuron	Matrix, Tranxit	N-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3 - (ethylsulfonyl)-2-pyridinesulfonamide
sethoxydim	Poast, Vantage, Poast Plus, Result G	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
siduron	Tupersan	N-(2-methylcyclohexyl)-N'-phenylurea
simazine	Aquazine, Princep; many	6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine
sodium chlorate	Defol	sodium chlorate
sulcotrione	Galleon	2-[2-chloro-4-(methylsulfonyl)benzoyl]-1,3-cyclohexanedione
sulfentrazone	Authority, Spartan	N-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl] phenyl]methanesulfonamide
sulfometuron	Oust	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]carbonyl]am ino] sulfonyl]benzoic acid
sulfosulfuron	Maverick, Outrider, Certainty	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-2-(ethylsulfonyl)imidazo[1,2-a]pyridine-3-sulfonamide
tebuthiuron	Spike	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea
terbacil	Sinbar	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H) - pyrimidinedione
thiazafluron	Dropp	N,N'-dimethyl-N-[5-(trifluoromethyl)-1,3,4-thiadiazol -2-yl] urea
thiazopyr	Mandate, Visor	methyl2-(difluoromethyl)-5-(4,5-dihydro-2-thiazolyl) -4-(2-methylpropyl) -6-(trifluoromethyl)-3-pyridinecarboxylate

Common Name	Trade Name	Chemical Name
thifensulfuron	Harmony GT	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid
thiobencarb	Bolero, Abolish	S-[(4-chlorophenyl)methyl]diethylcarbamothioate
topramezone		(3-(4,5-dihydro-isoxazol-3-yl)-4-methanesulfonyl-2-methylphenyl)-(5-hydroxyl-1-methyl-1H-pyrazol-4-yl)methanone)
tralkoxydim	Achieve	2-[1-(ethoxyimino)propyl]-3-hydroxy-5-(2,4,6-trimethylphenyl)-2-cyclohexen-1-one
triallate	Far-Go, Avadex, Showdown	S-(2,3,3-trichloro-2-propenyl) bis(1-methylethyl) carbamothioate
triasulfuron	Amber	2-(2-chloroethoxy)-N-[[(4-methoxy-6-methyl-1,3,5-t riazin-2-yl)amino]carbonyl] benzenesulfonamide
tribenuron	Express	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)methyla mino] carbonyl]amino]sulfonyl]benzoic acid
triclopyr	Garlon, Grandstand, Pathfinder, Remedy, Turflon, Renovate	[(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid
trifloxysulfuron	Enfield, Envoke, Monument	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(2,2,2-trifluoroethoxy)-2-pyridinesulfonamide
trifluralin	Treflan, Tri-4, Trilin; many	2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzena mine
triflusulfuron	UpBeet	2-[[[[[4-(dimethylamino)-6-(2,2,2-trifluoroethoxy)-1, 3,5- triazin-2-yl]amino]carbonyl]amino]sulfonyl]-3-methylbenzoic acid
vernolate	Vernam	S-propyl dipropylcarbamothioate

COMMON PRE-PACKAGED HERBICIDES

Common Pre-packaged Herbicides and Common Name of the Component Chemicals

Trade Name	Common Name of Individual Herbicides
Accent Gold	clopyralid + flumetsulam + nicosulfuron + rimsulfuron
Atrabute+	atrazine + butylate
Axiom	flufenacet + metribuzin
Backdraft	glyphosate + imazaquin
Basis	rimsulfuron + thifensulfuron
Basis Gold	atrazine + nicosulfuron + rimsulfuron
Betamix	desmedipham + phenmedipham
Bicep II Magnum	atrazine + s-metolachlor
Bicep Lite II Magnum	atrazine + s-metolachlor
Bison	bromoxynil + MCPA
Boundary	s-metolachlor + metribuzin
Bronate	bromoxynil + MCPA
Brushmaster	dicamba + 2,4-D + 2,4-DP
Buckle	triallate + trifluralin
Bullet	alachlor + atrazine
Camix	mesotrione + s-metolachlor
Canopy	chlorimuron + metribuzin
Canopy XL	chlorimuron + sulfentrazone
Canopy EX	chlorimuron + tribenuron
Celebrity	dicamba + nicosulfuron
Chaser	triclopyr + 2,4-D
Cheyenne	fenoxaprop + MCPA + thifensulfuron + tribenuron
Cimarron Max	dicamba + metsulfuron + 2,4-D
Cinch ATZ	atrazine + s-metolachlor
Clarion	Nicosulfuron + rimsulfuron
Confront	clopyralid + triclopyr
Cool Power	dicamba + MCPA + triclopyr
Crossbow	triclopyr + 2,4-D
Curtail	clopyralid + 2,4-D
Curtail M	clopyralid + MCPA
Dakota	fenoxaprop + MCPA
Degree Xtra	acetochlor + atrazine
Dissolve	mecoprop + 2,4-D + 2,4-DP
Distinct	dicamba + diflufenzopyr
Domain	flufenacet + metribuzin
Eclipse	clopyralid + MCPA + 2,4-DP
Epic	flufenacet + isoxaflutole
Equip	mesosulfuron(AEF-130060) + iodosulfuron
Event	imazapyr + imazethapyr
Exceed	primisulfuron + prosulfuron
Extreme	glyphosate + imazethapyr
FieldMaster	acetochlor + atrazine + glyphosate
Finesse	chlorsulfuron + metsulfuron

Trade Name	Common Name of Individual Herbicides
Fire Power	glyphosate + oxyfluorfen
Fuego	dicamba + triasulfuron
FulTime	acetochlor + atrazine
Fusion	fenoxaprop + fluazifop
Ganster	flumioxazin + cloransulam
Grazon P+D	picloram + 2,4-D
Guardsman Max	atrazine + dimethenamid
Harmony Extra	thifensulfuron + tribenuron
Harness Xtra	acetochlor + atrazine
Horizon 2000	fenoxaprop + fluazifop
Hornet	clopyralid + flumetsulam
Horsepower	dicamba + triclopyr + 2,4-D
Journey	imazapic + glyphosate
Kansel Plus	oxadiazon + pendimethalin
Keystone, Keystone LA	acetochlor + atrazine
Krovar	bromacil + diuron
Laddok S-12	atrazine + bentazon
Landmark II	chlorsulfuron + sulfometuron
Landmaster	glyphosate + 2,4-D
Lariat	alachlor + atrazine
Layby Pro	linuron + diuron
Lexar	Atrazine + mesotrione +s-metolachlor
Liberty ATZ	atrazine + glufosinate
Lightning	imazapyr + imazethapyr
Lumax	atrazine + mesotrione + s-metolachlor
Marksman	atrazine + dicamba
Millennium Ultra	clopyralid + dicamba + 2,4-D
Momentum	clopyralid + triclopyr + 2,4-D
NorthStar	dicamba + primisulfuron + prosulfuron
Oasis	imazapic + 2,4-D
OH2 (Ornamental Herbicide)	oxyfluorfen + pendimethalin
Onestep	imazapyr + glyphosate
Oustar	hexainone + sulfometuron
Oust Extra	metsulfuron + sulfometuron
Overdrive	dicamba + diflufenzopyr
PastureGard	triclopyr + fluroxypyrr
Power Zone	carfentrazone + dicamba+ mecoprop + MCPA
PrePair	napropamide + oxadiazon
Preview	chlorimuron + metribuzin
Prompt	atrazine + bentazon
QuickPro	diquat + glyphosate
Ready Master ATZ	atrazine + glyphosate
Redeem R&P	clopyralid + triclopyr
Regal O-O	oxadiazon + oxyfluorfen
RegalStar	oxadiazon + prodiamine
Resolve SG	dicamba + imazethapyr
Rhino	atrazine + butylate
Rout	oryzalin + oxyfluorfen

Trade Name	Common Name of Individual Herbicides
Sahara	diuron + imazapyr
Salute	metribuzin + trifluralin
Shotgun	atrazine + 2,4-D
Showcase	trifluralin + isoxaben + oxyfluorfen
Simazat	atrazine + simazine
Snapshot	isoxaben + trifluralin
Speed Zone	carfentrazone + dicamba + mecoprop + 2,4-D
Spirit	primisulfuron + prosulfuron
Squadron	imazaquin + pendimethalin
Stampede	MCPA + propanil
Steadfast	nicosulfuron + rimsulfuron
Steadfast ATZ	atrazine + nicosulfuron + rimsulfuron
Steel	imazaquin + imazethapyr + pendimethalin
Stellar	flumiclorac + lactofen
Sterling Plus	atrazine + dicamba
Strategy	clomazone + ethalfluralin
Stronghold	imazapyr + imazethapyr + mefluidide
Synchrony STS	chlorimuron + thifensulfuron
Team	benefin + trifluralin
Telone C17, Telone C35	chloropicrin + dichloropropene
Tiller	fenoxaprop + MCPA + 2,4-D
Tordon 101M	picloram + 2,4-D
Total	bromacil + diruon + sodium chlorate + sodium metaborate
Triamine	mecoprop + 2,4-D + 2,4-DP
Tri-Ester	mecoprop + 2,4-D + 2,4-DP
Trimec 992	dicamba + mecoprop + 2,4-D
Trimec Classic	dicamba + mecoprop + 2,4-D
Trimec Super	dicamba + dichlorprop + 2,4-D
Tri-Scept	imazaquin + trifluralin
Trupower	clopyralid + dicamba + MCPA
Typhoon	fluazifop + fomesafen
Velpar Alfamax	hexazione + diuron
Vengeance	dicamba + MCPA
Weedmaster	dicamba + 2,4-D
Westar	Hexazinone + sulfometuron
XL 2G	benefin + oryzalin
Yukon	dicamba + halosulfuron

EXPERIMENTAL HERBICIDES

Experimental Number	Common Name (Proposed), Trade Name, Company Name
AC-900001	picolinafen/Pico, BASF
AEF-130060	mesosulfuron/Osprey, Bayer
BAS 620	tepraloxydim/Aramo, Equinox, Honest, BASF
BAY MKH 6561	propoxycarbazone/Attribute, Olympus, Bayer
BK-800	Uniroyal
CGA-184927	clodinofop-propargyl/Discover, Syngenta
CGA-277476	oxasulfuron/Dynam, Syngenta
KIH-485	Kumiai
F4113	carfentrazone + glyphosate, FMC

PLANT GROWTH REGULATORS

Common Name	Trade Name
AVG	Retain
6-benzyl adenine	BAP-10
chlorflurecol	Maintain
chlormequat chloride	Cycocel
clofencet	Detasselor
copper ethylenediamine	Inferno
diphenylamine	
diminozide	B-nine
ethephon	Florel
forchlorfenuron	
GA 4 7/G BA	Promalin, Rite Size
GABA	Auxigro
MBTA	Ecolyst
mepiquat chloride	Mepex, Mepex Gin Out, Pix
paclobutrazol	Bonzi, Clipper, Trimmet
prohexadione	Apogee
sodium nitrophenolate	Atonik
trinexapac	Palisade, Primo
uniconazole	Prunit, Sumagic

COMMON AND CHEMICAL NAMES OF HERBICIDE MODIFIERS

Common Name	Chemical Name
benoxacor	(*RS*)-4-dichloroacetyl-3,4-dihydro-3-methyl-2*H*-1,4-benzoxazine
cloquintocet	(5-chloroquinolin-8-yloxy)acetic acid
cyometrinil	(Z)-α-[(cyanomethoxy)imino]benzeneacetonitrile
dichlormid	2,2-dichloro-N,N-di-2-propenylacetamide
dicyclonon	1-(dichloroacetyl)hexahydro-3,3,8a-trimethylpyrrolo[1,2-α]pyrimidin-6(2*H*)-one
dietholate	O,O-diethyl O-phenyl phosphorothioate
fenchlorazole	1-(2,4-dichlorophenyl)-5-(trichloromethyl)-1*H*-1,2,4-triazole-3-carboxylic acid
fenclorim	4,6-dichloro-2-phenylpyrimidine
flurazole	phenylmethyl-chloro-4-(trifluoromethyl)-5-thiazolecarboxylate
fluxofenim	1-(4-chlorophenyl)-2,2,2-trifluoroethanone *O*-(1,3-dioxolan-2-ylmethyl)oxime
furilazole	3-(dichloroacetyl)-5-(2-furanyl)-2,2-dimethyloxazolidine
isoxadifen	4,5-dihydro-5,5-diphenyl-3-isoxazolecarboxylic acid
mefenpyr	1-(2,4-dichlorophenyl)-4,5-dihydro-5-methyl-1*H*-pyrazole-3,5-dicarboxylic acid
mephenate	4-chlorophenyl methylcarbamate
naphthalic anhydride	1H,3H-naphtho[1,8-cd]-pyran-1,3-dione
oxabetrinil	α-[(1,3-dioxolan-2-yl)methoxyimino]benzeneacetonitrile

Disclaimer

Names for chemicals in these lists are correct to the best of the Editor's ability and current information available at the time of printing. This information is provided as a courtesy to our members and readers of the Proceedings. Compounds may be added or removed from the market at any time. All persons using this information for official or other purposes should always verify the validity of the product information contained in these lists.

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