Proceedings

of the

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of the

Northeastern Weed Science Society

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Northeastern Weed Science Society Award Winners

Photo Contest

1st Place- **Randy Prostak** of University of Massachusetts- Dandelion (*Taraxacum officinale*) seedhead		
2nd Place- **Shawn Askew** of Virginia Tech- Moth mullein (*Verbascum blattaria*) flower		
3rd Place- **Nelson DeBarros** of Penn State University- Slender speedwell (*Veronica Filliformis*) flower		

Awards Banquet Winners

From left to right:

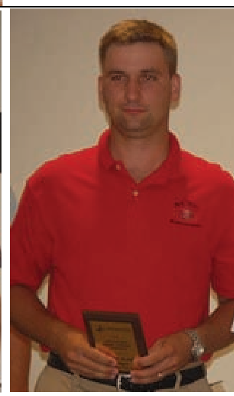
Outstanding Educator: **Mike Fidanza**, Penn State University

Oustanding Researcher: **Shawn Askew**, Virginia Tech

Distinguished Member: **Jeff Derrr**, Virginia Tech

Robert D. Sweet Oustanding Graduate Student: **Jacob Barney**, Cornell University

NEWSS Weed Contest Winners

	*First Place Graduate Team:* **Penn State University** (**<u>from left to right</u>**)- Nelson DeBarros, Ruth Mick, Dwight Lingenfelter (coach), Ryan Bates, and Matt Ryan
	*First Place Undergraduate Team:* **Guelph** (**<u>from left to right</u>**)- James Ferrier, Kelly O'Connor, and Blair Scott
  	**<u>From left to right:</u>** *First Place Graduate Individual:* **Matt Ryan**, Penn State University *Second Place Graduate Individual:* **Matt Goddard**, Virginia Tech *Third Place Graduate Individual:* **Ryan Pekarek**, North Carolina State University
 	**<u>From left to right:</u>** *First Place Undergraduate Individual*: **Blair Scott**, Guelph *Second Place Undergraduate Individual (tie)*: **Scott Snowe**, Guelph and **Cory Chelko**, Penn State University

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NORTHEASTERN WEED SCIENCE SOCIETY NOXIOUS AND INVASIVE VEGETATION SHORT COURSE 2008. M.A. Bravo, Pennsylvania Department of Agriculture, Harrisburg, W.S. Curran, Pennsylvania State University, and K.A. Wagner, Pennsylvania Department of Agriculture, Harrisburg.

ABSTRACT

The Northeastern Weed Science Society (NEWSS) Noxious and Invasive Vegetation Management Short Course (NIVM) was offered for the first time in the Northeast for public and private land managers; policy makers; township and municipality supervisors; and contractors who wanted to gain a better understanding of noxious and invasive vegetation management in terrestrial and aquatic environments such as forests, parks, preserves, conservancies, C.R.E.P (conservation reserve) lands, highway right-of-ways (R.O.W), and ponds, lakes and riparian areas. Weed management and invasive vegetation identification professionals affiliated with NEWSS from Maine to North Carolina to Tennessee conducted the training program that was designed to encourage interaction between instructors and participants. The three-day course was held in Lebanon County, Pennsylvania at a wooded retreat in Mount Gretna the week of September 15th, 2008. Participants had the option of registering for a 2 day terrestrial species course providing more than 15 hours of continuing education and a 1 day aquatic species course providing 8 hours of continuing education or a combination thereof.

Sixty-one registrants from MD, DE, PA, Washington D.C, NJ, NY, OH, VA, TN and Ontario, Canada attended the course that was taught by 16 instructors, a course coordinator and one staff assistant. Through hands-on participation, registrants learned how to identify invasive terrestrial and aquatic vegetation problematic in the northeastern region of the United States, apply basal or cut stump treatments, operated and calibrated herbicide application equipment, and inventory for multiple species. Registrants also attended lectures on the ecology of plant invasion, early detection and rapid response, inventory and mapping techniques, the decision making process, herbicide dissipation, mechanical tools of weed control, basic math calculations and species specific weed management scenarios. Break out sessions demonstrating herbicide mode of action, herbicide absorption and translocation, herbicide formulations and adjuvants, sprayer application tools, aquatic herbicide application techniques, were also provided. Registrants received plant identification books, a course binder, course certificates from the society and pesticide recertification credits from participating states. A course evaluation is currently being summarized.

RESPONSE OF CRANBERRY VINES TO HAND-HELD FLAME CULTIVATORS - INITIAL YEAR EVALUATION. K.M. Ghantous, University of Massachusetts, Amherst, H.A. Sandler, P. Jeranyama, University of Massachusetts-Amherst Cranberry Station, East Wareham, and W.R. Autio, University of Massachusetts, Amherst.

ABSTRACT

Weeds present a significant threat to cranberry bog yields. Current weed management strategies in cranberry production include cultural controls such as flooding and sanding, mechanical controls like hand weeding, and the use of herbicides. Several high priority cranberry weeds have no effective weed management strategy.

Flame cultivation is a nonchemical method of weed control where target plants are damaged or eradicated by exposure to brief periods of high temperature. Various flame cultivation methods have been used in annual crops such as carrots, corn, onions and potatoes. The utility of flame cultivation on perennial weeds in cranberry systems has not been investigated. Prescribed burns have been used in closely related species such as lowbush blueberry (*Vaccinium myrtilloides* and *Vaccinium angustifolium*) as a method of pruning to increase yield and aid in the control of weeds, pests, and pathogens. The response of cranberry vines to flame cultivation is of interest to determine if flame cultivation could be a useful nonchemical practice for cranberry weed control.

We hypothesized that 1) flame cultivation will cause damage to cranberry plants and that the amount of damage will increase with increasing exposure times; 2) the effects of different flame cultivators will differ from each other in the amount of damage created; and 3) cranberry plants will recover from the effects of flame cultivation.

To test these hypotheses, we evaluated three flame cultivators (Infrared, Open Flame, and Infrared Spike) on two cranberry varieties (Mullica Queen and Crimson Queen). For each variety, 4 rooted uprights were planted in 15 cm diameter clay pots and placed in a greenhouse. Each pot was subjected to a single treatment exposure from one of the three cultivators: 0, low, medium, high or Roundup® wipes (12.5% solution glyphosate). Treatments were arranged in a randomized complete block design with 5 replications. Plants were evaluated for damage at 1 DAT, 7 DAT, and 28 DAT and evaluated for recovery at 21 DAT and 50 DAT.

For both varieties, the Infrared and the Infrared Spike cultivators, damage increased as exposure increased. For the Open Flame, damage was similar for all exposure levels higher than 0. For both varieties, all plants showed some recovery at all levels of exposure except for the Roundup® treatment, which showed no recovery. Plants treated with the Infrared torch showed the most vigorous recovery at both evaluations. All plants and all torches treatments showed increasing recovery over time for all exposures, except for Roundup®.

Preliminary data analysis shows that for damage and recovery, the effects of Flame Cultivator, Exposure, and Flame Cultivator by Exposure were all highly significant. This supports the hypotheses that the amount of damage will increase with increasing exposure times, and the effects of the three flame cultivators will differ from each other for damage and recovery.

EFFICACY OF VARIOUS CUT STUMP HERBICIDE APPLICATIONS ON WISTERIA, PRIVET, AND PAULOWNIA. D.A. Little, J.C. Neal. North Carolina State University, Raleigh, and A.R. Post, Cornell University, Ithaca, NY.

ABSTRACT

Cut-stump herbicide applications are an effective tool for foresters and vegetation managers for the control of unwanted woody vegetation. Yet, limited research is available on the effectiveness of cut-stump treatments on non-native invasive plants. In March 2008, a field study was established to determine the efficacy of different herbicides and concentrations for the control of Chinese wisteria (*Wisteria sinensis*), Chinese privet (*Ligustrum sinense*), and paulownia (*Paulownia tomentosa*). In March 2005, plants were transplanted at the NCSU Horticulture Field Lab in Raleigh, N.C. In Nov 2005 and Nov 2006, separate sets of privet plants were cut back to 6 inches above the ground. Efficacy of treatments on one-year old and two-year-old regrowth were compared in the current study. Stems were cut using hand-held lopping shears, then 10 to 15 ml per stem of treatment solutions were applied using a hand-held pump sprayer. Plots were arranged in a randomized complete block design with five to six replications. Regrowth heights or fresh weights were recorded six months after treatments. Five herbicide treatments, triclopyr 3SC at 50 and 25% v/v, glyphosate 4SC 50 and 25% v/v, and 2,4-D 3.8SC 40% v/v, were tested on stems with one-year regrowth. On two-year-old regrowth these treatments plus 10% v/v imazapyr and 0.26 g/L metsulfuron were tested. A separate study was established to test four herbicide treatments (triclopyr 50 and 25% v/v and glyphosate 50 and 25% v/v) for the control of paulownia. An additional experiment was established to compare glyphosate, triclopyr, 2,4-D, imazapyr and metsulfuron at the rates described above for the control of wisteria.

All herbicide treatments provided greater than 99% control of privet regrowth. No treatment provided 100% paulownia control. Glyphosate at 50 and 25% provided 80 and 78% suppression of regrowth, respectively. Triclopyr at 50 and 25% provided 54 and 66% suppression, respectively. Both rates of triclopyr provided 100% wisteria control. Imazapyr and 2,4-D provided 85 and 90% reduction in fresh weight, respectively. These data provide vegetation managers options for the control of these invasive woody species. More research is required determine the minimum herbicide concentrations needed for privet and wisteria control as well as treatments that provide better control of paulownia.

Acknowledgement and disclaimer: This research was supported by a grant from the North Carolina Department of Transportation. The authors are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of either the North Carolina Department of Transportation or the Federal Highway Administration at the time of publication. This report does not constitute a standard, specification, or regulation.

UTILITY OF SAFLUFENACIL FOR BROADLEAF WEED CONTROL IN NON-CROP USE PATTERNS. J.E. Zawierucha, G.W. Oliver, J.H. O'Barr, and L.D. Charvat, BASF Corporation, Research Triangle Park, NC.

ABSTRACT

Saflufenacil is a new herbicide being developed by BASF for annual broadleaf weed control in a variety of crop and noncrop areas. Saflufenacil provides very rapid postemergence "knockdown" of sensitive broadleaf weeds as well as rate dependent residual control. BASF testing has demonstrated saflufencil to have potential in several noncrop markets including: industrial, rights-of-way, turfgrass, as well as for control of aquatic weed species. For industrial “bareground” applications, saflufencil has been tested at rates up to 400 g ai/ha for control of a broad spectrum of weeds including horseweed (*Conyza canadensis*), kochia (*Kochia scoparia*), Russian thistle (*Salsola kali*), and pigweed (*Amaranthus spp*.). Field trials have demonstrated that a number of perennial grasses are tolerant to saflufenacil. This grass selectivity provides the potential for use in rights-of-way areas to control weeds such as horseweed and giant ragweed (*Ambrosia trifida*) while maintaining desirable grasses for erosion control. Tolerance screening in cool and warm season turfgrass suggests that saflufenacil can be applied at rates up to 25-50 g ai/ha. In utility applications, research has demonstrated that mixtures of saflufencil and glyphosate can effectively control volunteer pine (*Pinus spp.*). Research results suggest that saflufencil should become a versatile herbicide for noncrop weed control applications.

EVALUATION OF COMMERCIALLY AVAILABLE HERBICIDES TO CONTROL ASIATIC DAYFLOWER IN GOLF COURSE ROUGHS. M.A. Fidanza, Pennsylvania State University, Reading, PA, M. Shaffer, D. Petfield, Merion Golf Club, Ardmore, PA, and J.A. Borger, Pennsylvania State University, University Park, PA.

ABSTRACT

Asiatic dayflower (*Commelina communis*) is an annual monocot weed commonly found in soybean fields throughout the Midwest. Within the fine fescue (*Festuca spp*.) roughs of Merion Golf Club - East Course (Ardmore, PA), however, this weed has become an invasive and problematic nuisance. The result is a reduction in visual quality of the naturalized look of the fine fescue roughs, a reduction in desired turfgrass stand density, and consequently negative impacts on playability of golf in the roughs. Therefore, the purpose of this investigation was to evaluate commercially available herbicide products for control of Asiatic dayflower. Mature and aggressive Asiatic dayflower plants were collected from several areas at Merion Golf Club on June 28, 2008 and immediately transplanted to plastic pots (6 in. diam. x 6 in. depth) filled with potting soil and transported to Pennsylvania State Berks Campus (Reading, PA). On August 7, 2008, herbicide treatments (Table 1) were applied only once from a CO_2-pressurized backpack sprayer calibrated to deliver one gal water-carrier per 1000 sq ft through an XR8004E flat-fan nozzle at 40 psi. Treatments consisted of one target plant (4-6 tillers, 12-16 in. ht.) per pot arranged as a randomized complete block design with three replications. Target plants were visually evaluated for injury/phytotoxicity on a 0 to 100% scale, where 0 = no injury and 100 = complete injury or death. Data were subjected to analysis of variance and treatment means compared with Fisher's least significance difference test at $P < 0.05$.

Turflon® Ester provided the best control (i.e., leaf necrosis, wilting, stem collapse), although noticeable suppression was observed from products containing 2,4-D and/or dicamba at 14 to 28 DAT. Future research should examine herbicide products in sequential applications and timings for both post- and pre-emergence control of this weed in turfgrass.

Table 1. Postemergence control of mature Asiatic dayflower plants collected from *Festuca* spp. turf, 2008.

Treatment and Product Am't/Acre		Active Ingredient(s)	8/10 (3 DAT)	8/14 (7 DAT)	8/21 (14 DAT)	8/28 (21 DAT)	9/4 (28 DAT)	9/18 (42 DAT)
			% Injury*					
1	Acclaim Extra 57EW 39 fl oz	fenoxaprop-ethyl	1 c	1 d	7 de	13 f	13 f	7 cd
2	Drive 75DF 16 oz	quinclorac	1 c	3 d	12 de	20 ef	20 ef	10 cd
3	2,4-D Amine 3.8L 32 fl oz	2,4-D	3 ab	13 c	28 c	47 c	50 cd	21 b
4	Banvel 4L 16 fl oz	dicamba	1 c	12 c	22 cd	28 de	28 ef	8 cd
5	Echelon 4SC 12 fl oz	sulfentrazone, prodiamine	1 c	8 cd	10 de	12 f	12 f	4 cd
6	Q4 1.54L 128 fl oz	quinclorac, 2,4-D, sulfentrazone, dicamba	2 b	28 b	40 b	58 b	60 b	15 bc
7	Trimec Classic 2.72L 64 fl oz	2,4-D, MCPP, dicamba	2 b	25 b	32 bc	47 c	57 bc	13 bc
8	Trimec Plus 2.64L 128 fl oz	2,4-D, MCPP, dicamba, MSMA	2 b	32 b	33 bc	37 de	42 d	12 cd
9	Turflon Ester 4EC 32 fl oz	triclopyr	4 ab	57 a	82 a	98 a	99 a	99 a
10	Untreated	---	0 c	0 d	0 e	0 g	0 g	0 d

*All treatments applied once on August 7, 2008 ("DAT" = days after treatment). Plant injury based on a 0 to 100% scale, where 0 = no injury and 100 = complete injury or death. Treatments means followed by the same letter are not significantly different according to Fisher's protected least significance difference test at P < 0.05.

CREEPING BENTGRASS PUTTING GREEN RESPONSE TO BISPYRIBAC-SODIUM.
P.E. McCullough and S.E. Hart, Rutgers Univeristy, New Brunswick, NJ.

ABSTRACT

Bispyribac-sodium is an efficacious herbicide for annual bluegrass (*Poa annua*) control in creeping bentgrass (*Agrostis palustris*) fairways but turf tolerance and growth inhibition from applications may be exacerbated on closer mowed putting greens. To test this hypothesis, field and greenhouse experiments investigated creeping bentgrass putting green tolerance to bispyribac-sodium. In greenhouse experiments, creeping bentgrass discoloration from bispyribac-sodium was exacerbated by reductions in mowing height from 24 to 3 mm but mowing height did not influence clippings or root weight. In field experiments, discoloration of creeping bentgrass putting greens was greatest from applications of 37 g/ha every ten days compared to 74, 111, or 222 g/ha applied less frequently. Chelated iron effectively masked discoloration of creeping bentgrass putting greens from bispyribac-sodium while trinexapac-ethyl inconsistently masked these effects. Overall, creeping bentgrass putting greens appear more sensitive to bispyribac-sodium than higher mowed turf but chelated iron and trinexapac-ethyl could mask discoloration.

FALL APPLICATION OF TRIBENURON-METHYL FOR BUNCHBERRY CONTROL IN WILD BLUEBERRIES. D.E. Yarborough and J.L. D'Appollonio, University of Maine, Orono.

ABSTRACT

Tribenuron-methyl was applied to a non-cropping wild blueberry (*Vaccinium angustifolium*) field containing bunchberry (*Cornus canadensis*) in the fall of 2006 and 2007 to evaluate the herbicide's effectiveness in controlling bunchberry and potential injury to wild blueberry. Tribenuron-methyl was applied at a rate of 0.43 oz ai/ A with a nonionic surfactant at 0.25% v/v to ten 1-m^2 plots per treatment date on 29 August, 26 September and 17 October 2006, and to a 24 by 50 ft block for each treatment date on 4 September, 17 September, and 3 October 2007. Ten 1-m^2 plots per treatment timing were evaluated at four weeks or two weeks post-treatment, respectively, for blueberry and bunchberry percent cover using a Daubenmire cover scale converted to percent cover, and results were compared to untreated control plots. In 2006 only, in ten 0.9-m^2 plots per treatment the blueberry and bunchberry stems were counted prior to all treatments and then recounted on 16 July 2007. On 16 July 2007 and 7 August 2008, percent blueberry and bunchberry covers were evaluated for all plots. The 1-m^2 plots were hand-harvested on 2 August 2007 and 7 August 2008, respectively, and converted to pounds per acre. Percent cover data were analyzed using Duncan's Multiple Range test for the 2006 to 2007 data and paired t-tests for the 2007 to 2008 data; yields were analyzed using Duncan's Multiple Range test. In 2007 the 2006 August treatment had the highest blueberry cover and the lowest bunchberry cover. Blueberry cover was significantly higher in the August treatment than the other treatments, while bunchberry cover was significantly lower than the untreated control in the August and September treatments but not for the October treatment. The same trends held true for the stem counts, except that the blueberry stem count for the August treatment was significantly greater than the October treatment only. The October treatment had the highest yield, with the August treatment a close second, but the yields did not vary significantly among treatments in 2007. In 2008 the blueberry cover was significantly higher on the 4 September 2007 treatment than the previous year; the untreated control and the September and October treatments were not significantly different. In 2008 the bunchberry cover was significantly lower on the untreated control and all treatments. The untreated control changed from 55% to 45% cover, but all of the treatments had significantly greater reductions in bunchberry cover with the 4 September treatment reduced from 75% to 5%, the 17 September treatment from 63% to 15% and the 3 October treatment from 20% to 5%. In all treatments blueberry yields were suppressed, but only the 17 September treatment was significantly lower than the untreated control. Tribenuron-methyl appears effective in reducing bunchberry cover without significantly reducing blueberry cover, but still has the potential to reduce yields the year after application. A State of Maine 24(c) label for the new Express® TotalSol formulation was given in September 2008 for application in the crop year after harvest. Fall treatments were made on both cropping and non-cropping fields in 2008 in order to compare effectiveness of tribenuron-methyl to control bunchberry and evaluate potential injury and yield of wild blueberry in 2009 and 2010.

CHEMICAL MOWING TO REDUCE ROW-MIDDLE MANAGEMENT COSTS IN ORCHARDS. R.S. Chandran and G.R. Leather, West Virginia University, Morgantown.

ABSTRACT

Field studies were conducted in 2006 and 2008 at Romney, WV, to evaluate reduced application rates of carfentrazone in combination with sethoxydim or glyphosate for the suppression of ‘Kentucky-31’ tall fescue row-middle sod in tree fruit orchards. Carfentrazone was applied at 8.69 g ai/ha with sethoxydim at 131 g ai/ha or glyphosate 145 g ai/ha. A crop oil concentrate at 1% v/v was added to both tank-mixtures. Treatments were applied in early May 2-3 days following first mowing. Grass height measurements and weed control ratings were recorded at 1 and 2 months after treatment (MAT). In 2006, carfentrazone + sethoxydim and carfentrazone + glyphosate provided similar levels of tall fescue suppression, 81 and 83% respectively, at 2 MAT, compared to untreated plots. In 2008 comparisons with untreated plots, the tank-mixture containing sethoxydim provided higher levels of tall fescue suppression (81%) compared to that containing glyphosate (59%) at 2 MAT. In 2006 and 2008, the untreated tall fescue measured 40 and 36 cm, respectively at 2 MAT. In 2006, the tank-mixture containing sethoxydim provided fair (70%) control of common chickweed (*Stellaria media* L.), whereas, that containing glyphosate provided good control (85%) of this weed during the study. Winter annuals were not present in sufficient numbers for evaluation in 2008. Cost analyses based on diesel fuel at $ 1.10/L and labor at $8.00/hr translated to a reduction of row-middle management costs by 17 and 35% using the sethoxydim and glyphosate based tank-mixtures, respectively.

HERBICIDE APPLICATION USING A WEED WIPER FOR PASTURE WEED MANAGEMENT. R.S. Chandran, E.B. Smolder, and R.M. Wallbrown, West Virginia University, Morgantown.

ABSTRACT

A field experiment was established in 2008, at Pt. Pleasant, WV, to evaluate the effectiveness of a spray-on type of weed wiper for hemp dogbane (*Apocynum cannabinum* L.) and New York ironweed [*Vernonia noveboracensis* (L.) Michx.] control in pastures. The weed wiper consisted of a rotary drum covered by a patented fabric onto which a herbicide solution was sprayed intermittently. The wiper, attached to an all-terrain vehicle (ATV) at a height of 15 cm, rolled in a clockwise direction as the equipment was drawn forward at 6 to 8 km/hr. Herbicide treatments (g ae/L; Trade name) consisted of 5% vol/vol solutions of premixes of 2,4-D + triclopyr (240+120; Crossbow®), 2,4-D + aminopyralid (319+40; Forefront™), 2,4-D + picloram (240+65; Grazon® P+D), fluroxypyr + triclopyr (60+180; Pasturegard®), fluroxypyr + picloram (80+80; Surmount™), and the single active ingredients glyphosate (660; Roundup WeatherMax®), and triclopyr (480; Remedy®). Treatments were applied on July 22, 2008, when the weeds were 40-50 cm tall and the soil was moist. Weed counts, in four 2.32 m^2 sub-plots within each plot, and control ratings were recorded 4 and 10 weeks after treatment (WAT). At 4 WAT, glyphosate resulted in 80% reduction of hemp dogbane compared to untreated plots. Similar levels of hemp dogbane reductions were observed from treatments containing fluroxypyr + picloram (78%) and fluroxypyr + triclopyr (66%), compared to untreated plots. Treatments containing 2,4-D + aminopyralid, 2,4-D + picloram, and fluroxypyr + picloram provided > 85% control of ironweed, 4 WAT. At 10 WAT, the above treatments along with that containing tryclopyr provided > 80% control of ironweed. The premix containing 2,4-D + picloram consistently provided >90% control of ironweed in this experiment. Glyphosate treatment failed to provide good (>80%) ironweed control. Red clover (*Trifolium pretense* L.) stands in treated plots were not reduced significantly compared to untreated plots at 4 and 10 WAT.

MANAGEMENT OF CUTLEAF BLACKBERRY IN PASTURES. R.S. Chandran and J.L. Miller, West Virginia University, Morgantown.

ABSTRACT

Cutleaf blackberry (*Rubus laciniatus* Willd.) is an erect, spreading, thorny shrub belonging to the rose family that can form dense thickets in pastures if left uncontrolled. A field experiment was conducted in 2008 at Wheeling, WV, to evaluate different herbicides used in pasture to control this troublesome weed. Herbicide treatments consisted of liquid formulations (g ae/l; g ae/ha; Trade name) of 2,4-D + triclopyr (240+120; 1123+562; Crossbow®), aminopyralid (240; 89; Milestone™), 2,4-D + aminopyralid (319+40; 747+94; Forefront™), 2,4-D + picloram (240+65; 1123+304; Grazon® P+D), fluroxypyr + picloram (80+80; 374+374; Surmount™), and dry flowable formulations (g/kg; g ai/ha; Trade name) of metsulfuron (600; 31.5; Cimarron®), and dicamba+diflufenzopyr (500+200; 280+112; Overdrive®). An adjuvant (methylated seed oil) at 1% vol/vol was mixed along with each treatment. The herbicides were applied on June 3, 2008, while the weed was in the pre-bloom stage (30-45 cm height). In-season weed control, recorded two months after treatment, indicated 85% control of cutleaf blackberry from fluroxypyr + picloram application followed by 80% control from metsulfuron. Other herbicides tested in this experiment failed to provide acceptable (60%) weed control at this time. Tall fescue (*Festuca arundinacea*), the predominant forage species in the pasture, exhibited an injury of 6.5 (on a scale of 0-10; where 0 = actively growing plants, and 10 = plant kill) from metsulfuron applied at the high rate. Other herbicides did not result in noticeable crop response.

POSTEMERGENCE CONTROL OF COMMON PERIWINKLE IN A FORESTED URBAN PARK.

M.G. O'Driscoll, J.C. Neal, D.A. Little, and T.H. Shear, North Carolina State University, Raleigh.

ABSTRACT

Long-appreciated as an ornamental ground cover in the United States, common periwinkle (*Vinca minor* L.) has more recently been recognized as a harmful invader of natural areas throughout its introduced range. Periwinkle is a (semi-)evergreen vine that grows well under moderate to heavy shade. Leaves are opposite, simple, narrowly elliptical; stems are slender, green, somewhat woody, and spread vegetatively rooting at the nodes forming dense mats. Pale blue, lilac or white, 5-petaled, axillary flowers are produced abundantly in the spring, then sporadically throughout the growing season. In the U.S., it is not known to produce viable seeds. Recommended control procedures for this species are limited and often conflicting. A study was established in Greensboro, NC to determine the effectiveness of postemergence herbicides currently recommended or commonly used for controlling periwinkle.

Plots (15 X 10 ft) were established within 5 patches of periwinkle in forested sections of Guilford Courthouse National Military Park. Treatments were arranged in a RCBD with 8 replicates and applied October 7, 2007 and March 26, 2008 with a CO_2 pressurized sprayer equipped with flat fan nozzles and calibrated to deliver 30 GPA. Herbicides tested were: 1 lb ai/A picloram (Tordon® K); 0.5, 1.5, and 3.0 lb ai/A triclopyr (Garlon 3A); 2 and 4 lb ai/A glyphosate (Roundup Pro®); 2 and 4 lb ai/A 2-4 D amine; 0.25 lb ai/A imazapyr (Arsena®l 2L); and 1.5 lb ai/A triclopyr + 2 lb ai/A 2-4 D Amine. To test for seasonal differences in control, glyphosate and triclopyr were applied in the fall and spring; other treatments were applied in the fall only. Percent control and new growth inhibition were visually estimated 6, 9 and 12 months after fall applications; percent ground cover was estimated before fall applications and 12 months after.

Nine months after fall applications (3 months after spring applications), both rates of fall-applied glyphosate provided approximately 90% control. Spring-applied glyphosate at 4 lb/A provided 75% control. Picloram, imazapyr, spring-applied glyphosate at 2 lb/A, and spring-applied triclopyr at 3 lb/A provided about 40% control and new growth inhibition of 40 to 60%. Spring-applied triclopyr at 1.5 lb/A did not control periwinkle but was observed to inhibit new growth by 32%. Fall-applied triclopyr or 2,4-D did not control periwinkle.

One year after fall treatments, glyphosate at 2 and 4 lb/A controlled periwinkle by 80% and 96%, respectively. Spring-applied high rate of glyphosate also provided about 80% control. At the final rating, picloram, imazapyr, spring-applied low rate of glyphosate, and spring-applied high rate of triclopyr all provided about 50% control. Spring-applied triclopyr at 1.5 lb/A provided only 20% control; other treatments provided no control. Glyphosate was more effective when applied in the fall. Triclopyr showed greater control when applied in the spring.

Glyphosate provided excellent control of periwinkle and is apparently most effective when applied in the fall. Other postemergence herbicides might reduce the density of infestation, but do not provide acceptable control.

TURFGRASS RESPONSE TO HERBICIDE TREATED IRRIGATION WATER. R.L. Roten, R.J. Richardson, and A.P. Gardner, North Carolina State University, Raleigh.

ABSTRACT

North Carolina has approximately 2.2 million acres of turfgrass with high demand for reliable sources of irrigation water. Ponds are frequent irrigation sources, but they may become infested with aquatic weeds and require herbicide treatment. This herbicide treatment often interferes with the ability to irrigate. Therefore, research was conducted with bermudagrass [*Cynodon dactylon* (L.) Pers.], creeping bentgrass (*Agrostis palustris* Huds.), tall fescue (*Festuca arundinacea* Schreb.), and zoysiagrass (*Zoysia spp.*) to evaluate the impacts of herbicides in irrigation water on turfgrass response. Sod was dug from a commercial farm and transplanted into 4" pots at the NCSU greenhouses using sandy clay loam as a potting medium. Turfgrass was allowed to establish in pots for at least one month prior to treatment. Herbicide treatments included atrazine (141 to 9000 ppb), diquat (71 to 4500 ppb), diuron (141 to 9000 ppb), glyphosate (71 to 4500 ppb), imazamox (35 to 2250 ppb), and imazapyr (35 to 2250 ppb), each applied at seven rates. A non-treated control was included for comparison. Atrazine and diuron are not registered for aquatic use, but were included due to frequent off-label use of diuron and potential for off-site atrazine movement. Herbicides were applied twice by hand with appropriate water volume to simulate 0.5 inch of irrigation. Digital images of each treatment were collected for visual documentation. Turf injury was visually rated on a weekly basis using a scale of 0% (no injury) to 100% (plant death). Trials were evaluated once a week for a total of 4 weeks after trial initiation. Regression curves were created based on the visual rating data. Based on these curves, the concentration of each herbicide required to cause 20% injury to each turf species were calculated. Turfgrass species demonstrated high tolerance to applications of diquat and glyphosate with little injury. Imazamox at 2,250 ppb resulted in 20% injury to bermudagrass and imazapyr produced 35% injury at 563 ppb and increased to 50% at 2,250 ppb. Creeping bentgrass injury increased with increasing rates of atrazine and diuron. Injury from atrazine was 23% with 1125 ppb and nearly 100% with 4,500 and 9,000 ppb. Diuron at 4,500 ppb resulted in 28% injury. Tall fescue was the most sensitive to injury among the grasses treated. Injury at 20% or greater was inflicted with each herbicide with the exception of glyphosate. The greatest level of injury was observed with atrazine and diuron with injury exceeding 90% at 2,250 ppb and 4,500 ppb respectively. Injury exceeded 45% with imazapyr at 2,250 ppb. Injury to zoysiagrass was minimal with less than 20% injury at all rates of atrazine, diquat, diuron, glyphosate, and imazapyr. In conclusion, all registered aquatic herbicides evaluated had an appropriate margin of safety based on the recommended use pattern.

A GENERAL HYPOTHESIS FOR THE OBSERVED CROP TOLERANCE TO WEEDS IN ORGANIC CROPPING SYSTEMS. R.G. Smith, M.R. Ryan, and D.A. Mortensen, Pennsylvania State University, University Park.

ABSTRACT

A growing number of studies examining weed abundance and row-crop yields report equivalent or only slightly lower yields in organic compared to conventional cropping systems despite organic systems often having significantly (sometimes five-fold) higher weed abundance. This apparent difference in crop tolerance to weeds in organic relative to conventional systems suggests that competitive interactions between weeds and crops are weaker in organic systems. Here we present a general model to account for this apparent crop tolerance to weeds in organic cropping systems. The model is based on ecological theory and involves the role of input diversity and heterogeneous resource pools that mediate weed-crop competitive intensities through niche differentiation. The model predicts that along a gradient of increasing resource pool heterogeneity, the relative competitive effects of weeds on crop yields should decrease. This prediction arises because crops and weeds require the same basic resources. Simplification of the resource pool (as occurs in conventional cropping systems) results in a strong coupling between weed biomass and crop yield because weeds are forced to compete with crops for resources from a common pool. In contrast, increasing the diversity of resource pools (derived from crop root exudates, decomposing plant tissues, compost or manure etc.), as occurs in organic systems, decreases the intensity of crop-weed competition because crops and weeds can draw nutrition from separate pools. A recent experiment examining the effects of crop diversity on yields and weed communities supports the predictions of the model and shows that as row-crop diversity increases incrementally from continuous monoculture (single crop-derived resource) to a six crop-species rotation (multiple crop-derived resource pools), the slope of the relationship between corn yield and weed biomass shifts from strongly negative to strongly positive.

COLE CROPS RESPONSE TO VINEGAR APPLICATION FOR WEED MANAGEMENT. C.B. Coffman and J.R. Teasdale USDA-ARS, Baltimore, MD.

ABSTRACT

Cole crops are grown throughout the middle-Atlantic by conventional and organic farmers and provide an important source of income at many farmer's markets in this region. These crops fit well into rotation systems on organic farms and are widely recognized as nutritional providers of a number of health benefits. Fall broccoli (*Brassica oleracea* L. var. italica), cauliflower (*Brassica oleracea* L. var. botrytis), and cabbage (*Brassica oleracea* L. var. capatita) response to vinegar application was investigated at the Beltsville Agricultural Research Center in 2008. The objective was to evaluate crop responses to basal application of 20% acetic acid vinegar for within-row weed control. Broccoli (var. 'Packman'), cauliflower (var. 'Snowball'), and cabbage (var. 'Late flat Dutch') plants were transplanted into a clean-cultivated field on 12 August. Broccoli plants were 18 inches apart in five-foot wide, 20-foot long rows. Cauliflower and cabbage plants were 14 inches apart in five-foot wide, 20-foot long rows. Treatments were applied to the center row of three-row plots and included (1) vinegar application, (2) un-weeded control, and (3) hand-weeded control. Treatments were replicated four times and were randomly placed in the field. Vinegar applications to all crops were made on 25 September using a hand sprayer. Vinegar was applied to weeds to achieve complete coverage until runoff. Broccoli plants were 8 to 12 inches high when treatments were applied whereas cauliflower plants ranged from 13 to 21 inches high and cabbage plants 8 to 10 inches high. Weeds between rows were controlled by cultivation. Weeds in the hand-weeded control were removed once during the growing season. Broccoli treatments were visually rated 1 October, and harvested from 3 through 15 October as heads achieved market size. All crop plants in the vinegar treatments showed diminished leaf turger within 60 minutes of application and chloritic tissues within 24 hours. Broccoli head counts did not differ among treatments. Total broccoli head weights as well as individual head weights from vinegar treated plots were 9 and 13% lower than those from un-weeded and hand weeded treatments, respectively. Data collection from cauliflower and cabbage treatments has not been completed.

HIGH GERMINATION RATES IN BURIED SEED STUDY OF JAPANESE STILTGRASS. A.N. Nord and D.A. Mortensen, Pennsylvania State University, University Park.

ABSTRACT

Japanese stiltgrass (*Microstegium vimineum*), an annual grass, is a troublesome invader in a wide variety of non-agricultural habitats throughout the eastern United States. Anecdotal evidence suggests its seeds remain viable 3-5 years in the soil. To further our understanding of seed bank dynamics, we initiated a buried seed study in November 2007. Sets of mesh bags, each containing 100 seeds, were buried in three commonly invaded habitats in a forest in central Pennsylvania: roadside, wetland, and logged upland forest. Each habitat was replicated four times, and seed bags were buried at a shallow depth under existing stands of Japanese stiltgrass. Seed bags were recovered in April, June, August, and October of 2008. There was high variability in number of seeds surviving one year, both within sites between sampling dates, and among sites within habitats. Germination in the roadside sites tends to be higher than in the other types. As many as 94% of the seeds in some roadside sites germinated within the first year, while less than 20% germinated in several of the wetland and logged forest sites. Less than one percent of the seeds rotted. If the germination rates observed in this study are indicative of natural populations, our results suggest that in some sites one year of control to prevent seed production may greatly reduce stiltgrass populations in following years.

STRATEGIES FOR DEVELOPING A POCKET GUIDE FOR MANAGEMENT OF INVASIVE WEEDS. R. Koepke-Hill, G.R. Armel, G.N. Rhodes, University of Tennessee, Knoxville, and R.J. Richardson, North Carolina State University, Raleigh.

ABSTRACT

Management of invasive weeds relies on two things: prompt and accurate identification and timely initiation of appropriate strategies for control of invasive weed species. A simple pocket guide will aid managers in early identification. A pocket guide must include an appropriate list of weeds with enough information to correctly identify the weed and then, once identified, accurate information on how to control the invasive weed of interest. There are several invasive weeds with a variety of competitive attributes found throughout the United States and unfortunately the size of a pocket guide limits the amount of information that can be included about all invasive species. Therefore, selecting the most competitive species throughout a particular region is a top priority. Careful analysis and layout design are imperative to convey as much information without sacrificing clarity and portability. The primary way to assemble an appropriate list of weeds is to survey exotic plant experts in the area. For this pocket guide the authors surveyed invasive weed scientists in the Appalachian region and also contacted experts in groups like the National Park Service, The Tennessee Exotic Pest Plant Council, the Tennessee Department of Transportation, Southeast Exotic Pest Plant Council, Pennsylvania Department of Agriculture, and the North Carolina Department of Agriculture. From this survey we determined there were 73 primary invasive species of interest in the Appalachian region. These species are members of 60 distinct weed families.

POSTEMERGENCE WEED CONTROL IN SNAP BEANS: TWO IS BETTER THAN ONE. M.J. VanGessel, B.A. Scott, Q.R. Johnson, University of Delaware, Georgetown, D.D. Lingenfelter, Pennsylvania State University, University Park, and D.H. Johnson, Pennsylvania State University, Manheim.

ABSTRACT

Snap beans (*Phaseolus vulgaris*) are an important vegetable crop in the mid-Atlantic Region, both for processing and fresh market. Weeds can impact snap bean yield as well as harvest efficiency, harboring other pests, and reducing the deposition of other pesticides. Only a limited number of herbicides are currently available for snap beans, with a heavy reliance on ALS-inhibiting herbicides (imazethapyr, imazamox, and halosulfuron) for broadleaf weed control. Fomesafen and bentazon (Reflex and Basagran, respectively) are also labeled for use in snap beans as postemergence herbicides. These herbicides have little to no impact on crop rotations, and since they are not ALS-inhibiting herbicides, they fit well for resistance management. Neither fomesafen nor bentazon control all the major problem broadleaf weeds in snap beans. However, when used in combination with one another they complement each other quite well. This study was designed to establish effective rates of fomesafen and bentazon tankmixtures for broad-spectrum weed control in snap beans. All treatments included a nonionic surfactant. The studies were conducted at the Pennsylvania State Research Farms in Lancaster and Centre Counties, and at the University of Delaware Research Farm in Sussex County in 2008, and two additional trials in 2007 in Delaware.

Results for visual snap bean injury were variable, with three out of five locations having significant crop injury. In general, the combination of fomesafen plus bentazon was more injurious than fomesafen alone; and there were no differences between the rates of bentazon. However, snap beans recovered quickly from the herbicide injury.

Fomesafen alone provided excellent control of common ragweed (*Ambrosia artemisiifolia*) and jimsonweed (*Datura stramonium*). The combination of fomesafen and bentazon improved control of common lambsquarters (*Chenopodium album*), velvetleaf (*Abutilon theophrasti*), and morningglory species (*Ipomoea* spp.) over fomesafen alone. The most consistent rates for broad-spectrum control were fomesafen at 0.187 lb ai/A plus bentazon at 0.75 lbs ai/A (Reflex at 12 fl oz/A plus Basagran at 1.5 pts/A). Lower rates were effective for some weed species (fomesafen at 0.115 lb ai/A plus bentazon at 0.5 lbs ai/A), but they were not consistent across all locations and species. Both the fomesafen and bentazon labels require that snap beans have at least one fully expanded trifoliate leaf before treatment, which can result in applications to weeds >2 inches in height and may contribute to the inconsistency of the lower use rates.

A RISK ASSESSMENT FOR BUSHKILLER. A.M. West and R.J. Richardson, North Carolina State University, Raleigh.

ABSTRACT

Bushkiller [*Cayratia japonica* (Thunb.) Gagnep] is an invasive plant that was first documented in the United States in 1964 in Texas. Since then, it is known to have spread to Alabama, Louisiana, Mississippi, and North Carolina. Bushkiller is a perennial vine in the grape family with aggressive growth resembling kudzu. Due to concerns about this species in North Carolina, The USDA-APHIS template entitled "Weed-Initiated Pest Risk Assessment Guidelines for Qualitative Assessments" was used to develop a risk assessment model. Components of the model include plant biology, climatic tolerance, pest status, consequences of introduction, spread and dispersal potential, economic impact, environmental impact, and other criteria. Ratings of negligible, low, medium, and high along with associated point values are assigned to various subcategories which are then used to calculate the final assessment. Important aspects of bushkiller follow. Within the native range, bushkiller tolerates winter temperatures as low as -7° C and summer temperatures greater than 42° C. Average annual precipitation varies from 60 to 1,100 cm within that range. Native range data was used to project potential range in the U.S. using the CLIMEX model. Model output suggested that bushkiller could survive minimum temperatures across most of the continental U.S. A limitation to spread of buskiller in the U.S. is lack of viable seed production. However, bushkiller may be spread by vegetative means and has done so in North Carolina. Bushkiller would be expected to reduce crop yield on infested sites and would lower commodity value, but would not result in a loss of foreign markets due to quarantine. Bushkiller reduced community structure and reduces plant diversity on affected sites, thus resulting in high environmental impact. As a final result, bushkiller was ranked as a medium-high risk to the United States.

WEED CONTROL UNDER PLASTIC WITH DAZOMET SOIL FUMIGANT. B.A. Scott, M.J. VanGessel, and Q.R. Johnson, University of Delaware, Georgetown.

ABSTRACT

Dazomet is a soil fumigant used to control weeds, fungi, and nematodes. The use of dazomet in high-value vegetable production needs to be investigated. In the fall of 2006 and 2007, field trials were initiated in Georgetown, DE to determine the efficacy of fall dazomet application for weed control under plastic layed in the fall versus the standard practice of herbicide application and plastic mulch layed in the spring. In the second year, an additional objective to compare both weed control and watermelon injury with spring-applied dazomet was included.

Trial areas were chisel plowed, disked and field cultivated in the fall of each year. Dazomet (400 lbs/A) was applied with a drop spreader and treatments varied by incorporation method. In 2006, dazomet was incorporated immediately with a roto-tiller (to a 6-inch depth) prior to bedding and laying plastic; no roto-till, but incorporated within 30 minutes by bedding procedure and laying plastic; or roto-tilled then water-sealed over a five day period with overhead irrigation. Water-sealed treatments were bedded and plastic mulch laid in the spring. Comparison treatments included halosulfuron (Sandea® 0.67 oz wt/A) applied in the spring one day prior to bedding and laying plastic and no weed control under plastic mulch. In the second year, the dazomet water-sealed treatment was replaced by a fall dazomet application that was roto-tilled then covered with clear plastic for three weeks after application then bedded in the spring. Four additional treatments were included the second year. Two spring-applied dazomet applications were included with one treatment having holes opened 2 weeks prior to transplant. A fall-bedded untreated check and a spring-applied halosulfuron (Sandea® at 0.67 oz wt/A) plus bensulide (Prefar® at 6 qt/A) treatment were also included in the second year trial. 'Millionaire' seedless watermelons and pollinators were transplanted in May both years. These studies were arranged as a randomized complete block with five replications.

In the 2006-07 trial, at 7 weeks after transplanting (WATRP), dazomet with plastic mulch laid in the fall provided the highest level and most consistent weed control (>85% control of all species noted). Large crabgrass (*Digitaria sanguinalis)* and common purslane (*Portulaca oleracea*) control was poor if plastic mulch laying was delayed until the spring. Common lambsquarter (*Chenopodium album)*, pigweed species (*Amaranthus spp*.), and yellow nutsedge (*Cyperus esculentus*) control was reduced in the dazomet water-sealed treatment compared to the two fall dazomet treatments and halosulfuron under plastic. In 2007-08 trial, at 9 WATRP, dazomet applied in the spring without holes and dazomet with plastic mulch laid in the fall (regardless of incorporation method) provided the most consistent pigweed species control (>70%). No differences were observed with respect to morningglory or large crabgrass control in 2007-08.

In 2006-07 trial, watermelon yield was highest in the dazomet, roto-tilled, with plastic mulch laid in the fall. In 2007-08 trial, watermelon yields were highest in the dazomet spring application.

POSTEMERGENCE WEED CONTROL WITH COMBINATIONS OF QUINCLORAC AND SULFENTRAZONE. M.J. Goddard, J.L. Jester, T.L. Mittlesteadt, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Many different herbicides are currently registered for the control of annual grasses and broadleaf weeds in turfgrass. Of these products, few have activity on both. Sulfentrazone is a fast acting herbicide that is active on both grasses and broadleaves. Quinclorac also demonstrates control of several broadleaf weeds and select annual grasses. Combinations of these two products are being evaluated for improved annual grass and broadleaf control in turfgrass. Trials were initiated at 2 locations in the summer of 2007 on a 'Midnight' Kentucky bluegrass and a perennial ryegrass fairway maintained at 1.5 cm and at one location in 2008 on lawn height 'Midnight' Kentucky bluegrass maintained at 6.3 cm in Blacksburg, VA. These trials included 12 treatment options which evaluated single applications of sulfentrazone, quinclorac, and a combination of the two products at varying rates. Treatments were arranged in a randomized complete block design with 3 replications and were applied on July 26, 2007 and July 18, 2008. Treatments included sulfentrazone (Dismiss™ 4 F) at 140, 280, and 420 g ai/ha, quinclorac (Drive® 75 DF) at 420, 840, and 1120 g ai/ha plus a nonionic surfactant at 0.25% v/v, a combination of the two products (Solitare 75 DF) at 560, 840, 1120, 1400, and 1680 g ai/ha plus a nonionic surfactant at 0.25% v/v, and a nontreated check. Trials were evaluated for control of smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.), white clover (*Trifolium repens* L.), and common dandelion (*Taraxacum officinale* F.H. Wigg), and turfgrass injury and quality. Trial effects were not significant in 2007 and data were pooled. In 2007, sulfentrazone treatments resulted in less than 50% and 20% control of smooth crabgrass at 7 and 21 days after treatment (DAT), respectively, at the highest rates. At the same rates, sulfentrazone was more effective on white clover which was 61% control at 21 DAT. Regardless of rate, Solitare resulted in 66-78%, and 84-98% control of smooth crabgrass and 68-77%, and 100% control of white clover at 7 and 21 DAT, respectively. Quinclorac resulted in 58-64% and 65-92% control of smooth crabgrass and 58-72% and 100% control of white clover at 7 and 21 DAT, respectively. In 2008, similar trends were noticed. Solitare provided equivalent or better control of smooth crabgrass and white clover to quinclorac. In addition, Solitare containing treatments controlled dandelion 78-92% where quinclorac treatments controlled dandelion 67-92% 28 DAT.

DETECTION AND GENETIC ANALYSIS OF POLYEMBRYONIC PALE SWALLOW-WORT SEEDS. L.R. Daconti, P.A. Ortiz, A. DiTommaso, O. Vatamaniuk, M.A. Mutschler, A.G. Taylor, and R.L. Obendorf, Cornell University, Ithaca, NY.

ABSTRACT

Pale swallow-wort *(Vincetoxicum rossicum)* is a highly invasive perennial vine in the Asclepiadaceae. It is currently most abundant in the Lower Great Lakes Basin and it poses an economic and ecological threat to Christmas-tree plantations, pastures, forest understories, vineyards, and orchards. Leaves and seeds from thirty mother plants were collected from multiple sites in central NY State. About one-half of the seeds contain polyembryos differing in dormancy. A commercially available kit was used to extract DNA from leaves (mother plant) and each seedling (embryos). Embryo DNA was extracted from tissues of individual germinated seedlings arising from a polyembryonic seed to avoid contamination with DNA from adhering maternal cells or endosperm cells within the seed. Random Amplification of Polymorphic DNA (RAPD), a type of PCR reaction where the DNA is amplified at random, will be used to determine whether all embryos are identical to each other but only half identical to the mother, or if there is one true embryo that is half related to the mother while all other embryos are identical to themselves and to the mother. The former would suggest that embryos arise via embryo cleavage while the latter would suggest that polyembryos arise via nucellar amplification. Genetic information on polyembryos within a seed may contribute to dormancy breaking strategies for controlling seed propagation of this invasive plant species. The polyembryology of the seeds was determined by non-destructive radiography technology so as to visualize the number of embryos in each seed and to classify groups of seeds by their polyembryonic status. Identification of seeds with a specific number of embryos permits a more precise physiological testing of the dormancy mechanism(s) which may suggest a more effective means of controlling the population by effectively reducing new populations from seed.

THE GIANT SALVINIA ERADICATION PROGRAM IN NORTH CAROLINA. S.L. True, R.J. Richardson, and W. Batten, North Carolina State University, Raleigh, R. Iverson, North Carolina Department of Agriculture, Raleigh, R. Emens, North Carolina Department of Environmental and Natural Resources, Raleigh, and M. Heilman, SePRO Corporation, Whitakers, NC.

ABSTRACT

The federal noxious weed, giant salvinia (*Salvinia molesta* D.S. Mitchell) was first reported in North Carolina in 1998 at the state fair. In 2000, this plant was identified at several locations in southeastern North Carolina. In response, the Southeast North Carolina Giant Salvinia Task Force was formed to develop and implement an eradication program. The task force consisted of individuals from state and federal agencies, NCSU, cooperative extension, and industry. This effort secured a NFWF Pulling Together Initiative grant to fund management efforts, surveyed and delineated areas of infestation, and implemented control strategies. Survey and delineation efforts indicated that giant salvinia has infested ten unique sites in North Carolina and reached a maximum infestation level of around 40 acres. Infestations were diminished during winter, but salvinia did over-winter readily. Management efforts in North Carolina have included foliar and in-water applications of the aquatic herbicides diquat, fluridone, and penoxsulam, and release of the salvinia weevil (*Cyrtobagous salviniae* Calder & Sands). The salvinia weevil did slow growth of salvinia, but did not stop spread or reduce infestation levels. Therefore, biocontrol efforts were abandoned in 2007 and release areas treated with herbicide. As a result of eradication efforts, a single site of approximately 2 acres with minimal plant density is the only known current infestation. This site is currently under treatment with water concentrations of fluridone and penoxsulam that will be maintained until winter. Treatments will resume early in 2009 until salvinia is eradicated from the current site of infestation.

RESPONSE OF NEWLY SEEDED KENTUCKY BLUEGRASS CULTIVARS TO MESOTRIONE. C. Mansue and S. E. Hart, Rutgers University, New Brunswick, NJ.

ABSTRACT

Field experiments were conducted in the fall of 2007 and 2008 to evaluate the response of newly seeded Kentucky bluegrass (*Poa pratensis* L.) cultivars to mesotrione. Kentucky bluegrass cultivars that were evaluated in these experiments were ‘Avalanch’, ‘Kingfisher’, ‘America’, ‘Bedazzal’, ‘Thermal’, ‘P105’, ‘Award’, ‘Washington’ and ‘Midnight II’. Experimental Design was a strip plot with 4 replications. Cultivars were seeded in 1.8 m strips at a rate of 48 kg/ha on September 14 and 18th in 2007 and 2008, respectively. Mesotrione was applied at 0.28, 0.56, 1.1 or 2.2 kg ai/Ha at planting as a single treatment or as a sequential treatment at the same application rates 4 weeks after emergence (WAE). Sequential applications included nonionic surfactant (NIS) at 0.25% v/v. Plots were evaluated for percent cover at 2, 4, and 8 WAE as well as the following spring. Mesotrione at 0.28 kg/Ha applied at planting did not reduce cover relative to the untreated at any observation time. The cover of 'America" was reduced at 0.56 kg/ha of mesotrione 2 WAE, but full recovery was observed at 4 WAE. Mesotrione at 1.1 kg/ha reduced the cover of all cultivars at 2 WAE with the exception of ‘Midnight II’ while 2.2 kg/ha reduced cover of all cultivars. Cover reductions at this rate were as high as 90% for some cultivars. Some cultivars such as ‘Avalanch’, ‘Washington’, ‘Thermal’, and ‘Award’ recovered from 1.1 kg/ha mesotrione at 8 WAE but not from 2.2 kg/ha. Cover reductions were still evident the following spring for some cultivars at 1.1 kg/ha and all cultivars at 2.2 kg/ha the following spring. Sequential applications of mesotrione at 0.28 kg/ha did not reduce cover of any cultivars. However, rates of 0.56 kg/ha or higher reduced cover of all cultivars at 8 WAE. All cultivars with the exception of ‘Midnight II’, ‘Washington’, and ‘Award’ did not fully recover from sequential applications of 0.56 kg/ha into the following spring, while no cultivars fully recovered from the higher sequential application rates. Mesotrione applied at 0.28 kg/ha at planting provided complete control of common groundsel (*Senecio vulgaris* L.), common chickweed (*Stellaria media* (L.) Vill.), common purslane (*Portulaca oleracea* L.), and yellow woodsorrel (*Oxalis stricta* L.). Annual bluegrass (*Poa annua* L.) control was 84 and 93%, respectively at 0.28 kg/ha applied at planting or as a sequential treatment. The results of the first year of this study suggest that differential tolerance of Kentucky bluegrass cultivars may exist but higher than labeled use rates of mesotrione were required to observe these differences.

PREPLANT WEED MANAGEMENT IN SOYBEANS WITH SAFLUFENACIL. J.H. O'Barr, A.C. Hixson, J.S. Harden, T.D. Klingaman, and G.W. Oliver, BASF Corporation, Research Triangle Park, NC.

ABSTRACT

Saflufenacil is a new herbicide being developed for broadleaf weed control in several crop and non-crop use patterns with registration expected in 2009. Control of sensitive broadleaf weed species is through the inhibition of the protoporphyrinogen IX oxidase enzyme. Field research trials have been conducted across the United States and Canada to evaluate weed control and crop safety of saflufenacil. Saflufenacil provides rapid burndown of emerged broadleaf weeds when applied in conservation till or no-till soybean (*Glycine max*) management systems. Saflufenacil has been shown to effectively control most key broadleaf species, including glyphosate- or ALS- resistant biotypes, such as horseweed (*Conyza canadensis*), prickly lettuce (*Lactuca serriola*), common lambsquarters (*Chenopodium album*), ragweed species (*Ambrosia spp*), and pigweed species (*Amaranthus spp*). Research has focused on a burndown use rates of 18-50 g ai/ha. Rates above 25 g ai/ha are required for extended residual control of most dicot weed species. Results indicate that saflufenacil can be tank mixed with glyphosate to increase the burndown weed spectrum to include emerged grasses. The combination of saflufenacil and glyphosate generally resulted in near complete burndown efficacy. Imazethapyr, imazaquin, or pendimethalin can be added to further extend the residual weed control period up to an in-crop application of glyphosate in glyphosate-tolerant soybean cropping systems.

NEW HERBICIDE AND MULCH COMBINATION PRODUCTS. H.M. Mathers, L.T. Case, U. Somireddy, K. Daniel, and J. Parrish, Ohio State University, Columbus.

ABSTRACT

Herbicide treated mulches could offer a distinct advantage to homeowners and landscapers who wish to decrease the amount of time devoted to handweeding. Past research conducted at The Ohio State University led by Dr. Hannah Mathers provides evidence that herbicide treated mulches do provide better and longer weed control than mulches or herbicides applied alone. There are now several companies that have incorporated granular herbicides into the mulch, but as of yet, no one has treated mulch with liquid herbicides. Mulch Manufacturing, Inc. has taken the initiative to incorporate liquid herbicides into dyed and undyed mulches. This study was set up to compare various mulches, with dye and without dye, treated with various herbicides to mulches that have granular herbicides, untreated mulches, and an untreated control for efficacy and phtyotoxicity over a 90 day period. Mulches were prepared by Mulch Manufacturing, Inc. and brought to The Ohio State University Waterman Farm, Columbus, OH. Mulches were dyed red, dyed black, or not dyed. Mulches, hardwood or Softscape©, were treated with isoxaben + trifluralin, flumioxazin, or oryzalin at different rates. Treatments also consisted of mulches (herbicide treated and untreated) incorporated with fertilizer, animal retardant, and borax (flame resistance treatment), Preen Mulch Plus© (as a standard already commercially available) and untreated mulches. On July 2 and July 3, 2007, the study was initiated. 'Mugo' pine (*Pinus mugo* 'Mugo') and geraniums (*Pelargonum hortorum*) were planted into 10' X 2' plots prior to putting out the treatments. Evaluations of phytotoxicity and efficacy were conducted approximately 30, 60, and 90 days after treatment (DAT).

The pines and geraniums from the untreated controls showed the most phytotoxicity, due to the hot, dry summer with inadequate irrigation. The six worst treatments [other than the control (5.8)] which gave a visual rating of above 3 on geranium were 0.75X rate of SureGuard treated red mulch, 1.25X rate of SureGuard treated red mulch, 1.25X rate of animal retardant on red mulch, both borax products on Softscape, and SureGuard + granular fertilizer on red mulch. None of the treatments provided a phytotoxicity visual rating of greater than 3 to the pines. Fifteen of 27 treatments provided commercially acceptable control when averaged over the dates by visual ratings. However, at 90 DAT, only 10 treatments provided acceptable control. By weed fresh weight (≤ 3 grams), only 10 treatments were efficacious over the three evaluation dates. However, all treatments provided significantly less weed dry weight than the untreated (bare ground) control. Of the top 10 efficacy treatments and combining that with low phytotoxicity, four combinations are best overall, Preen Colored Mulch Plus, 0.75X and 1.25X liquid Snapshot on red mulch, and Surflan on red mulch. Three of the four best overall treatments are liquid + mulch formulations indicating a possible advantage to liquid applications + mulch over granular formulations + mulch.

EVALUATION OF A PRE-PLANT APPLICATION OF SULFOSULFURON ON ORNAMENTAL BEDS. T.L. Harpster and J.C. Sellmer, Pennsylvania State University, University Park.

ABSTRACT

Sulfosulfuron, an acetolactate synthase (ALS) inhibitor in the sulfonylurea family, is a pre and/or postemergence herbicide labeled to control some grasses and broadleaves in turf, pastures, wheat, and non-crop areas. Sulfosulfuron is available as a 75% water-soluble granule and sold under the trade names Certainty®, Maverick®, and Outrider®. This study was initiated to evaluate the tolerance of 10 ornamental shrub species to pre-plant applications of sulfosulfuron.

Boxwood (*Buxus* x 'Green Mountain'), burning bush (*Euonymus alatus* (Thumb.) 'Compacta'), creeping euonymus (*Euonymus fortunei* (Turcz.) 'Emerald Gaiety'), English ivy (*Hedera helix* L. 'Buttercup'), hydrangea (*Hydrangea arborescans* L. 'Annabelle'), holly (*Ilex* x *meserveae* S. Y. Hu 'Blue Princess'), juniper (*Juniperus horizontalis* Moench 'Wilson'), mugo pine (*Pinus mugo* Turra), rhododendron (*Rhododendron* x 'P.J.M.), and viburnum (*Viburnum* x *pragense* Hort.) were purchased as plugs or one quart liners and planted the end of May into one-gallon containers filled with a pine bark based nursery mix and top dressed 15 gram Osmocote® Plus 15-9-12.

On June 5, 2008, eight 6 x 12 sq. ft. plots were established in turf above hagerstown silt loam soil by first treating the areas with glyphosate at 3 lb/a followed by rototilling five-days later. On June 13, 2008, four plots were treated with 0.117 lb/a sulfosulfuron and a nonionic surfactant at 0.025%. Applications were made with a CO_2 test plot sprayer set at 30 psi delivering a rate of 30 gallons per acre through an 8004 flat fan nozzle under an ambient air temperature of 79° F and winds of 3-5 mile per hour. On June 20, randomized complete blocks with four replicates of each species were planted in treated and untreated plots. Injury ratings, height, and width (two directions) data was collected at 2, 4, 8, and 12 weeks after treatment (WAT). Injury ratings were on a scale of 1-5 (5 = dead and 1 = highest quality). Data was analyzed by ANOVA using SAS 6.14 with Duncan's mean separation at the 0.05 level.

No difference in growth or observable injury was found among the boxwoods, creeping euonymus, holly, mugo pine, or viburnum. Junipers grown in the sulfosulfuron plots were statistically larger than the untreated controls. By 12 WAT, the burning bush, English ivy and rhododendron sustained minimal but statistically significant injury in the treated plots. Injury symptoms included leaf stunting, distortion, and necrosis; however, overall plant growth was uneffected. Sulfosulfuron significantly injured the hydrangea and reduced growth. Treated plants were stunted, discolored, and were poor quality. Leaf burn was also observed at the plant base likely from soil splash in the treated plots.

In conclusion, only hydrangea was negatively affected by the pre-plant application of sulfosulfuron. Growth of the other species even when injured was not impaired.

THE EFFECTS OF TRINEXAPAC-ETHYL APPLICATIONS AND CULTIVATION ON THE DIVOT RESISTANCE OF KENTUCKY BLUEGRASS CULTIVARS. T.J. Serensits and A.S. McNitt, Pennsylvania State University, University Park.

ABSTRACT

Athletic fields should provide a safe, stable surface that resists divoting. A divot on an athletic field can be described as a piece of turf partially or completely gouged out of surrounding turf by studded footwear. Divoting often results in poor footing, which can compromise the playability and safety of the playing surface. Few studies have evaluated divot resistance on athletic fields. Trinexapac-ethyl (TE) has been found to increase tiller density and affect rooting of Kentucky bluegrass (*Poa pratensis* L.). These effects may increase the divot resistance of a turfgrass stand. From 2006-2008, studies were conducted on both a USGA sand-based rootzone and a silt loam soil to evaluate two TE application regimes (May-July and May-Oct) and springtime cultivation on the divot resistance of nine Kentucky bluegrass cultivars under various levels of simulated traffic. Traffic was applied using a Brinkman Traffic Simulator. Divots were created following the final traffic application in November using the PENNSYLVANIASWING device, which consists of a weighed pendulum with a golf club head attached to one end. Divot length was used to indicate differences in divot resistance. TE applied from May-July was the most effective treatment, reducing divot length compared to the control by 15% on the sand-based rootzone and by 10% on the silt loam soil. TE applied from May-October and the cultivation treatment each showed some evidence of improving divot resistance compared to the control, but differences were smaller than those observed with the May-July TE application regime.

EVALUATION OF GLYPHOSATE AND BOTTOM HEAT ON NURSERY TREE HARDINESS. K.M. Daniel, H.M. Mathers, and L.T. Case, Ohio State University, Columbus.

ABSTRACT

The economic cost to the U.S. nursery industry of bark cracking is conservatively estimated at $6.6M annually (or 2.5% of finished inventory) according to recent calculations. This estimate does not include the additional estimate of $14M in landscape tree failures due to bark cracking. The nursery cost estimates continue a pattern of strong and steady increased severity and frequency of bark cracking throughout the US nursery/landscape industry since 2004. Concurrently, (2001-05) consumer preference for faster working glyphosate products was driving the production and use of various surfactants to break down the cuticle of plants to increase the rate and amount of glyphosate uptake. However, in 2005 researchers at Ohio State University (OSU) speculated that bark cracking was not solely related to cold injury as was widely and previously accepted but that the absorption of glyphosate into thin or pigmented-bark was also a factor due to the reduction of cold hardiness. One year old bare root tree liners were planted in the field May 2007. Five herbicide and two fertilizer treatments were applied to the trees. The herbicide treatments included: Roundup Original Maxx®, Roundup Pro®, Kleenup Pro®, cultivation, and weedy plots, each applied on a monthly basis. The three glyphosate treatments were sprayed at a 5% solution with a backpack sprayer with a LFG 80° nozzle. The fertilizer treatments included 125 lbs./N/acre and 250 lbs./N/acre of ammonium nitrate. After taken from field in December 2007, roots were washed, placed in plastic bags with a 50-50 perlite/sand mixture, and put in a walk-in cooler set at 5° C. Bottom heat was placed at 8°, 11°, 14°, and 17° C, with one treatment no bottom heat. After 70 days, trees were cut into 1-3 mm segment of the shoot (new growth) and roots. They were then subjected to freezing temperatures of -6°,-12°,-18°,-24°, and -30° C, and one treatment of no freezing. Electrical conductivity was obtained after freezing and after autoclaving to assess the percentage of cell death due to freezing. There were two objectives to this study: 1) determine if glyphosate, tillage and sod cover can affect the cold hardiness of field grown trees; and, 2) evaluate the influence of bottom heat and glyphosate and non-glyphosate treatments on root growth in sweetbay magnolia (*Magnolia virginiana*) and kousa dogwood (*Cornus kousa*). Previous research supports that hardiness should be reduced by sub-lethal dosing with glyphosate (Stasiak et al, 1991); however, this is the first conclusive study indicating glyphosate reduces root hardiness in kousa dogwood but not in sweetbay magnolia. This is also the first report of sweetbay magnolia roots expressing no root dormancy and producing significant biomass during the period of shoot dormancy. In contrast, kousa dogwood roots exhibited dormancy and even deteriorated when placed in elevated root zone temperatures of 17° C. This was interesting as the effect of glyphosate treatments was most pronounced on kousa dogwood versus sweetbay magnolia, indicating species variability in susceptibility to glyphosate causing increased cold susceptibility via possible inhibition of root dormancy.

INFLUENCE OF SOYBEAN SEEDING DENSITY AND CEREAL RYE BIOMASS ON WEED SUPPRESSION. M.R. Ryan, D.A. Mortensen, Pennsylvania State University, University Park, S.B. Mirsky, USDA-ARS, Beltsville, MD, W.S. Curran, Pennsylvania State University, University Park, and J.R. Teasdale, USDA-ARS, Beltsville, MD.

ABSTRACT

No-tillage crop management can be successfully implemented in organic cropping systems if cultural practices can offset the weed suppression effects of tillage. Combining multiple cultural practices that synergize weed suppression is the focus of this work. In this study, cereal rye (*Secale cereale* L.) biomass and soybean [*Glycine max* (L.) Merr.] plant density were varied to enhance weed suppression. Five levels of rye residue representing 0, 0.5, 1, 1.5, and 2 times the ambient level (~10,000 kg/ha) were established in a complete split-block design with five soybean densities ranging from 0 to 741,000 seeds/ha. Weed biomass decreased with increasing cereal rye residue; however, soybean was also suppressed at high cereal rye residue levels. There was also a shift in weed communities across the different residue levels. Giant foxtail (*Setaria faberi* L.) was most abundant in the no-residue plots whereas it was absent at low residue levels. Common ragweed *(Ambrosia artemisiifolia* L.) was most abundant in the mid-range of residue, but was suppressed at higher residue levels. Hedge bindweed (*Calystegia sepium* L.) was the only species present at high residue levels. Although not as dramatic as the effect from cereal rye residue, weed biomass also decreased with increasing soybean density. Unlike cereal rye residue, there was no shift in weed communities across the soybean density gradient. Results indicate that cereal rye residue can provide adequate levels of weed suppression in organic no-till planted soybean. Soybean seeding rate can also be used to enhance weed suppression at low cereal rye level.

CREEPING BENTGRASS SCALPING AND QUALITY AS INFLUENCED BY ETHEPHON AND TRINEXAPAC-ETHYL. R.L. Pigati and P.H. Dernoeden, University of Maryland, College Park.

ABSTRACT

Ethephon is commonly tank-mixed with trinexapac-ethyl (TE) and applied to putting greens in spring to manage annual bluegrass (*Poa annua* L.) seedheads. Previous research has shown that ethephon can cause stem elongation in Kentucky bluegrass (*Poa pratensis* L.), which can predispose turf to scalping. It therefore would be prudent to determine if ethephon has similar effects on creeping bentgrass (*Agrostis stolonifera* L.) grown on putting greens. This study was conducted on a mature stand of 'Providence' creeping bentgrass grown on a USGA specified, sand-based rootzone. In 2007, ethephon (3.4 lb ai/A) and TE (0.04 lb ai/A) were applied alone or in tank-mix combination either once (20 April) or twice (20 April and 7 May). The same rates were evaluated in 2008 and the treatments were ethephon alone and ethephon + TE applied either once (18 April) or twice (18 April and 7 May); ethephon + TE applied twice on 18 April and 7 May, and an additional three applications of TE were appled to these plots on 25 May and 5 and 18 June (i.e., ethephon + TE 5 times); TE alone applied five times on a two week interval from 18 April to 18 June; and an untreated control. Turf was mowed five times weekly to a height of 0.156 inches. The site received between 1.5 and 1.75 lb N $1000ft^2$ from water soluble N sources between early April and late May in 2007 and 2008. The site was irrigated as needed to prevent wilt. The plant growth regulators (PGR's) were applied in 50 GPA with a CO_2 pressurized backpack sprayer equipped with an 8004 flat fan nozzle. Plots were 5 ft by 5 ft and arranged in a randomized complete block with four replications. Turfgrass quality and scalping were assessed visually. Data were subjected to the analysis of variance and significantly different means were separated by Fisher's protected LSD test at $P \leq 0.05$.

Two applications of ethephon alone or tank-mixed with TE resulted in significant scalping that persisted from 36 (2007) to 55 (2008) days. Scalping first became evident on a consistent basis in early June between 30 (2008) and 37 (2007) days following the second application of ethephon. Little or no scalping was observed in TE-treated or untreated plots in either year. Close visual examination revealed that ethephon had caused a distortion in normal shoot development as a result of abnormal elongation of axillary buds. As a result of scalping elicited by ethephon there was a subsequent reduction in turf quality. Plots treated once with ethephon + TE did not exhibit reduced quality in 2007, but reduced quality was observed in mid-late June 2008. Quality was reduced to a greater extent and for a longer period in plots treated twice with ethephon + TE in 2008 versus 2007. In 2008, quality ratings from plots treated twice with ethephon + TE were reduced to unacceptable levels on most rating dates after mid-June. Plots treated with ethephon + TE 5 times exhibited quality that was unacceptable for only two weeks in June; however, quality was reduced by this treatment versus the control on all dates between mid-June and early August. It is important to note that this study was conducted on a research green where normal inputs of nitrogen and continued use of PGR's was not sustained throughout the study period, which may have impacted results.

PREEMERGENCE HERBICIDE EFFICACY ON FOUR SPECIES OF SPURGE. C. A. Englert and J. C. Neal, North Carolina State University, Raleigh.

ABSTRACT

Species of spurge (*Chamaesyce spp*.) are common and problematic weeds that affect container nursery crop production. While spotted spurge (*Chamaesyce maculata*) is the most prevalent species, garden spurge (*Chamaesyce hirta*), ground spurge (*Chamaesyce prostrata*), and hyssop spurge (*Chamaesyce hyssopifolia*) are becoming increasingly common in container nurseries as well. Our previous research has suggested that preemergence herbicide efficacy may differ between species of spurge. Building upon these preliminary results, the effectiveness of 14 preemergence herbicides at various dosages was examined with the four species of spurge listed above. The treatments included 3lb ai/A oxyfluorfen + pendimethalin (OH2®), 3 lb ai/A oxyfluorfen + oryzalin (Rout®), 0.38 lb ai/A flumioxazin (Broadstar™), 2.5 and 5 lb ai/A isoxaben + trifluralin (Snapshot® TG), 5 lb ai/A oxyfluorfen + isoxaben + trifluralin (Showcase™), 2 and 4 lb ai/A oxadiazon (Ronstar®), 2 and 4 lb ai/A oryzalin (Surflan®), 2 and 4 lb ai/A pendimethalin (Pendulum®), 0.75 and 1.5 lb ai/A prodiamine (Barricade®), 2.5 lb ai/A *s*-metolachlor (Pennant® Magnum™), 1.5 lb ai/A dimethenamid-P (Tower™), 1 lb ai/A isoxaben (Gallery®), 0.5 lb ai/A dithiopyr (Dimension®), and 1.75, 2.6, and 3.5 lb ai/A dimethenamid-P + pendimethalin (FreeHand™). Treatments were applied July 25, 2008 in a randomized complete block design with 6 replications of each species of spurge. Spray treatments were applied using a CO_2 pressurized sprayer equipped with two 8004 XR nozzles and calibrated to deliver 30 GPA. All other treatments were applied using a hand held shaker jar. Pots were seeded on July 28, 2008. Four weeks after treatement (WAT), emerged seedlings were counted. Weed control was visually evaluated on September 16 2008, 7 WAT.

There were significant differences in control among species. Overall, treatments controlled garden spurge and ground spurge significantly better than hyssop spurge and spotted spurge. Rout®, OH2®, Broadstar™, Showcase™, Surflan®, Pendulum®, Barricade®, Tower™, Dimension®, FreeHand™, Gallery® and 5 lb ai/A Snapshot TG provided at least 88% control of garden spurge. Snapshot® TG at 2.5 lb ai/A, Ronstar® and Pennsylvaniaant Magnum provided less control of garden spurge. All treatments except Pennant® Magnum™, Dimension®, and the low rate of Snapshot® TG provided excellent control of ground spurge. Rout®, OH2®, Broadstar™, Showcase™, Surflan®, FreeHand™, Pennant® Magnum™, Tower™, Gallery®, and the high rates of Snapshot® TG, Barricade®, and Pendulum® controlled hyssop spurge. Dimension®, Ronstar® and the low rates of, Pendulum®, Barricade®, and Snapshot® TG provided less control of hyssop spurge. Only FreeHand™, Tower™, and high rates of Surflan® and Pendulum® provided greater than 90% control of spotted spurge. Of the 21 treatments, high rates of Surflan® and Pendulum®, FreeHand™ at all tested levels, and Tower™ effectively controlled all species of spurge.

Results from this highlight the importance of careful weed identification to correctly pair weed species with appropriate control measures.

MEASURING AND MAPPING PLANT DIVERSITY IN AGRICULTURAL LANDSCAPES.
J.F. Egan and D.A. Mortensen, Pennsylvania State University, University Park.

ABSTRACT

Planning successful agricultural conservation programs requires a landscape scale perspective and an understanding of how biodiversity resources are distributed across landscapes. To contribute to this goal, we applied a GIS-based approach linking field sampling of plant communities to land use patterns in an intensively farmed region in Pennsylvania, USA. Agricultural in the region consists mainly of large scale grain-fed dairy operations, and the landscape is characterized by corn, soy, alfalfa, and small grain fields within a matrix of pastures, early successional grasslands that serve as riparian buffer strips, and small woodlots. We used aerial imagery to stratify four study landscapes into digitized maps of four basic land use classes: arable fields, pastures, grasslands, and woodlots. We then used a nested plot design to survey plant communities and build species/area curves in a random subsample of four sites of each land use type in each landscape. We used this data to ask: 1.) What are the differences and variation in species richness and species composition across the four land use types?, and 2.) How is plant diversity partitioned within a landscape and within land use types into α, β, and γ components? Results indicate consistent differences in species richness and species/area relationships across land use types, but a broad range in community composition for each type. Most of the species richness within a landscape (γ-diversity) was found in the grassland and woodlot habitats (high α and β-diversity), but a high level of β-diversity for each land use type meant that many uncommon plant species also utilized the intensively managed arable field and pasture habitats. We encountered 377 species through sampling a total of only 6.4 ha, demonstrating that this approach is an efficient method for rapidly assessing plant diversity at landscape scales and linking diversity patterns to land use types.

NONSELECTIVE POSTEMERGENCE CONTROL OF SPURGE AND BITTERCRESS IN CONTAINERS. L.C. Walker and J.C. Neal, North Carolina State University, Raleigh.

ABSTRACT

Control of weeds in container nurseries is typically obtained through use of preemergence herbicides supplemented with hand weeding. While these methods provide good weed control, they are costly. In larger containers spot application of non-selective postemergence herbicides, such as pelargonic acid (Scythe®), may be used to control emerged weeds. However, the use of Scythe® for this purpose is expensive and leaves an undesirable odor. In a preliminary study, phytotoxic effects were observed with the organosilicate surfactant Silwet L-77® when applied to container nursery weeds at 0.4% v/v, suggesting the potential for herbicidal use of organosilicate surfactants. This experiment was designed to compare the efficacy of Silwet L-77®, a nonionic surfactant (Latron™ AG-98), Scythe®, and diquat (Reward®) in control of bittercress (*Cardamine flexuosa*) and spurge (*Chamaesyce maculata*). The herbicides were applied at labeled rates recommended for spot treatment, 5% v/v Scythe® and 0.5 lb ae/A Reward® + 0.25% v/v Latron™. The surfactants were applied at concentrations of 0.5%, 1%, 5%, and 10% v/v. All treatments were applied with a CO_2-pressurized backpack sprayer calibrated to deliver 90 GPA. Percent control was visually evaluated 1, 2, 3, 7 or 10, and 14 days after treatment (DAT).

Symptoms were visible within 1 day for all treatments. Weed control increased with increasing concentrations of Silwet L-77® and Latron™. Spurge control with 0.5%, 1%, 5%, and 10% Silwet L-77® 7 DAT was 15%, 32%, 85%, and 90%, respectively. Latron™ was less effective with less than or equal to 65% control at all concentrations. Scythe® controlled spurge 91% and Reward® controlled spurge 98% 7 DAT. Control with all treatments except Reward® declined after the 7 DAT evaluation. Bittercress control 14 DAT with 0.5%, 1%, 5%, and 10% Silwet L-77® was 32%, 66%, 84%, and 93%, respectively. Bittercress control with Latron™ was a maximum of 54% 3 DAT at the 10% concentration. Scythe® controlled bittercress 96% and Reward® 98% at 14 DAT.

These results suggest that postemergence control of weeds in containers may be possible with organosilicate surfactants. Such treatments may have the potential to reduce the cost for weed control in container nurseries.

TIME LAPSE PHOTOGRAPHY AND DIGITAL ANALYSIS DETECTS SEED EMERGENCE. J.L. Jester and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Predicting weed emergence can lead to more accurate selection and application of pre-emergence herbicides which leads to better control. Timing of herbicide application can be improved when modeling is applied to more than one species. Most seed emergence models require seed emergence times and weather data recorded daily. The current method for emergence studies is labor intensive and requires the researcher manually count and remove seedlings from the plot at planned intervals. By utilizing time lapse photography technology, the labor intensive portion is reduced. The goal is to identify individual plant emergence determining the first image in a time-lapse sequence of images where a threshold of pixels exhibit desired hue and saturation values at a given pixel coordinate.

The study was conducted in three locations in Montgomery County, VA. Each site consisted of a framed seed bed and time lapse module. A wooden frame measuring three by four feet was recessed into the plot area with a 2.5 cm lip above ground level and then back filled with sterilized soil. A one half meter area was marked in the center of each plot and 50 one-decimeter-square microplots were partitioned. One hundred seeds were placed in each microplot and topdressed with 3 mm of Profile™ crushed ceramic topdressing material. Dandelion (*Taraxacum officinale*), goosegrass (*Eleusine indica*), smooth crabgrass (*Digitaria ischaemum*), spotted spurge (*Euphorbia maculata*), and white clover (*Trifolium repens*) were randomly arranged in the 50 microplots so that 100 seeds of each species were represented in 10 microplots at each experimental location. Sites were hand watered at initiation. The time lapse module consisted of a Pelican™ waterproof case with a sealed glass window, a Digisnap 2000™ intervolometer with wire harness, Nikon Coolpix 5400™ and a 12 volt deep cycle battery. The module was mounted on a 10.2 cm by 10.2 cm post set at the Northeastern edge of the frame and was approximately 1.8 m above ground level. Photos were taken four times a day and downloaded weekly. Weather and soil data were collected at each site for the duration of the study.

Weed emergence will be related to growing degree day models using visual count and computer-aided image analysis of seedlings.

THE COMPETITIVE EFFECTS OF COMMON RAGWEED ON BUTTERNUT SQUASH.
J. Wright, M.A. Isaacs, M.J. VanGessel, Q.R. Johnson, B.A. Scott, University of Delaware, Georgetown, and H.P. Wilson, Virginia Tech, Painter.

ABSTRACT

Field studies were conducted in 2007 and 2008 at the University of Delaware Research and Education Center, located in Georgetown, DE. The objective was to determine the competitive effects of common ragweed (*Ambrosia artemisiifolia*) on butternut squash (*Cucurbita moschata*).

The experimental design was a randomized factorial design with four replications. The factors were common ragweed density and squash presence. Common ragweed seedlings were transplanted into the field three weeks after squash planting at the following densities: 0.25, 0.5, 1.0, 2.0, and 4.0 per meter (m) of row. Each density was planted into separate plots with and without squash. An additional treatment of 1.3 ragweed per square meter was also planted into a plot containing squash. Plots were 15 feet wide by 25 feet long with two rows 5 feet apart. The variety 'Atlas' was planted with a Monosem planter at 36 inch seed spacing. To minimize other weed competition or injury to butternut squash, irrigation, cultivation, hoeing, and a PRE application of ethalfluralin (Curbit® 3E at 3 pt/A) were utilized. Also, POST applications of mefenoxam and chlorothalonil were made weekly for disease control. Data collected included yields (number of squash and weights) and ragweed biomass and height.

Common ragweed density did not significantly decrease butternut squash yields in 2007 or 2008. None of the weed densities utilized yielded any significant differences in total squash weight, number of squash, or average weight of squash in each plot. However, ragweed biomass and heights significantly differed among treatments in both years. In 2007 and 2008, ragweed biomass collected (at all of the above densities) from plots with squash and the 4.0/m density ragweed only plot resulted in significantly less biomass than all other respective ragweed densities in ragweed only plots. This certainly suggests interspecific competition between butternut squash and common ragweed. The reduced biomass of the 4.0/m density common ragweed only plot was due to intraspecific competition. In addition, intraspecific competition in both years caused the 2.0/m and 4.0/m densities of ragweed only plots to yield significantly less biomass than the 0.25/m, 0.5/m, and 1.0/m densities of ragweed only plots. In 2007, ragweed height did not significantly differ between plots with and without squash. However in 2008, plots with squash resulted in significantly taller ragweed than plots without squash. This suggests that interspecific competition for sunlight occurred between butternut squash and common ragweed. In both years, there were various significant differences in ragweed height among the different densities. In general, intraspecific competition caused higher densities of ragweed to be significantly taller than lower density ragweed plants.

HERBICIDE EFFICACY COMPARISONS ON BITTERCRESS ACCESSIONS FROM CONTAINER NURSERIES. A.R. Post, Cornell University, Ithaca, NY and J.C. Neal North Carolina State University, Raleigh.

ABSTRACT

Cardamine is one of the most common and troublesome weeds of container nursery crops in the United States. Recent research has indicated at least five Cardamine species occur in the United States nursery industry. Most bittercress in the trade is wavy bittercress (*Cardamine flexuosa*), which has isoxaben tolerant populations reported from Europe. Due to the movement of nursery stock around the country and worldwide we wanted to determine if Cardamine populations in the United States have differential herbicide susceptibility. Twelve Cardamine accessions were assayed to determine the efficacy of preemergent herbicides commonly used on bittercress in container nurseries including: isoxaben (Gallery®), oxyfluorfen (Goal®), dimethenamid-P (Tower™), and pendimethalin (Pendulum®). The twelve accessions included three species: *Cardamine hirsuta*, *Cardamine flexuosa*, and *Cardamine corymbosa* collected from the United Kingdom and four states including CA, NC, NY, and OR. Treatments included three rates of isoxaben (0.25, 0.5, and 0.75 lb ai/A) and one rate each of oxyfluorfen (1.0 lb ai/A), dimethenamid-P (0.75 lb ai/A) and pendimethalin (3.0 lb ai/A) in a randomized complete block design with four single pot replicates. Treatments were applied to empty pots and overseeded with 35 seeds per pot one week after treatment. Seedling counts were recorded every 7 days for four weeks and a fresh weight measurement was taken at the end of the trial. The experiment was repeated. Isoxaben at 0.5 and 0.75 lb ai/A and oxyfluorfen at 1.0 lb ai/A performed well providing 70% or greater control for all accessions based on seedling counts and 75% or greater control based on fresh weights. Pendimethalin performed poorly for *Cardamine* accessions, as expected, controlling all at 50% or less based on seedling counts and fresh weights. Only the low rate of isoxaben had an unacceptable level of control for one accession of *Cardamine corymbosa* controlling only 47% compared to the untreated based on fresh weights. In a comparison between accessions, there appears to be some variation in control with dimethenamid-P which controlled Cardamine between 40% and 100%. There does not appear to be variation in control between accessions for other treatments.

CONTROLLING BROADLEAF PLANTAIN AND BUCKHORN PLANTAIN WITH DPX-KJM44, DPX-MAT28, AND DPX-QKC88. T.L Mittlesteadt and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Broadleaf plantain (*Plantago major*) and buckhorn plantain (*Plantago lanceolata*) are common broadleaf weeds found in turfgrass. Two field trials were conducted in 2008 in Blacksburg, VA to evaluate the use of DPX-KJM44 and DPX-MAT28 for control of broadleaf plantain and buckhorn plantain. Both trials were established on perennial ryegrass (*Lolium perenne*) with one trial evaluating control of broadleaf plantain and the other trial evaluating control of buckhorn plantain and white clover (*Trifolium repens*). Safety to perennial ryegrass was evaluated for both trials.

Herbicides evaluated for broadleaf plantain control included DPX-KJM44, DPX-KJM44-082, DPX-KJM44-087, DPX-MAT28, and DPX-QKC88. Trimec Classic® (25.93% 2,4-D, 6.93% MCPP, and 2.76% dicamba) at 4 pt/acre and Momentum Force (0.16% 2,4-D, 1.20% 2,4-D 2-ethylhexyl ester, 0.32% MCPP, and 0.08% dicamba) at 156 lbs/acre were applied as comparisons. DPX-KJM44 was applied at 0.75, 1.0, and 1.5 oz/acre. The 0.75 oz/acre rate was also evaluated with nonionic surfactant added. DPX-KJM44-082 and DPX-KJM44-087 were applied at 125 and 165 lbs/acre. DPX-MAT28 was applied at 2.25, 3.0, and 4.5 oz/acre. DPX-MAT28 at the 2.25 oz/acre rate was also evaluated with the addition of a nonionic surfactant. DPX-QKC88 was evaluated at a rate of 100 lbs/acre.

Herbicides evaluated for buckhorn plantain control included DPX-KJM44-082, DPX-KJM44-087, DPX-MAT28-035, and DPX-MAT28-036. DPX-KJM44-082 and DPX-KJM44-087 were evaluated at 125, 133, and 165 lbs/acre. DPX-MAT28-035 and DPX-MAT28-036 were evaluated at 125 and 165 lbs/acre. Momentum Force applied at 156.8 lbs/acre was used as a comparison.

Herbicide treatments did not injure perennial ryegrass in either trial. All treatments controlled broadleaf plantain 70-100% 4 weeks after treatment (WAT). Furthermore, DPX-MAT28 at 2.25 oz/acre without nonionic surfactant and DPX-KJM44-087 at 125 lbs/acre controlled less broadleaf plantain than other treatments.

All treatments controlled buckhorn plantain 65-90% and white clover 96-100% 6 WAT. All treatments at low and high rates controlled buckhorn plantain and white clover significantly better than the comparison herbicide, Momentum Force. With the exception of DPX-MAT28-035, all treatments controlled buckhorn plantain better at the highest rate of 165 lbs/acre.

EVALUATION OF DPX-KJM44 FOR WOODY PLANT CONTROL. R.L. Roten, R.J. Richardson, and A.P. Gardner North Carolina State University, Raleigh.

ABSTRACT

DPX-KJM44, proposed common name aminocyclopyrachlor-methyl, is currently under development for application to a variety of non-cropland sites. Several research trials were conducted to evaluate the response of selected woody plant species to this herbicide. In a trial conducted on cut-over loblolly pine sites, DPX-KJM44 rates ranged from 0.15 to 0.77 lb ai/A and were applied with 30 gpa spray volume. Woody plant size ranged from 1 to 10 ft in height and natural regeneration of loblolly seedlings were present at time of application. Loblolly pine was also transplanted into plots at approximately 3 months after treatment (MAT). At 10 MAT, yellow poplar was controlled at least 97% with all rates and red oak species were controlled 100% with rates above 0.3 lb/A. Control of white oak species was 82% with 0.77 lb ai/A, but wild grape control was not acceptable. Loblolly pine seedlings were injured up to 80%, while loblolly transplanted after application were not injured more than 21%.

VEGETATIVE EXPANSION OF THE INVASIVE SWALLOW-WORTS IN NEW YORK STATE. K.M. Averill, A. DiTommaso, C.L. Mohler, Cornell University, Ithaca, NY, and L.R. Milbrath, USDA-ARS, Ithaca, NY.

ABSTRACT

Pale and black swallow-wort [*Vincetoxicum rossicum* (Kleopow) Barbar. and *Vincetoxicum nigrum* (L.) Moenchm] are nonnative, perennial, herbaceous vines in the Asclepiadaceae. The species are becoming increasingly problematic in the northeastern United States and southeastern Canada. Management of the species has been challenging. Consequently, a classical biological control program was initiated in 2004 by the USDA-ARS with the goal of providing sustainable and economical long-term suppression of these two competitive species. Success of this biological control effort depends on the availability of plant demographic data, which can be modeled to determine which swallow-wort life stage(s) are likely to be most susceptible to control efforts. To determine the survival, rate of vegetative expansion, and fecundity of mature swallow-wort plants, we established demographic studies in 7 field sites in New York State. In 2005, we established 4 pale swallow-wort sites in Central NY, 3 of which had both old-field and forest habitats. In 2006, we established 3 black swallow-wort sites in old-field or disturbed habitats in the Hudson Valley. In each habitat, we measured the survival, expansion, and reproduction of 30 randomly-selected target plants of similar size (2-5 stems plant^{-1} in the establishment year). Pale swallow-wort yearly survival was 99.6 ± 0.4% and 99.7 ± 0.3% in old-field and forest habitats, respectively, and 100 ± 0% in black swallow-wort habitats. Pale swallow-wort increase in number of stems from 2005 to 2008 was greater in old-field habitats (20 ± 8% yr^{-1}) than in lower light forest habitats (2 ± 4% yr-1). From 2006 to 2008, the black swallow-wort increase in number of stems was 29 ± 18% yr^{-1}. Preliminary data suggest greater pale swallow-wort fecundity in the old-field (600 ± 200 seeds plant-1 yr^{-1}) compared with the forest (110 ± 90 viable seeds plant-1 yr^{-1}) habitats. Black swallow-wort fecundity was approximately 430 ± 50 viable seeds plant-1 yr^{-1}.

ANNUAL BLUEGRASS CONTROL IN CREEPING BENTGRASS USING AMICARBAZONE. M.J. Goddard, T.L. Mittlesteadt, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Annual Bluegrass *(Poa annua* L.) is a common weed of creeping bentgrass (*Agrostis stolonifera* L.) turf. To date, there are few selective herbicide options for turfgrass managers to effectively control annual bluegrass infestations in creeping bentgrass. Amicarbazone is a herbicide under evaluation for use in many turfgrass weed control situations including annual bluegrass control. In other trials, amicarbazone has shown to effectively reduce annual bluegrass populations in bermudagrass. Field trials were established in the spring of 2008 to evaluate the effects of amicarbazone on annual bluegrass control. Trials were initiated at 2 locations on an L-93 and a Putter/Pencross creeping bentgrass fairway each maintained at 1.5 cm. in Blacksburg, VA. Treatments were arranged in a randomized complete block design with 4 replications and were applied on May 16 and May 19, 2008. These trials included 11 treatment options which evaluated amicarbazone at rates of 123, 196, and 245 g ai/ha plus a nonionic surfactant at 0.25% v/v applied once or with sequential applications 3 and 5 weeks after initial treatment (WAIT), compared to bispyribac-sodium (Velocity 80 SP) applied at 74 g ai/ha with a sequential application 2 WAIT. Trials were evaluated for control of annual bluegrass and creeping bentgrass injury and quality. Both trial sites resulted in good control of annual bluegrass in plots treated with amicarbazone. On the L-93 fairway, annual bluegrass control ranged from 65% following a single application at the 123 g ai/ha rate to 95% at the highest rates with sequential applications of amicarbazone, with sequential applications of Velocity controlling 69% of annual bluegrass. Sequential applications of amicarbazone improved annual bluegrass control at all rates and timings, but caused unacceptable injury (>30%) to plots receiving sequential applications with rates above 123 g ai/ha, 3 WAIT. Injury was not deemed unacceptable at any rating for the 123 g ai/ha rate regardless of sequential application. At the second location, greater annual bluegrass control was observed as well as increased injury to the bentgrass cultivars. It is believed that weaker bentgrass varieties and a lower managed stand of creeping bentgrass at this location attributed to this increase in turfgrass injury. This site has higher annual bluegrass populations and receives less irrigation than the L-93 site. Amicarbazone is an effective method of controlling annual bluegrass in creeping bentgrass. However, cultivar screens and further studies to evaluate rate responses are needed to determine a proper application of this herbicide.

COMPETITION EFFECTS ON GROWTH OF BUSHKILLER, TRUMPETCREEPER AND VIRGINIA CREEPER. A.M. West, R.J. Richardson, North Carolina State University, Raleigh, and M.G. Burton, Southwest Missouri State University, Springfield.

ABSTRACT

Research trials were conducted to evaluate bushkiller under inter- and intraspecific competition. In experiment 1, bushkiller [*Cayratia japonica* (Thunb. ex Murray)], trumpet creeper [C*ampsis radicans* (L.) Seem.], and wild grape (*Vitis spp*.) were grown alone, two species per pot, or three species per pot. Each species was propagated from root stock and transplanted into 29 cm pots containing a commercial potting mix. All plants were 30 cm in height at trial initiation. A garden trellis was secured to each pot to serve as a climbing medium. Of the three species, bushkiller grew the tallest and had the greatest final biomass when grown alone. When all three species were grown together, bushkiller grew over twice the height of trumpet creeper, over 3 times the height of wild grape, and over 4 times the biomass of either species. When height was plotted over time, competition did not affect bushkiller or wild grape growth rate, but trumpet creeper growth was reduced when grown with bushkiller. In experiment 2, bushkiller was grown in cultures of 1, 2, and 3 plants per pot to determine intraspecific competition effects on growth. At six weeks after trial initiation, bushkiller height was not affected by competition; however bushkiller dry weight decreased with increasing competition.

EVALUATION OF HERBICIDES FOR CONTROL OF BEACH VITEX. S.L. True, R.J. Richardson, A.P. Gardner, North Carolina State University, Raleigh, and W.J. Everman, Michigan State University, East Lansing.

ABSTRACT

Beach vitex *(Vitex rotundifolia* L.f.) is a perennial woody shrub native to Hawaii and countries of the Pacific Rim including China, Japan, Taiwan, Thailand, Indonesia, Malaysia, Papua New Guinea, Philippines, Australia, Fiji, and New Caledonia. It out competes native dune species, including the Federally Threatened seabeach amaranth (*Amaranthus pumilis*). Dense mats of beach vitex also interfere with native waterfowl and sea turtle nesting. In order to determine the most appropriate control measures, field and laboratory trials were conducted. In 2007, a field herbicide trial was initiated to compare efficacy of six herbicides on beach vitex. Treatments included glyphosate at 1, 2, 5, and 10 % v/v, imazapyr, imazamox, penoxsulam, and aminopyralid at 1.5% v/v, and metsulfuron at 1% v/v. Methylated seed oil at 1% v/v was included with each non-glyphosate treatment. An untreated control was also included for comparison. Experimental treatments were applied to foliage at 280 L/ha. Treatments were replicated three times, and the experiment was conducted at two locations. Plots were rated for weed control at 1 and 8 months after treatment (MAT). Rating scale was 0 to 100%, with zero being no control, and 100 being complete plant death. An additional laboratory trial was conducted to evaluate absorption and translocation of glyphosate on cut stems of beach vitex. ^{14}C-glyphosate treatment solution was prepared by diluting ^{14}C-glyphosate in a commercial formulation of glyphosate. All plants had single stems with similar diameters. Each plant was cut off two cm above the soil surface and 20 drops of 1 micro liter prepared ^{14}C-glyphosate solution were applied to the cut surface of the stem. Three treated plants were harvested at 6, 24, 48, 96, and 192 hours after treatment. Harvesting included separating the one inch stump above the soil, the first 10 cm of roots, second 10 cm of roots, and the remaining end roots. Each dried sample was weighed, ground into a fine dust, and then combusted in an OX-500 Biological Material Oxidizer. Radioactivity from oxidations was quantified using liquid scintillation spectrometry in a TRI-CARB 2100TR Liquid Scintillation Analyzer. In the field trial, imazapyr (1.5% v/v) and glyphosate (10% v/v) controlled beach vitex better than other herbicides evaluated. Control was 77 to 82% at 1 MAT and 82 to 90% at 8 MAT. Control with other treatments did not exceed 52% at 8 MAT. Increasing glyphosate rate resulted in significantly better beach vitex control. Control at 1 MAT increased from below 50% with 1.5% v/v to over 75% with 10% v/v at 1 MAT. At 8 MAT, control increased from 35% to 85% across the same rate range. In the laboratory trial, time of harvest was not significant (data not presented), most likely indicating that all absorption and translocation occurred within the first four hours after treatment. Most of the herbicide remained in the stump with moderate translocation to the first root section and minimal translocation to root segments greater distances from the stump. As glyphosate typically translocates in a source to sink direction, shoot removal breaks this process and may reduce or limit the amount of glyphosate that translocates within the remaining plant segments.

EFFICACY OF ARYLOXYPHENOXYPROPIONATE HERBICIDES FOR BERMUDAGRASS CONTROL IN ZOYSIAGRASS FAIRWAYS. D.F. Lewis, University of Tennessee, Knoxville, J.S. McElroy, Auburn University, Auburn; J.C. Sorochan, J.T. Brosnan, and G.K. Breeden, University of Tennessee, Knoxville.

ABSTRACT

Aryloxyphenoxypropionate (AOPP) herbicides are used to control bermudagrass (*Cynodon dactylon*) contamination in various turfgrass settings. However, applying AOPP herbicides alone can cause phytotoxic injury to zoysiagrass (*Zoysia* spp.). While research has shown that applications of these materials can be safened when tank-mixed with triclopyr, there is no data illustrating the extent of bermudagrass control and zoysiagrass tolerance when these two herbicides are combined. Research was conducted to determine the efficacy of multiple AOPP herbicides alone and tank-mixed with triclopyr for bermudagrass control in zoysiagrass fairways.

Treatments included: triclopyr (1.12 kg ai/ha); fluazifop (0.11 kg ai/ha); fluazifop plus triclopyr (0.11 kg ai/ha + 1.12 kg ai/ha); fenoxaprop (0.14 kg ai/ha); fenoxaprop plus triclopyr (0.14 kg ai/ha + 1.12 kg ai/ha); cyhalofop (0.32 kg ai/ha); cyhalofop plus triclopyr (0.32 kg ai/ha + 1.12 kg ai/ha); quizalofop (0.09 kg ai/ha); and quizalofop plus triclopyr (0.09 kg ai/ha + 1.12 kg ai/ha). Each treatment was applied three times on 28 day intervals. A randomized complete block design with four replications was employed to both 'Tifway' bermudagrass (*Cynodon dactylon* x *transvaalaensis*) and 'Zenith' zoysiagrass (*Zoysia japonica*) fairways, with experimental units measuring 2.25m^2. Herbicides were applied with a CO_2 pressurized sprayer calibrated at 280 L/ha. Bermudagrass control was visually rated every two weeks on a 0-100% scale (0%=no visible turfgrass injury; 100%=complete turfgrass death), with >70% injury considered acceptable control. Zoysiagrass injury was also rated visually using the same 0-100% scale, with <15% injury considered acceptable tolerance. In addition, percent turfgrass cover was evaluated every two weeks using digital image analysis (DIA).

In 'Tifway' bermudagrass, all AOPP herbicides improved control with the addition of triclopyr. Fluazifop, fenoxaprop, cyhalofop, and quizalofop did not provide acceptable bermudagrass control (<70%) when applied alone; however, when applied in combination with triclopyr, fluazifop, fenoxaprop, and quizalofop had acceptable levels of bermudagrass control (>70%). Triclopyr alone caused notable control (47.5%).

In 'Zenith' zoysiagrass, all AOPP herbicides were safened with the addition of triclopyr. When applied alone, fluazifop, fenoxaprop, and quizalofop caused unacceptable zoysiagrass injury (>15%). When applied in combination with triclopyr, injury was less than <6% for each material tested. These data suggest that AOPP herbicides tank-mixed with triclopyr can be used to control bermudagrass contamination in 'Zenith' zoysiagrass fairways.

INTEGRATED WEED MANAGEMENT IN HIGH RESIDUE CROPPING SYSTEMS.
R.T. Bates, R.S. Gallagher, and W.S. Curran, Pennsylvania State University, University Park.

ABSTRACT

Conservation tillage practices in corn and soybean have been widely adopted by many agricultural producers. These systems have reduced the potential for soil and nutrient losses, but have relied heavily on herbicides for weed control. Increased dependence on herbicides can lead to herbicide resistant weeds and raises the potential for additional offsite impacts. A more integrated approach that includes nonchemical management strategies can reduce the negative effects of herbicides, while maintaining adequate weed control. The objective of our study was to evaluate mechanical tillage implements for their incorporation into an integrated weed management system in high-residue corn. Ten individual treatments were included to evaluate a vertical coulter implement, a rotary harrow, a high residue rotary hoe, and a high residue row cultivator in combination with pre-plant broadcast, pre-plant band, or post emerge herbicides. A conventional no-till treatment using herbicides and a weedy check treatment without any weed control were included for comparison. The effectiveness of the treatments was based on maintaining surface residue, weed density and end of season weed biomass, and corn grain yield.

Treatments including herbicides reduced weed density and weed biomass compared to treatments relying on mechanical alone. The vertical coulter and rotary harrow combination controlled weeds similar to a burndown herbicide treatment. Treatments with the rotary hoe had weed densities higher than herbicide treated plots, but less than treatments without weed control operations. Treatments that included banded herbicide reduced weed density and weed biomass compared to no herbicide, but banded herbicide and cultivation was not as effective as the broadcast herbicide treatments. Of the mechanical tools tested, the high residue cultivator was the most effective in reducing weed density and weed biomass. However, the cultivator reduced surface residue levels below 30%. The vertical coulter and rotary harrow reduced surface residue on average 15% and the rotary hoe did not impact surface residue. Overall, the combination of mechanical tillage implements included in high-residue corn allowed reduced herbicide use, while maintaining acceptable weed control and corn yields.

IMPACT OF TALL FESCUE AND HYBRID BLUEGRASS MIXTURES ON WEED ENCROACHMENT AND TURF QUALITY. M.A. Cutulle, J.F. Derr, and B.J. Horvath, Virginia Tech, Virginia Beach.

ABSTRACT

Tall Fescue (*Festuca arundinacea* Schreb.) is a common cool-season turfgrass utilized in the transition zone due to its ability to establish quickly and tolerate heat and drought. However, it is susceptible to brown patch (*Rhizoctonia solani*), especially in the hot, humid summers of the transition zone. Hybrid bluegrass, a cross between *Poa pratenis* and *Poa arachnifera*, is reported to be heat tolerant and thus may perform well in the transition zone. Hybrid bluegrass is resistant to brown patch, but establishes slowly, which may subject it to weed infestations.

Combinations of tall fescue and hybrid bluegrass may have lower overall disease infestations, therefore resulting in lower weed densities than monocultures of either turf species. Optimizing seeding rates should be important when establishing such combinations. In the fall of 2006, field plots were seeded with 'Greenkeeper' tall fescue at 293 kg/ha, ‘Thermal Blue Blaze’ hybrid bluegrass at 110 kg/ha, tall fescue at 264 kg/ha plus hybrid bluegrass at 29 kg/ha, or tall fescue at 146 kg/ha plus hybrid bluegrass at 55 kg/ha. No preemergence herbicides were applied to this trial.

Tall fescue germinated quicker than hybrid bluegrass, achieving 70% cover at one month after seeding, while hybrid bluegrass cover was only 40%. At one month after seeding, percent cover by purple deadnettle (*Lamium purpureum* L.), common chickweed (*Stellaria media* L.), and henbit (*Lamium amplexicaule* L.) were greater in hybrid bluegrass alone compared to tall fescue alone. Weed cover in the combination seeding containing tall fescue at 264 kg/ha plus hybrid bluegrass at 29 kg/ha was similar to that seen in tall fescue alone. Weed cover in the combination seeding at the lower rate of tall fescue and the higher rate of hybrid bluegrass was intermediate between the two monocultures. Monoculture stands of hybrid bluegrass had the highest cover of southern crabgrass [*Digitaria ciliaris* (Retz.) Koel.] in the summers of 2007 and 2008, and the highest cover of white clover (*Trifolium repens* L.) in the spring of 2008. Weed cover in the combination seeding treatments were similar to that seen in monocultures of tall fescue. Brown patch infestations in the summer of 2008 were highest in the monoculture of tall fescue.

Tiller counts taken in February of 2008 indicated an approximate 1:1 ratio of the two turf species when tall fescue was seeded at 146 kg/ha with hybrid bluegrass at 55 kg/ha. At the higher seeding rate of tall fescue with the lower seeding rate of hybrid bluegrass, the ratio was approximately 4 tillers of tall fescue to 1 tiller of hybrid bluegrass.

Without additional inputs, monocultures of hybrid bluegrass cannot outcompete annual weeds. Combinations of hybrid bluegrass with tall fescue result in lower weed density compared to monocultures of hybrid bluegrass, with lower brown patch incidence compared to monocultures of tall fescue.

CHANGES IN WEED VIGOR AND GROWTH IN RESPONSE TO CARBON: NITROGEN RATIO MANIPULATION. S.E. Whitehouse, A. DiTommaso, L.E. Drinkwater, and C.L. Mohler, Cornell University, Ithaca, NY.

ABSTRACT

Maintenance of soil fertility is essential for proper crop growth. Although weeds compete with crops for soil nutrients, maximum crop yields may still be met with specific fertility regimens and minimal weed densities. Anecdotal evidence from organic corn growers in New York State suggests that when soil carbon:nitrogen (C:N) ratios are relatively balanced, overall weed vigor and fecundity is considerably reduced. It is unclear whether this observation is indeed due to a balance in C:N fertility or other factors. The objective of this study was to identify C:N ratios that decrease the competitive ability of velvetleaf (*Abutilon theophrasti*) and giant foxtail (*Setaria faberi*), two major annual weeds in New York State corn (*Zea mays*) production. We hypothesized that a balanced C:N ratio will reduce the vigor and therefore competitive ability of velvetleaf and giant foxtail in a corn crop. In a greenhouse pot experiment, four C:N ratio treatments based on percent availability of C and N were established (8:6 High C/High N; 8:2 High C/Low N; 4:6 Low C/High N; 4:2 Low C/Low N) by adding a mixture of organic compost and ammonium nitrate (NH_4NO_3) to collected field soil. Velvetleaf and giant foxtail were grown at densities of 2, 4, and 8 plants per pot along with corn, and growth parameters (i.e. height, leaf and tiller number) were recorded weekly during the 3-month trial. Initial statistical analyses demonstrate significant increases in height for giant foxtail at each density when grown under the balanced C:N treatments (mean = 156 and 139 cm for High C/High N and Low C/Low N respectively). In contrast, velvetleaf height was greatest under the High C/High N treatment only (mean = 158 cm). Although biomass data have not yet been collected, visual observations of both weed species indicate that the High N/Low C soil treatment resulted in the tallest and most robust plants across the three planting densities. It is expected that results generated from this study will aid growers in improving their weed control efficacy by using more appropriate soil fertility management strategies. Improving soil quality while suppressing weed populations will also allow growers to produce higher quality crops and reduce their dependence on herbicides.

GAT® UNIVERSITY TRIALS WITH OPTIMUM® HERBICIDES IN 2008. G.S. Rogers, S.K. Rick, M.T. Edwards, J.D. Harbour, and D.W. Saunders, DuPont Crop Protection, Elkton, MD.

ABSTRACT

Weed control programs designed for use on corn (*Zea mays*) and soybean *(Glycine max*) crops containing the Optimum® GAT® traits are under development. Integrated herbicide programs making use of preemergence, postemergence, and 2-pass weed control strategies were evaluated by 25 universities in 2008. Data will be presented supporting the use of Optimum® GAT® trait crops as new tools for managing weed control needs across the United States. Seed products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT® trait are not currently registered for sale or use in the United States.

IN SEARCH OF EFFECTIVE GRASS CONTROL DURING SWITCHGRASS ESTABLISHMENT.

W.S. Curran, Pennsylvania State University, University Park, M. Myers, and P. Adler, USDA-ARS, University Park, PA.

ABSTRACT

Experiments investigating weed control during switchgrass (*Panicum virgatum* L.) establishment were conducted at Rock Springs from 2005 to 2008. These experiments focused on switchgrass tolerance and annual grass control. The two primary herbicides investigated were quinclorac (Paramount®) and sulfosulfuron (Outrider®). Quinclorac is labeled for use in warm season grasses for seed production, while sulfosulfuron is labeled for use in switchgrass and other native grasses. Quinclorac was applied postemergence at 0.248 and 0.375 lb ai/acre with methylated seed oil, while sulfosulfuron was applied postemergence at 0.035 and 0.062 lb ai/acre with nonionic surfactant. In 2006, several additional herbicides were tested including propoxycarbazone, mesosulfuron, topramezone, tembotrione. In 2007 and 2008, experiments focused more on quinclorac and sulfosulfuron rate and application timing. In 2005, very little crop injury was observed from either quinclorac or sulfosulfuron. By 8 weeks after application (WAA), fall panicum (*Panicum dichotomiflorum* Michx.) and yellow foxtail [*Setaria glauca* (L.) Beauv.] control averaged 68 and 58%, respectively with sulfosulfuron and 68 and 83% with quinclorac. In contrast to 2005, the higher rates of sulfosulfuron and quinclorac produced 63 to 65% switchgrass stunting and chlorosis 4 WAA in 2006. In addition, propoxycarbazone caused 45% injury, mesosulfuron 52% injury, and both topramezone and tembotrione caused 100% switchgrass mortality. In 2006 sulfosulfuron provided about 40% green foxtail [*Setaria viridis* (L.) Beauv.] control, while quinclorac provided about 83% control. In 2007, sulfosulfuron reduced switchgrass height between 13 and 37% and caused 5 to 27% chlorosis 2 WAA. In contrast, 0.375 lb quinclorac never exceeded 17% injury 2 WAA. Regardless of herbicide, by 8 WAA, crop injury had mostly disappeared.

In 2008, sulfosulfuron stunted and discolored switchgrass at both application timings. Even at 8 WAA, 0.062 lb/acre reduced plant height by 13 to 22%, although no discoloration was observed. Quinclorac injury ranged from 13 to 40% 2 WAA, mostly due to chlorosis. No injury was observed by 8 WAA with quinclorac in 2008. In 2007, sulfosulfuron provided between 53 and 68% yellow foxtail control depending on application timing and greater than 82% yellow nutsedge (*Cyperus esculentus* L.) control. Quinclorac provided 73 to 85% yellow foxtail control and had no activity on yellow nutsedge. In 2008, sulfosulfuron provided 33 to 73% yellow foxtail control with the EPOST timing producing the better results. Quinclorac provided 45 to 88% control with the best control also occurring from the earlier application timing.

Four years of research showed that both sulfosulfuron and quinclorac can injure switchgrass seedlings and potentially reduce stand. Sulfosulfuron causes both height reductions and chlorosis, while quinclorac primarily causes chlorosis. However, 8 WAA evaluations showed switchgrass recovery from both herbicides. In terms of weedy grass activity, quinclorac is the stronger summer annual grass herbicide and smaller grasses are more susceptible to both herbicides. Sulfosulfuron activity primary benefit in this study was control of yellow nutsedge and suppression of some broadleaves.

OPTIMIZING CEREAL RYE MANAGEMENT FOR IMPROVED WEED SUPPRESSION IN ORGANIC AND CONVENTIONAL SOYBEAN. W.S. Curran, Pennsylvania State University, University Park, B.P. Jones, Virginia Tech, Verona, S.B. Mirsky, USDA-ARS Beltsville, MD, D.A. Mortensen, M.R. Ryan, and E. Nord, Pennsylvania State University, University Park.

ABSTRACT

Trials were conducted in Pennsylvania and Virginia to investigate how cereal rye (*Secale cereale* L.) cover crop management can influence weed suppression in no-till soybean [*Glycine max* (L.) Merr.]. Cereal rye was established in the fall and terminated at different dates in the spring to achieve a cover crop biomass gradient. In late fall or early spring, common ragweed *(Ambrosia artemisiifolia* L.), giant foxtail (*Setaria faberi* Herrm.), and smooth pigweed (*Amaranthus hybridus* L.) seeds were mixed and seeded at three different densities in weedy subplots. In conventional soybean, glyphosate was applied to control the cover crop followed by a roller/crimper to help position the cover crop to maximize weed suppression. Only the roller/crimper was used to control the cover in organically managed soybean. Soybeans were planted in either a 19 or 72 cm row spacing after rolling/crimping. Half the plots received glyphosate postemergence in the conventional soybean, while a high residue cultivator provided some post control in half of the organic plots. Only the cultivated plots were planted in 72 cm rows. Weed density by species was monitored several times during the summer and weed biomass by species was collected from the weedy subplots in late summer. Soybean population and grain yield were collected from each plot. Only the conventional treatments were included in Virginia and this abstract will report on the preliminary results from Pennsylvania.

In Pennsylvania, rye biomass ranged from 1920 to 9840 kg/ha depending on termination date. Because the rye was terminated somewhat later in the organic soybean, at least 5000 kg/ha biomass was achieved even at the first termination date. Soybean populations tended to decrease as rye biomass increased and some treatments required replanting. In conventional soybean, giant foxtail biomass increased as termination was delayed, while the opposite was observed for common ragweed. Smooth pigweed biomass was more similar across termination dates. In the organic treatments, giant foxtail control was more similar across termination dates, smooth pigweed was more prevalent at late termination and common ragweed control was a problem regardless of termination date. As expected, the conventional soybean receiving the post herbicide had the best overall weed control, while efficacy of the high residue cultivation varied and was the least effective in controlling common ragweed. Although end of season soybean data are currently being collected, preliminary results suggests that soybean yield decreased with the delay in planting likely due to decreased soybean population and lower yield potential for later planted soybean.

MANAGING A HAIRY VETCH COVER CROP TO MAXIMIZE WEED SUPPRESSION IN NO-TILL CORN. B.P. Jones, Virginia Tech, Verona, W.S. Curran, D.A. Mortensen, Pennsylvania State University, University Park, and S.B. Mirsky, USDA-ARS, Beltsville, MD.

ABSTRACT

There is growing interest in the Mid-Atlantic region for integrating cover crops into no-tillage crop production systems. In particular, legume cover crops such as hairy vetch (*Vicia villosa*) provide surface residue over winter to minimize soil loss and can provide significant amounts of plant available nitrogen to the following cash crop. Cover crops such as hairy vetch have also been shown to enhance weed control by physically and chemically suppressing weed recruitment and growth. However the interactions between cover crop termination date, cover crop growth stage and biomass production, and weed suppression have not been investigated. Additionally, optimization of the suppressive effects of cover crops demands that the crop is in synchrony with the germination periodicity of the weeds. This project strives to address these questions by testing the effects of cover crop termination date on weed management across varying initial weed population densities and emergence periodicities for a vetch-corn crop rotation. Field experiments were established in fall of 2007 in Pennsylvania and Virginia in a modified split-split plot, randomized complete block design with four replications. Main plot treatments were organized in a modified factorial arrangement with three main treatment factors (cover crop termination date, synthetic weed seedbank density and weed species). The influence of weed emergence periodicity and initial weed seedbank size on weed suppression was assessed by establishing three species at varying initial seedbank densities (100, 450 and 1050 seeds m^{-2}) that have known differences in emergence periodicity. The three species chosen for this study were: Common ragweed (*Ambrosia artemisiifolia*), giant foxtail (*Setaria faberi*), and smooth pigweed (*Amaranthus hybridus*). Vetch biomass was determined prior to termination and corn (*Zea mays*) was planted 7 to 10 days after vetch termination. Weed densities were measured at 0, 5, 7 and 12 WAP and final weed biomass was determined. Plots were split and half received a non-selective post-emergence herbicide application at approximately 6 WAP. Corn yields were measured at the end of the growing season. Hairy vetch biomass was 273 and 1305 kg ha^{-1} greater between termination dates at the Virginia and Pennsylvania sites, respectively. Vetch termination date also affected weed density, with later terminated vetch having fewer weeds in all but two measurements. Interestingly, final weed biomass was not affected by termination date in either location. Both weed biomass and weed densities were affected by initial weed seedbank density at the Pennsylvania location. Weed biomass at both locations was affected by post-emergence herbicide control regardless of vetch termination date. Corn had not yet been harvested at this writing. This project is on-going and will continue in the 2008-09 growing season.

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

ABSTRACT

Studies have been conducted at the Central Maryland Research and Education Center located in Beltsville, MD, for the control of Italian ryegrass (*Lolium multiflorum* Lam.) in wheat (*Triticum aestivum* L.). Research has demonstrated the utility of preemergence (PRE) or delayed-PRE applications of *s*-metolachlor or flufenacet + metribuzin for Italian ryegrass control in wheat. To minimize injury, the delayed-PRE applications are suggested. Flufenacet, applied alone, has also been examined as a PRE treatment with good Italian ryegrass control. However, wheat injury and resulting yield loss were experienced as rates of flufenacet increased. Pendimethalin has also been examined as a PRE treatment. Depending upon rate and time of application, pendimethalin provided good Italian ryegrass control, no wheat injury, and resulted in good yields. KIH-485 has also been examined as a PRE and delayed-PRE application. Injury has been observed with both types of applications, but may be rain dependent. In some years, better control was obtained with the delayed-PRE applications, but this also may be rain dependent. Mesosulfuron-methyl and pinoxaden have been examined for postemergence (POST) control of Italian ryegrass control in wheat. Both products have provided excellent weed control, good crop tolerance, and resulting good yields. Chlorsulfuron + flucarbazone-sodium have also been investigated for control of Italian ryegrass control in wheat. Applications were made early fall, mid-fall, and early spring. Injury was noted with all rates and timings. However, excellent Italian ryegrass control was noted with no loss in wheat yield. In the spring of 2008, POST applications of pyroxsulam were investigated. Applications were made alone and in combination with broadleaf herbicides. Excellent Italian ryegrass control was obtained, with no crop injury and no antagonism noted.

DANDELION CONTROL IN NO-TILLAGE CORN AND SOYBEANS. R.R. Hahn and P.J. Stachowski, Cornell University, Ithaca, NY.

ABSTRACT

Burndown and control of dandelion (*Taraxacum officinale* Weber in Wiggers) in no-tillage corn (*Zea mays* L.) and soybeans [*Glycine max* (L.)Merr.] were investigated at the Musgrave Research Farm near Aurora, NY between 2005 and 2008. A corn experiment established in 2005 compared mid-November and early May treatments. Early May evaluations revealed that burndown with fall applications of 0.77 lb ae/A of glyphosate, 0.375 oz ai/A of the premix rimsulfuron + thifensulfuron (Basis®), or the combination of these two treatments averaged 91%. Burndown with fall application of 0.77 lb/A of glyphosate plus 0.475 lb ae/A of 2,4-D amine was 79% in early May. Unfortunately, many of the dandelions in these treatments recovered by early July when control with rimsulfuron + thifensulfuron had declined to 22%, and control with glyphosate alone, glyphosate plus rimsulfuron + thifensulfuron, or glyphosate plus 2,4-D averaged 54%. When applied in early May, dandelion control 2 months after treatment (MAT) was 68% with glyphosate alone while combinations of glyphosate with 2,4-D or with rimsulfuron + thifensulfuron controlled an average of 79%. Spring applied rimsulfuron + thifensulfuron was no better than when fall applied (22%) and produced a yield of 123 Bu/A. Glyphosate alone, and glyphosate combinations with 2,4-D or rimsulfuron + thifensulfuron had an average yield of 157 Bu/A. A second corn experiment established in October 2006 examined how tribenuron might help with dandelion control. In this experiment, control with 0.475 lb/A of 2,4-D ester with 0.25 or with 0.375 oz/A of rimsulfuron + thifensulfuron averaged 72 and 17% 6 and 8 MAT respectively. When 0.094 oz ai/A of tribenuron was added, dandelion control with these rimsulfuron + thifensulfuron plus 2,4-D treatments averaged 98 and 40% 6 and 8 MAT respectively. The addition of tribenuron to these fall treatments increased corn yields an average of 30 Bu/A. Additional information on the contribution of tribenuron was collected following early preplant (EPP) applications in May 2008. The addition of 0.125 oz/A of tribenuron to 0.375 oz/A of rimsulfuron + thifensulfuron plus 0.475 lb/A 2,4-D ester increased dandelion control from 77 to 96% 1.5 MAT. A separate treatment of 0.187 oz/A of tribenuron plus 0.475 lb/A of 2,4-D controlled 93% of the dandelion 1.5 MAT. A soybean experiment established in October 2006 compared fall and spring applications of 0.325 oz ai/A of the premix chlorimuron + tribenuron (Canopy® EX) plus 0.475 lb/A of 2,4-D ester with application of 0.11 oz ai/A of the premix chlorimuron + thifensulfuron (Synchrony® XP) plus 0.094 oz/A of tribenuron and 0.475 lb/A 2,4-D. Fall application of these combinations showed excellent (99%) dandelion burndown when evaluated 6 MAT but control declined to an average of 38% 9 MAT. Spring applications of these combinations provided an average of 49% control 3 MAT. Dandelion control improved from 68 to 94% with the addition of 0.075 oz/A of tribenuron to an EPP application of 1.35 oz ai/A of the premix chlorimuron + flumioxazin + thifensulfuron (Enlite™) plus 0.475 lb/A 2,4-D ester in a 2007 soybean experiment. Finally, dandelion control 1.5 MAT increased from 70 to 96% with the addition of 0.25 oz/A of tribenuron to an EPP application of 0.11 oz/A of chlorimuron + thifensulfuron and 0.475 lb/A of 2,4-D in 2008.

DUPONT HERBICIDES WITH MULTIPLE MODES OF ACTION AND FLEXIBLE UTILITY FOR USE ON OPTIMUM® GAT® CORN AND SOYBEAN. D.W. Saunders, H.A. Flanigan, M.F. Holm, K.L. Hahn, L.H. Hageman, and W.J. Schumacher, DuPont Crop Protection, Dallas Center, IA.

ABSTRACT

Corn (*Zea mays*) hybrids and soybean (*Glycine max*) varieties containing the Optimum® GAT® trait will be tolerant to applications of glyphosate as well as a wide range of ALS-inhibitor herbicides. This broad herbicide tolerance will allow the development of new DuPont herbicide blends designed to meet changing weed control needs in row crops. Data will be presented supporting the development of DuPont™ Diligent™, Instigate™ and Trigate™ herbicides that will deliver broader-spectrum weed control, soil-residual activity plus additional herbicidal modes-of-action for difficult-to-control weeds and many herbicide resistant weeds. Weed control data will also be presented which supports the development of DuPont™ Traverse™ and Freestyle™ herbicides. These herbicides will provide additional broader spectrum weed control while maintaining crop rotation and expanded application flexibility. Seed products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT® trait are not currently registered for sale or use in the United States.

THE INFLUENCE OF NOZZLE TYPE ON THE CONTROL OF FIELD CROP WEEDS.

R.E. Wolf and D.E. Peterson, Kansas State University, Manhattan.

ABSTRACT

This study was conducted to evaluate herbicide efficacy comparing multiple nozzle types designed to reduce drift while maintaining adequate efficacy. The experiment included comparisons of a chamber style nozzle, the turbo flat-fan from Spraying Systems (TT): three older venturi styles, the AirMix from Greenleaf (AM), the Ultra LoDrift from Hypro (ULD), and the Air Induction from TeeJet (AI); two new venturi style nozzles, the Air Induction Extended Range from TeeJet (AIXR) and the Guardian from Hypro (GA); a new design chamber nozzle, the Turbo Twin flat-fan from TeeJet (TTJ60), and a new venturi design from Greenleaf, a TurboDrop High Speed Twin Fan (TD HS TF). Orifice sizes and operating pressures for each nozzle treatment were selected to deliver a spray volume of 70 L/ha at 16 km/h. Droplet size was determined based on nozzle type and pressure selected for each nozzle from manufacturer recommendations. The flow rates were attained by selecting the following orifice sizes: TT110025, AM110025, TTJ60110025, GA110025, AIXR110025 (all at 276 kPa), AIC11002, ULD12002, and TDHSTF11002 (all at 483 kPA). Applications were made with a tractor-mounted 3-point sprayer equipped with a 4-nozzles spaced at 51 cm and located 51 cm above the target. Glyphosate at 0.42 kg ae/ha and paraquat at 0.42 kg ai/ha were used to compare efficacy on velvetleaf, common sunflower, sorghum, and corn. Ammonium sulfate at 2% w/w was added to the glyphosate treatments and nonionic surfactant at 0.5% v/v was added to the paraquat treatments. Treatments were replicated three times and efficacy was evaluated 28 days after treatment.

Species control varied between glyphosate and paraquat. When averaged across nozzle type and species, glyphosate had 97.9% control and paraquat had 80.2% control. Glyphosate had very few differences in control among nozzle types. Range of control averaged across nozzle type by species was 99.8% for corn, 99.6% for sorghum, 98.4% for common sunflower, and 86.8% for velvetleaf. Velvetleaf control across nozzle type ranged from 88 to 82% with the TT significantly less compared to the other nozzle types. In corn, the range in control was 100 to 99% with the AI significantly less. In common sunflower the TT and AM were significantly less than the other types with range from 100 to 97%. There were no significant differences found in control of sorghum among nozzle types. With paraquat, differences were found across all nozzle types and species. Range of control averaged across nozzle type by species was 93% for common sunflower, 83.5% for corn, 73.3% for velvetleaf, and 71.0% for sorghum. The AM and the TTJ60 were significantly less for velvetleaf control. The TT was significantly better than the others for sorghum control. The TTJ60 had significantly less coverage with sorghum. The TT, AM, GA, and TDHSTF were significantly better for control of corn, while the GA was significantly lower in control of common sunflower.

There were no significant differences found for each species among nozzle types when averaged across glyphosate and paraquat. Average control across nozzle type was 96% for common sunflower, 92% for corn, 85% for sorghum, and 80% for velvetleaf.

WEED MANAGEMENT IN CORN WITH SAFLUFENACIL. C.A. Judge, S.J. Bowe, L.D. Charvat, T.D. Klingaman, W.E. Thomas, and J.H. O'Barr, BASF, Research Triangle Park, NC.

ABSTRACT

Saflufenacil (BAS 800H) is a selective herbicide currently under development by BASF for preplant and preemergence broadleaf weed control in field corn (*Zea mays*). In field research trials across the US, saflufenacil has provided residual control (> 80%) of many small- and large- seeded broadleaf weeds, including troublesome weeds such as common cocklebur (*Xanthium strumarium*), common lambsquarters (*Chenopodium album*), common ragweed (*Ambrosia artemisiifolia*) giant ragweed (*Ambrosia trifida*), morningglory species (*Ipomoea* spp.), pigweeds and waterhemp species (*Amaranthus* spp.), and velvetleaf (*Abutilon theophrasti*). Optimal residual weed control was obtained when at least 1.3 cm of rain and/or irrigation was received prior to weed emergence. Rates of saflufenacil that have been evaluated were based upon soil texture, organic matter, and length of residual weed control desired ranging from 50 to 125 g ai/ha. In a planned two-pass weed control program, lower saflufenacil rates have provided excellent broadleaf weed control as the residual herbicide prior to crop emergence followed by a registered postemergence product such as glyphosate in glyphosate-tolerant corn. At higher rates, saflufenacil has provided sufficient residual broadleaf weed control until canopy closure. A tank-mix partner was required for residual grass and/or sedge control. A pre-mix of saflufenacil with dimethenamid-p was evaluated and provided excellent control (>80%) of many broadleaf, grass, and sedge weeds. In addition to the residual weed control obtained at the rates described herein (50 to 125 g ai/ha), saflufenacil has also provided preplant burndown control of emerged broadleaf weeds when applied in conservation tillage or no-till crop management systems. However, for burndown weed control, saflufenacil required the addition of adjuvants such as crop oil concentrate or methylated seed oil plus ammonium sulfate. For burndown weed control, a tank-mix partner was required for control of emerged grasses. Glyphosate was the tank-mix partner most often evaluated and provided excellent broadleaf and grass weed control with no observed antagonism. Low rates of saflufenacil (< 25 g ai/ha) have also been evaluated in corn and many other crops for preplant burndown of broadleaf weeds, but with limited or no residual weed control. In research, corn has demonstrated excellent tolerance from applications of saflufenacil made prior to emergence; however, injury has resulted from saflufenacil applications made after corn emergence. Tolerance of sweet corn, popcorn, and seed corn to saflufenacil is currently under evaluation. Overall, saflufenacil has demonstrated utility for residual and burndown broadleaf weed control in conventional or reduced-till production, herbicide-tolerant or conventional corn, and planned one-pass or two-pass weed control programs. Saflufenacil will require a tank-mix partner for burndown grass control (e.g., glyphosate) or residual grass control (e.g., dimethenamid-P).

PREPLANT APPLICATION OF SAFLUFENACIL FOR BROADLEAF WEED CONTROL IN CEREALS. S. Tan, M. Oostlander, L.D. Charvat, G. Forster, L. Drew, J.H. O'Barr, and S. Willingham, BASF Corporation, Research Triangle Park, NC and Missisauga, ON.

ABSTRACT

The efficacy of a new developmental herbicide, saflufenacil (BAS 800), was tested in combination with glyphosate as a preplant treatment prior to cereal crops and as a chemfallow treatment. Trials were conducted from 2004 to 2008 in all the major ecozones of Western Canada, and across the cereal growing regions of the United States. Saflufenacil applied at rates from 18 to 50 g ai/ha, in combination with glyphosate at 450 or 840 g ae/ha provided excellent control of broadleaf weeds, including glyphosate tolerant species, in a preplant and chemfallow use pattern. Saflufenacil at the lower rate of 18 g ai/ha + glyphosate provided excellent burndown control of all evaluated broadleaf weeds. Increasing the rate to 50 g ai/ha provided residual activity on species such as wild mustard (*Sinapis arvensis*) and wild buckwheat (*Polygonum convolvulus*). Cereal tolerance to saflufenacil was assessed at rates from 18 to 100 g ai/ha over a wide range of climates and soil conditions. Cereals (bread wheat, durum wheat, barley, oats) showed excellent tolerance to saflufenacil at rates up to 100 g/ha.

BAS 800: HAS HORSEWEED MET ITS MATCH. M.J. VanGessel, B.A. Scott, and Q.R Johnson, University of Delaware, Georgetown.

ABSTRACT

Saflufenacil (BAS 800) is an experimental herbicide being developed for use in agronomic crops with postemergence activity as well as some soil residual activity. University of Delaware Weed Science program has evaluated saflufenacil since 2003, primarily for horseweed (*Conyza canadensis*) control for no-till soybean (*Glycine max*). Seven trials examined saflufenacil at rates of 0.01, 0.02, and 0.04 lb ai/A, either alone or with glyphosate. Two of the seven trials included horseweed size at time of application as a variable and results were the same whether horseweed plants were 2 to 4 inches at time of application or 4 to 10 inches tall. The results across year were mixed. When glyphosate-resistant (GR) horseweed was abundant, saflufenacil plus glyphosate provided 60 to 99% horseweed control at four weeks after application. Typically, the high rate of saflufenacil (0.04 lb ai/A) provided better horseweed control than the lower rates. When horseweed plants were 2 to 4 inches tall, glyphosate plus 2,4-D (at 0.5 lb ae/A) was not statistically different from the glyphosate plus saflufenacil treatments. However, when horseweed plants were larger at time of application (4 to 10 inches tall), glyphosate plus 2,4-D (0.5 lb ae/A) was not as effective as saflufenacil at 0.04 lbs ai/A plus glyphosate. In trials with field pansy (*Viola arvensis*) or common chickweed (*Stellaria media*) present, saflufenacil alone did not provide effective control of these species.

In a single trial, saflufenacil was used in combination with glyphosate for control of horseweed plants following wheat harvest. Saflufenacil was used at only one rate (0.02 lb ai/A) with glyphosate and compared to various products. Saflufenacil in combination with glyphosate provided 63% control, while glufosinate and paraquat plus chorimuron provided 86 and 84% control, respectively.

In four trials evaluating residual activity of saflufenacil, at 0.02 lb ai/A, it was not as effective as sulfentrazone or flumioxazin for summer annual weed species.

Saflufenacil will provide another herbicide mode of action for horseweed control, which will assist with resistance management. It will provide an additional option to control horseweed plants within one to two weeks of soybean planting (when it is not appropriate to use 2,4-D at rates needed for horseweed control). However, identifying benefits beyond horseweed activity and improving the consistency of horseweed control are necessary to determine saflufenacil utility in no-till soybeans.

RESPONSE OF SELECTED CONTAINER-GROWN ORNAMENTALS AND WEED SPECIES TO FORMULATIONS OF DIMETHENAMID-P. A.F. Senesac, Cornell Cooperative Extension, Riverhead, NY

ABSTRACT

Two container studies were conducted at the LI Horticultural Research and Extension Center to evaluate the response of weed species and container grown ornamentals to two formulations of dimethenamid-P. The studies were conducted in the spring 2008 on plant material that had recently been transplanted into commercial nursery media. Plots were overhead irrigated soon after treatment and on a daily basis after that. Both Freehand™ (dimethenamid-P + pendimethalin 1.75G at 2.63, 5.25 and 10.5 lbs a.i./a) and Tower™ (dimethenamid-P 6EC at 1, 2 and 4 lbs a.i./a) were evaluated at 1, 2 and 4 times the proposed labeled use rate. The woody species evaluated were: Japanese maple (*Acer palmatum* 'Atropurpureum'), red maple (*Acer rubrum)*, silver maple (*Acer saccharinum*), slender deutzia (*Deutzia gracilis* 'Nikko'), hibiscus (*Hibiscus moscheuto)*, St. John's Wort (*Hypericum kalmianum* 'Gemo'), blue spruce (*Picea pungens)*, eastern white pine (*Pinus strobus*), and western redcedar (*Thuja plicata* 'Stoneham Gold'). The herbaceous species evaluated were: variegated reed grass (*Calamagrostis acutiflora* 'Overdam'), coral bells (*Heuchera americana* 'Palace Purple'), catmint (*Nepeta x faassenii* 'Walker's Low'), garden phlox (*Phlox paniculata* 'Robert Poore'), creeping phlox (*Phlox subulata* 'Emerald Blue'), obedient plant (*Physostegia virginiana*), stonecrop (*Sedum spurium* 'John Creech'), goldenrod (*Solidago sphacelata* 'Golden Fleece'), and creeping speedwell (*Veronica peduncularis* 'Waterperry'). The results of visual inspection of the foliage and roots indicate that slight to moderate injury was caused in red maple, variegated reed grass, catmint, garden phlox, creeping phlox and stonecrop by either formulation. The other species evaluated appeared to tolerate dimethenamid-P well. While dimethenamid-P did not provide excellent control of liverwort, both formulations did inhibit the spread of the weed within infested containers by 50 to 75% over the course of eight weeks. Tower provided slightly better control than Freehand during this period. Smooth crabgrass (*Digitaria ischaemum*) and yellow woodsorrel (*Oxalis stricta*) were well controlled by both formulations of dimethenamid-P.

IRRIGATION AFFECTS HERBICIDE PENETRATION OF SHRUB CANOPIES. J.E. Altland, USDA-ARS, Wooster, OH.

ABSTRACT

Nursery growers can apply herbicides in either granular or sprayed formulations. Despite greater risk for injury, sprayed preemergence herbicides are often less expensive than an equivalent granular formulation, easier to apply, and result in more uniform application. When herbicides are sprayed over crops, overhead irrigation is used to simultaneously wash herbicides from the foliage and incorporate the herbicide into the substrate surface. Most labels stipulate 1.25 cm of irrigation following herbicide application. Irrigation is thus an intrinsic component of herbicide applications in ornamental nursery crops, and could greatly affect how preemergence herbicides move from shrub foliage into the substrate below. It has been suggested that foliage of crops to be sprayed with herbicide should first be wetted with irrigation, then sprayed while foliage remains wet, and then irrigated soon thereafter. The logic is that herbicides will be less likely to dry on or absorb into foliage if the herbicide remains in solution after spraying. The objective of this research was to determine if irrigation before or after sprayed herbicide application affects foliar retention of the herbicide.

On Sept. 24, 2008, hydrangea (*Hydrangea paniculata* Sieb. 'Quick Fire') growing in 10.2 L containers and approximately 31 cm tall and 36 cm wide were sprayed with pendimethalin (Pendulum® 3.3 EC). Applications were made with a CO_2 sprayer equipped with a three nozzle boom and calibrated to deliver 40 gal/A. Pendimethalin was applied at a rate of 4.8 qt/A. Pendimethalin was applied under each of the following three scenarios: 1) pendimethalin was applied to dry foliage, and foliage was allowed to dry after application for 30 min prior to irrigation, 2) pendimethalin was applied to dry foliage and irrigated immediately afterward, and 3) pendimethalin was applied to wet foliage and irrigated immediately afterward. In all cases, irrigation following application was run for 30 min which resulted in approximately 1.25 cm water. Leaf samples were collected following application. Samples were stored in separate glass jars that were placed in an iced cooler for transport back to the laboratory. Leaf samples were rinsed with methylene chloride and analyzed with gas chromatography-mass spectrometry to determine pendimethalin coverage on the leaf surface. There were three replications per treatment.

Allowing the herbicide to dry on foliage for 30 min prior to irrigation resulted in 1.77 $\mu g/cm^2$ recoverable pendimethalin on plant foliage. In contrast, irrigating immediately after application resulted in 0.53 or 0.48 $\mu g/cm^2$ when applied to foliage that was either dry or wet at the time of application, respectively, but irrigated immediately afterwards. These data suggest that timing of irrigation after is critical for removing herbicide residues from plant foliage. However, this single experiment did not demonstrate significantly different levels of herbicide residue after application to either wet or dry foliage immediately followed by irrigation.

HERBICIDES FOR POSTEMERGENCE WEED CONTROL IN TEN FIELD-GROWN CONIFER SPECIES. J.F. Ahrens and T.L. Mervosh, Connecticut Agricultural Experiment Station, Windsor.

ABSTRACT

Mesotrione and a combination of glyphosate, oxyfluorfen and clopyralid were applied over ten conifer species to evaluate plant injury and weed control. The conifers, of typical transplant size, were planted in tilled sandy loam soil in Windsor, CT between April 17 and May 5, 2008. Species consisted of eastern white pine (*Pinus strobus*), fraser fir (*Abies fraseri*), Douglas-fir (*Pseudotsuga menziesii*), Norway spruce (*Picea abies*), white spruce (*Picea glauca*), Colorado spruce (*Picea pungens*), eastern hemlock (*Tsuga canadensis*), American arborvitae (*Thuja occidentalis* 'Emerald Green'), yew (*Taxus* x *media* 'Hicksii'), and juniper (*Juniperus horizontalis* 'Blue Star'). Five plants of each species were planted per plot, in two 34-ft-long rows spaced 3 ft apart. An RCB design with four replicates was utilized. Herbicides were sprayed in a volume of 25 gal/A using a hand-held four-nozzle boom with 8003VS tips. Treatments included mesotrione (Callisto® 4SC) at 0.125 or 0.25 lb ai/A applied with simazine at 1.35 lb ai/A on May 7; the mesotrione treatments were reapplied on June 19. Also, simazine was applied alone on May 7, followed by mesotrione at 0.125 or 0.25 lb ai/A on June 19. On May 7, the three spruce (*Picea*) species and eastern hemlock had broken bud; the other conifers were still dormant. All plants were actively growing on June 19. A combination of glyphosate (Roundup Original®) plus oxyfluorfen (GoalTender®) plus clopyralid (Lontrel®) was applied at doses of 0.125 lb ai/A + 0.25 lb ai/A + 0.094 lb ae/A, respectively, and in the same combination at double each of these doses. Following simazine on May 7, the three-way combinations were applied on June 19 and again on July 17. Evaluations of plant injury (0 = none; 10 = plant dead) and weed control (0 = none; 10 = complete control) were recorded periodically. Rainfall in summer 2008 was about twice normal.

On June 9, some Norway spruces treated on May 7 with mesotrione (0.25 lb ai/A) plus simazine were chlorotic, with an average injury rating of 2.0. All other injury ratings were less than 1.0 on June 9. Plots were evaluated again on July 9 (3 weeks after the June 19 treatments during active growth). Douglas-fir was the most sensitive of the conifers to mesotrione, which whitened the new flush of needle growth (injury ratings of 1.5 to 3.3). Norway spruce and white spruce had lesser extent of whitening, mostly in plots treated twice with 0.25 lb ai/A of mesotrione. Injury symptoms dissipated by September. In mesotrione-treated plots, needles of some Douglas-firs were still chlorotic, but the second flush of growth was normal in color. All conifers were tolerant of the glyphosate plus oxyfluorfen plus clopyralid treatments; only very slight injury on Douglas-fir was observed late in the season after two applications at the double dose.

The primary weeds in the field were large crabgrass (*Digitaria sanguinalis*), common ragweed (*Ambrosia artemisiifolia*), carpetweed (*Mollugo verticillata*), purslane (*Portulaca oleracea*) and yellow woodsorrel (*Oxalis stricta*). The simazine + mesotrione treatments controlled these weeds through early August (control ratings 8.7 to 10). By September 8, late emerging weeds had become prevalent in these plots. The three-way combination treatments gave excellent season-long control of all weeds present.

FALL APPLICATIONS OF FLUMIOXAZIN ON DECIDUOUS ORNAMENTALS. S. Barolli, Imperial Nurseries, North Granby, CT and J.F. Ahrens, Connecticut Agricultural Experiment Station, Windsor, CT.

ABSTRACT

In research on deciduous shrubs over three seasons we learned that sprays of flumioxazin can be safely used on many shrubs in late fall. The objective in 2007 was to confirm these results on other deciduous shrubs. Sprays will allow us to control weeds in late fall and early spring at reduced costs.

Three plants of each of five species were included in each experimental unit. Seven different herbicide treatments and a control were replicated four times in randomized complete blocks. The plants included forsythia (*Forsythia x intermedia* 'Goldtide'), spiraea (*Spiraea x bumalda* ‘Anthony Water’) and potentilla (*Potentilla fruticosa* ‘Gold Finger’) in 2-gallon pots, and weigela (*Weigela florida* ‘Minuet’) and lilac (*Syringa vulgaris* ‘Krasavitza Moskvy’) in 3-gallon pots. Applications were made on November 7, 2007. Plants were in full leaf at treatment and heavy frost occurred two previous nights.

The treatments were sprays of flumioxazin (SureGuard®) at 0.25, 0.38, 0.75 lb ai/A and granules of flumioxazin (BroadStar™) at 0.38 lb ai/A. Sprays of V-10142 at 1 lb ai/A, and simazine + oryzalin at 1 + 2 lb ai/A, and isoxaben + oryzalin at 0.93 + 2 lb ai/A were also included. The granules were weighed out, mixed with sand and applied by hand using an 18 sq. ft. frame over the plots. Sprays were applied with a calibrated CO_2 powered hand-held boom equipped with three Teejet 8004-VS nozzles operating at 41 psi and 3 ft/sec, applying 50 gal/A. The temperature at treatment was 35° F. Following applications the experiment was irrigated for 20 minutes. On November 8th weed seeds were sown in three plantless 1 gal cans for each plot. Common chickweed (*Stellaria media* L. Vill.) was seeded at 1/8 teaspoon per can. Groundsel (*Senecio vulgaris* L.) seed diluted with sand, sifted through a 20-mesh screen, was sown using 1 teaspoon per can. Plants were held in a hoophouse that was covered with plastic on November 15th. On April 9, 2008 holes were cut for airflow. Vigor ratings were made on May 12, 2008, when all plants were actively growing. Vigor was rated on a scale of 0 to 10 with 0-dead and 10-best vigor. The same day percentage area covered with weeds and the number of weeds were counted for each can.

Except for V-10142, no treatment affected plant vigor. Vigor of forsythia and spiraea was significantly reduced by V-10142 treatment. All three rates of SureGuard were most effective in controlling chickweed. All treatments except simazine + oryzalin effectively controlled groundsel.

The results of this and previous experiments show that flumioxazin sprays can be successfully used in many deciduous shrubs in late season. They can provide excellent weed control, and have reduced costs by 70%, compared with the former standard OH2®. This has been practiced at Imperial Nurseries for the last two seasons with excellent results.

DIMETHENAMID-P: WHAT WAS LEARNED IN 2008 WITH THE GRANULAR AND LIQUID FORMULATIONS FOR ORNAMENTALS. K.E. Kalmowitz, C.A. Judge, R.J. Keese, and K.J. Miller, BASF Corporation, Research Triangle Park, NC.

ABSTRACT

Dimethenamid-P, a Group 15 chloroacetamide herbicide from BASF, was registered in 2008 as a preemergence herbicide for ornamental uses including field and container commercial production and non-turfgrass landscape areas. In trials from 2006 to 2008, some woody ornamentals have shown tolerance to a liquid dimethenamid-P EC formulation (720 g/L), Tower™. However, the first labeled use for the liquid dimethenamid-P is for field production and landscape directed-applications only. A dimethenamid-P + pendimethalin granular formulation (1.75%), FreeHand™, was registered for nursery production and landscape sites for over-the-top applications to both woody and herbaceous ornamental plants. Registered rates of the products are Tower™ at 1.1 and 1.7 kg ai/ha and FreeHand™ at 2.0, 3.0 and 3.9 kg ai/ha.

Plant tolerance to dimethenamid-P continued as a major objective for research trials and large plot demonstrations conducted in 2008. Focus of trials was for ornamental crop species and weed efficacy label expansion. Additional investigations on timing and use of the herbicides for specific production practices were evaluated. Both formulations at two rates applied to perennial plugs stuck directly from cell-trays into 3-L containers at transplant, 1 and 2 weeks following transplant were examined. Also, five top-ranked North Carolina ornamental grasses produced in 32-cell trays were transplanted and both formulations of dimethenamid-P applied at transplant and 2 weeks after transplanting. Two rates of the liquid dimethanimd-P herbicide were compared to one rate of the granular herbicide to evaluate grass species tolerance. The following ornamental grasses were included: variegated reed grass (*Calamagrostis x acutiflora* 'Overdam'), sea oats (*Chasmanthium latifolium*), pink pompas grass (*Cortaderia selloana* ‘Rosea’), maiden grass (*Miscanthus sinensis* ‘Gracillimus’), muhly grass (*Muhlenbergia capillaris* ‘Alkali’), and *Pennsylvaniaisetum x advena* ''Rubrum’. All grasses showed some unacceptable phytotoxicity at one or more rate or timing and this is consistent with selected grass species previously examined.

Caladium bicolor, a tropical perennial grown from a tuber, and gladiolus spp., a tender perennial grown from a corm, were identified as field-produced flowering crops in the eastern United States. Dimethenamid-P was screened in 2007 and 2008 for use on caladiums in container studies. In 2008, planted gladiolus corms were screened for tolerance to the dimethenamid-P liquid formulation applied at two rates and three timings, at transplanting and 5 and 14 days after transplanting.

WEED CONTROL AND ORNAMENTAL TOLERANCE TO MESOTRIONE. J F. Derr, Virginia Tech, Virginia Beach.

ABSTRACT

Mesotrione has recently been developed for use in golf courses and sod farms, with additional turf uses expected. Ornamentals could be exposed to this herbicide when it is applied to turf areas. Trials were conducted to evaluate the tolerance of bedding plants and woody nursery crops to mesotrione. In a field trial, mesotrione applied either prior to or after transplanting at 0.125 or 0.25 lb ai/A caused significant visible injury, ranging from 10 to 80%, depending upon rate, to marigold (*Tagetes erecta* L.), vinca [*Catharanthus roseus* (L.) G. Don], gazania [*Gazania rigens* (L.) Gaertn], salvia (*Salvia splendens* Sellow ex Roem. & Schult.), and lanceleaf coreopsis (*Coreopsis lanceolata* L.) 17 DAP. Significant reduction in flowering was noted in all species except vinca 30 days after planting. Mesotrione applied POST once at 0.25 lb/A gave excellent control of smooth [*Digitaria ischaemum* Schreb. Ex Muhl.] and southern crabgrass [*Digitaria ciliaris* (Retz.) Koel.], good control of goosegrass, [*Eleusine indica* (L.) Gaertn.] and a significant reduction in yellow nutsedge (*Cyperus esculentus* L.) stand. The same rate applied PRE did not provide acceptable control of crabgrass or goosegrass. In a similar trial conducted in containers, mesotrione at 0.25 lb/A caused 45% or greater injury to gazania, verbena [*Verbena canadensis* (L.) Britton], lanceleaf coreopsis, and impatiens (*Impatiens walleriana* Hook.), with less injury to vinca (18%) 28 DAT. In another field trial, mesotrione caused severe injury to forsythia (*Forsythia x intermedia* Zabel) with both directed and overtop applications, with moderate to severe injury to variegated privet (*Ligustrum sinense* Lour) depending on rate and number of applications. Injury to azalea ranged from 14 to 23% at 41 days after treatment. A single POST application of mesotrione at 0.125 and 0.25 lb/A gave fair and excellent control of yellow nutsedge 9 DAT, but yellow nutsedge control was not acceptable at 41 DAT. Two applications of mesotrione gave good to excellent yellow nutsedge control, significantly higher than that seen with a single application. A single POST application at 0.125 or 0.25 lb/A gave excellent control of smooth and southern crabgrass and goosegrass. Single and repeat applications of mesotrione injured yellow foxtail [*Setaria glauca* (L.) Beauv.], but this species was able to outgrow the injury. Fall panicum (*Panicum dichotomiflorum* Michx.) infested all mesotrione-treated plots. Two directed spray applications of mesotrione at 0.125 or 0.25 lb/A caused approximately 15 to 25% injury to azalea (*Rhododendron obtusum* L.), hydrangea (*Hydrangea macrophylla* L.), flowering dogwood (*Cornus florida* L.), and daylily (*Hemerocallis spp*.) 27 DAT, with greater injury to butterfly bush (*Buddleia davidii* Franch.), redbud (*Cercis canadensis* L.) and marigold. Single applications resulted in less injury. Injury generally decreased by 65 DAT, except in butterfly bush and marigold. Two POST applications of mesotrione at 0.125 or 0.25 lb/A gave good to excellent control of yellow nutsedge, while single application gave unacceptable control 27 DAT.

Nursery crops and annual grasses vary in their tolerance to mesotrione. Root uptake appears to be an important mode of exposure in nursery crops. Two POST applications of mesotrione provide good to excellent control of yellow nutsedge, goosegrass, and crabgrass species.

EFFICACY AND SAFETY OF DIMETHENAMID-P + PENDIMETHALIN IN CONTAINER NURSERY CROPS. J.C. Neal, North Carolina State University, Raleigh.

ABSTRACT

Freehand, a granular formulation of dimethenamid-P + pendimethalin, has recently been registered for use in nursery crops and landscapes. Previous research on different formulations and ratios of these two active ingredients has demonstrated safety on a wide range of woody nursery crops and weed control efficacy on many important nursery weeds.

A series of experiments were conducted on woody and herbaceous ornamentals in 2007 and 2008 to evaluate the safety and efficacy of the commercialized formulation. Trials were conducted at several locations in North Carolina: Horticultural Crops Research Station at Castle Hayne, Zelenka Nursery at Sims, Horticultural Field Laboratory in Raleigh, and Monrovia Nursery in LaGrange. At each site, the container substrate was pine bark-based with standard slow release fertilizer incorporated. Herbicides were applied in pre-weighed aliquots in a randomized complete block design with 4 replicates and 3 pots of each species per plot (n=12 for each species / treatment combination). In woody ornamental trials, herbicides were applied within 48 hours of potting and again approximately 9 weeks after initial treatment. Herbaceous plants were treated once within one week of potting.

In general, control of flexuous bittercress (*Cardamine flexuosa*), spotted spurge (*Chamaesyce maculata*), woodsorrel (*Oxalis stricta*) was comparable an industry standard herbicide, trifluralin + isoxaben (Snapshot® TG). Freehand™ provided greater than 90% control of doveweed (*Murdannia nudiflora*). Eclipta (*Eclipta prostrata*), longstalked phyllanthus (*Phyllanthus tenellus*) and marsh marsley (*Apium leptophyllum*) control with Freehand™ was superior to that observed with Snapshot® TG.

Sixteen species of woody ornamentals were included in the 2007 and 2008 experiments. No injury from Freehand™ was observed on abelia, Indian hawthorn, wax myrtle, cryptomeria, caryopteris, arborvitae, 'Knock Out' rose, ‘Flower Carpet’ rose, ‘Gerard’s Rose’ azalea, boxwood, ‘New Gold’ lantana, ‘Muskogee’ crape myrtle, nandina, or viburnum ‘Pragense’. In 2007 no injury was observed on dwarf burford holly or ‘Ruby’ loropetalum. However, in 2008 inhibition of new growth on ‘Needlepoint’ holly was observed. Also in 2008, up to 40% growth inhibition was observed on ‘Ruby’ loropetalum at the maximum labeled dose of Freehand™.

These data support previous reports of weed control comparable to industry standards and safety to a wide range of woody nursery crops. However, differences in holly and loropetalum response between 2007 and 2008 for inexplicable reasons underscore the need to test new products at multiple sites and in multiple years. Furthermore, growers should be encouraged to test new herbicides before treating large blocks of nursery crops.

EVALUATION OF SULFOSULFURON SAFETY APPLIED OVER-THE-TOP OF TEN CONTAINER GROWN WOODY LANDSCAPE ORNAMENTALS. T.L. Harpster and J.C. Sellmer, Pennsylvania State University, University Park.

ABSTRACT

A study was initiated to evaluate the tolerance of 10 ornamental shrub species to over the top (OTT) applications of sulfosulfuron at varied rates and application times. Six treatments were applied in a RCBD to five replicate plants of each species. Treatments were: 1) sulfosulfuron at 0.0586 lb/A, 2) two- 0.0586 lb/A applications 2 wk apart, 3) two- 0.0586 lb/A applications 4 wk apart 4) sulfosulfuron at 0.117 lb/a, 5) halosulfuron at 0.062 lb/a, and 6) an untreated check. All sulfosulfuron and halosulfuron treatments included a nonionic surfactant at 0.025%. Treated species included: boxwood (*Buxus* x 'Green Mountain'), burning bush (*Euonymus alatus* (Thumb.) 'Compacta'), creeping euonymus (*E. fortunei* (Turcz.) 'Emerald Gaiety'), English ivy (*Hedera helix* L. 'Buttercup'), hydrangea (*Hydrangea arborescans* L. 'Annabelle'), holly (*Ilex* x *meserveae* S. Y. Hu 'Blue Princess'), juniper (*Juniperus horizontalis* Moench 'Wilson'), mugo pine (*Pinus mugo* Turra), rhododendron (*Rhododendron* x 'P.J.M.), and viburnum (*Viburnum* x *pragense* Hort.). Applications were sprayed OTT on June 25, 2008 using a CO_2 test plot sprayer set at 30 psi delivering 30 GPA. Plant injury rating data was collected 2, 4, 8 and 12 weeks after treatment (WAT).

Response to treatment rate and application timing varied among species. No significant difference in plant injury rating or growth was found among treated juniper and mugo pine. Holly and viburnum showed early injury symptoms and reduced growth from all treatments. Holly appeared to recovery by 12 WAT. The high rate and repeat application of sulfosulfuron at the 0.0586 lb/A rate reduced width growth in viburnum. Boxwood was injured by all treatments except with the 30-day repeat application of sulfosulfuron. New growth on the treated boxwood plants appeared as shortened internodes and stunted leaves. All sulfosulfuron treatments reduced growth and produced early injury symptoms to burning bush; however, by 12 WAT only the high rate and the 30-day repeat application produced significant damage. Overall, leaves were stunted, discolored, and distorted. The 30-day repeat application of sulfosulfuron and the halosulfuron treatments resulted in significant injury to the creeping euonymus. Treated and new growth was necrotic and stunted; however, plant size was not obviously affected. All treatments except the single low rate application of sulfosulfuron produced necrotic and distorted leaves on English ivy. By 12 WAT no difference in plant growth was found among the treatments. Treated rhododendrons were discolored and yellow. Only the halosulfuron and high rate of sulfosulfuron produced significant injury. Overall plant growth was not affected. Hydrangea was most dramatically affected. All treatments produced early injury symptoms including necrosis, shoot dieback, and death. By week 12 plants treated with halosulfuron or a single low rate application of sulfosulfuron appeared to recover. All sulfosulfuron treatments reduced growth. This study indicates that sulfosulfuron applied at 0.0586 lb/a results in minimal injury and growth reduction on boxwood, burning bush, creeping euonymus, English ivy, juniper, mugo pine, rhododendron and viburnum, however sulfosulfuron is not recommended for use on hydrangea.

2008 TRIAL RESULTS AT THE OHIO STATE UNIVERSITY WITH DIMETHENAMID-P, DIMETHENAMID-P + PENDIMETHALIN, MESOTRIONE G, AND IMAZOSULFURON.

L.T. Case and H.M. Mathers, Ohio State University, Columbus.

ABSTRACT

Nine species were selected to determine phytotoxicity of preemergence herbicides: red maple (*Acer rubrum* 'Sun Valley'), butterfly bush (*Buddleia davidii* 'Nanho Blue'), Japanese holly (*Ilex crenata* 'Convexa'), Norway spruce (*Picea abies*), red oak (*Quercus rubra*), lilac (*Syringa xtribrida* 'Lark Song'), yew (*Taxus media* 'Runyan'), Japanese tree lilac (*Syringa reticulata* 'Ivory Silk'), and 'Dolgo' crabapple (*Malus domestica*). Plants were upshifted into containers with a soilless mix [60% pine bark, 20% rice hulls, 10% sand, 5% comtil (composted sewage sludge), and 5% stone aggregate] at The Ohio State University, Columbus, Ohio, and herbicides applied on 29 May, 2008. Herbicides and rates tested included dimethenamid-P + pendimethalin (Freehand™) at 2.65 (1X), 5.3 (2X), and 10.6 (4X) lbs ai/ac, Tower™ (dimethenamid-p) at 0.97 (1X), 1.94 (2X), and 3.88 (4X) lbs ai/ac, V-10142 (imazosulfuron) at 0.75 (1X), 1.5 (2X), and 3.0 (4X) lbs ai/ac, and Mesotrione - G at 2.1 (1X), 4.2 (2X), and 6.3 (3X) lbs ai/ac. Tower™ is an emulsifiable concentrate which was sprayed on with a CO_2 backpack sprayer with 8002 evs nozzles in a spray volume of 25 gallons per acre. All other herbicides were in the granular form and spread by shaker jars. Herbicides were reapplied on 10 July 2008. The protocol specified that fluxioxazin (BroadStar™) not be applied at the first application timing, but at the second, so it was also applied on 10 July 2008 at 0.375 (1X), 0.75 (2X), and 1.5 (4X) lbs ai/ac. Immediately after each application, ½ acre-inch irrigation was applied. Phytotoxicity evaluations were performed at 1 WA1T (week after first treatment), 2 WA1T, 4 WA1T, 1 WA2T (week after second treatment), 2 WA2T, and 4 WA2T. Visual ratings were performed on a scale of 0-10 with 0 being no phytotoxicity, 10 being dead, and ≤3 commercially acceptable. Growth indices [(height+width+width)/3] were taken at the first and last evaluations. The trial was set up as a split plot (main = species, sub = treatment). For each treatment, there were four replications with 3 subsamples per replication.

FreeHand™ was safe on red maple, red oak, and lilac and crabapple at all rates tested. Tower™ was safe at all rates tested on Norway spruce, and with the 1X and 2X rates on red maple, red oak, and lilac. Injury from Tower™ was in the form of burning of foliage (especially when plants were younger) at the higher rates. V-10142 was completely safe on Japanese holly and red oak; however, the yew and butterfly bush showed a dose response, especially from the 1X rate to 2X rate. Many of the yews and butterfly bushes were not injured by the 1X rate of V-10142, but most were by the 2X rate, which was general chlorosis of the yew plants and either death or meristem malformation of the butterfly bush. Mesotrione – G was safe on red maple; however, red oak was slightly stunted by the Mesotrione – G. Mesotrione – G was injurious to yew at the 2X and 4X rates and was injurious to butterfly bush, Japanese holly, and lilac at all rates. BroadStar™ was safe at all rates on the Japanese holly, yew, Japanese tree lilac, and butterfly bush and only slightly injurious to the red oak at the 4X rate.

EVALUATION OF VARIOUS MIXTURES OF HPPD AND PSII INHIBITORS FOR WEED CONTROL IN SEVERAL ORNAMENTAL PLANTS. G.R. Armel, W.E. Klingeman, and P.C. Flanagan, University of Tennessee, Knoxville.

ABSTRACT

Greenhouse and shadehouse studies were conducted and repeated in time in 2008 at the University of Tennessee campus in Knoxville, TN to evaluate postemergence (POST) applications of the HPPD inhibitors mesotrione at 105 to 420 g ai/ha, tembotrione at 92 to 370 g ai/ha, and topramezone 18 to 147 g ai/ha alone or in combinations with the PSII inhibitors bentazon at 560 g ai/ha, atrazine at 560 g ai/ha, and diuron at 448 g ai/ha for selective control of several weeds important to the nursery industry. Nursery crops evaluated included daylily (*Hemerocallis* 'Siloam June Bug'), burning bush (*Euonymus alatus* 'Compactus'), azalea (*Azalea* 'Girard's Rose'), Japanese holly (*Ilex crenata* 'Noble's upright', flowering dogwood (*Cornus florida*), rose (*Rosa* 'knockout'), and snapdragon (*Antirrhinum majus* 'First Ladies'). All rates of mesotrione and mixtures of mesotrione at 105 g ai/ha plus bentazon at 560 g ai/ha did not visually injure or reduce chlorophyll content in burning bush or azalea greater than 5%. Similar azalea and burning bush response was observed with tembotrione at 92 and 184 g ai/ha and with topramezone at 18 and 37 g ai/ha. Roses were injured 12 to 43% and 17 to 55%, respectively with applications of tembotrione and mesotrione. Conversely, rose injury did not exceed 18% with any rate of topramezone. Daylily injury never exceeded 27% with any HPPD inhibitor application, however topramezone (rates up to 74 g ai/ha) was the safest HPPD inhibitor applied to daylilies (injury of 7% or less). Flowering dogwood injury was 8 to 23% with all herbicide treatments. Japanese holly displayed little to no visual response or chlorophyll reductions with any application of the HPPD inhibitor applications. In contrast, no HPPD inhibitor treatment was safe for use in snapdragon. Bentazon alone at 560 g ai/ha did not cause greater than 13% injury to any nursery crop evaluated in these studies. Snapdragon flower numbers increased 160% when treated with bentazon at 1120 g ai/ha when compared with the check.

POST applications of HPPD inhibitors were also evaluated on several weed species including redroot pigweed (*Amaranthus retroflexus*), chamberbitter (*Phyllanthus urinaria*), spotted spurge (*Chamaesyce maculata*), yellow nutsedge (*Cyperus esculentus*), and mugwort (*Artemisia vulgaris*). All HPPD treatments provided 71 to 100% control of redroot pigweed; however topramezone was the only HPPD inhibitor that provided at least 97% control of redroot pigweed at every rate evaluated in these studies. Tembotrione and topramezone did not adequately control yellow nutsedge or spotted spurge, however mesotrione at 210 and 420 g ai/ha controlled both weeds between 75 to 88%. No HPPD inhibitor alone provided commercially acceptable control of chamberbitter or mugwort, however mixtures of the PSII inhibitors bentazon at 560 g ai/ha, diuron at 448 g ai/ha, or atrazine at 560 g ai/ha with mesotrione at 210 g ai/ha provided 93 to 97% control of mugwort. Similar mugwort control was also observed with mixtures of tembotrione at 184 g ai/ha plus atrazine at 560 g ai/ha or diuron at 448 g ai/ha. POST applications of mesotrione at 105 g ai/ha plus bentazon at 560 g ai/ha provided 89 to 98% control of all weeds evaluated in these studies except chamberbitter.

UPDATE ON 2008 WEED SCIENCE RESEARCH IN THE IR-4 ORNAMENTAL HORTICULTURE PROGRAM. C.L. Palmer, J.J. Baron, and E. Vea, IR-4 Project, Princton, NJ.

ABSTRACT

The 2008 IR-4 Ornamental Horticulture Research Program sponsored crop safety testing of over-the-top applications on six different herbicide products. The goal of this research was to continue testing new herbicides on woody and herbaceous perennials grown primarily in container nurseries. Five products contained new active ingredients: EXC3898 (mesotrione + s-metolachlor + prodiamine), F6875 0.3G (sulfentrazone + prodiamine), Freehand™ G (dimethenamid + pendimethalin), Tower™ EC (dimethenamid), and V-10142 0.5G. The last product, Broadstar™ 0.25G VC1604 (flumioxazin), was a new formulation of a registered active ingredient reportedly exhibiting more favorable crop safety. Applications were made at dormancy and approximately 6 weeks later for all products with the exception of Broadstar™ 0.25G, which was applied once at the later application date. Broadstar™ 0.25G VC1604 was applied to 37 crops; EXC3898 was applied to 39 crops; F6875 was applied to 10 crops; Freehand™ was applied to 60 crops, Tower™ was tested on 28 crops, and V-10142 0.5G was tested on 23 crops. The results from this research will aid in the development of the labels for these products and will help growers and landscape care professionals make more informed product choices.

GIANT HOGWEED CONTROL AND ERADICATION IN PENNSYLVANIA. M.A. Bravo, M.Polach and J. Zoschg, Pennsylvania Department of Agriculture, Harrisburg, and D. Hillger, Dow AgroSciences, Pickerington, OH.

ABSTRACT

Pennsylvania has been controlling and eradicating giant hogweed (*Heracleum mantegazzianum*), a federal noxious weed of limited distribution in Pennsylvania since 1998. Giant hogweed has been discovered in 17 counties at 524 sites since the program began in the state. Of these only 19% (100 sites) were "active" and required treatment in 2007 and less than 11% (60 sites) were “active” and required treatment in 2008. The program continues to have few new sites reported with less than 10 new sites of giant hogweed reported and confirmed in 2008. All of the confirmed new sites had not been previously listed and released. This information continues to support the states findings that effective eradication of giant hogweed infested sites can occur after 3 consecutive years or less depending on the seed bank. Herbicide trials in 2007 and 2008 at two different locations in Pennsylvania confirmed the effectiveness of triclopyr (Garlon® 3A) and aminopyralid (Milestone™ VM) as well as combinations of the two plant growth regulators. Pennsylvania will continue to use Garlon® 3A at 5% v/v or 2.5% v/v (determined by plant size) with 0.5% v/v Milestone™ in either a Thinvert or water solution as the base program. Glyphosate and/or mechanical removal are also utilized on a case by case basis. Beginning in August of 2008, pre-stamped, return to sender postcards were mailed to 172 “released” sites of giant hogweed (3 years with no live detection) in Pennsylvania asking for verification that the site remains negative. Postcards will continue to be mailed for 3 more years to monitor seed bank activity.

EVALUATION OF REPEATED ANNUAL TREATMENTS FOR A PILOT KUDZU ERADICATION PROGRAM IN PENNSYLVANIA: THIRD YEAR SUMMARY.

M.A.Bravo, P.Broady and R. Romanski, Pennsylvania Department of Agriculture, Harrisburg.

ABSTRACT

Pennsylvania began a pilot kudzu [*Pueraria montana* var. lobata (Willd.) Maesen & S.M. Almeida] eradication program in 2005. Kudzu is a state noxious weed in Pennsylvania and all known sites in the state are surveyed and monitored. Kudzu is found in Zone 6 of the U.S. National Arboretum Plant Hardiness Zone Map in 13 counties in the state. PDA has confirmed kudzu on more than 114 individual properties. Since 2005, 52 of 89 populations have been enrolled in the 3 year treatment program. The majority of enrolled sites are less than a half an acre in size (small sites) but 3 sites greater than 2 acres (large sites) are also part of the pilot program. Enrolled sites are treated for 3 consecutive years by the Bureau of Plant Industry with the annual goal of limiting any significant above ground biomass production. Technical assistance and training is also provided to enable property owners to monitor and effectively manage the seed bank after the program ends. Three types of treatment applications are used in the program that begins in the spring and ends with the onset of frost: high volume foliar, low volume foliar and cut stump/basal bark. Herbicides used in the program since 2000 include aminopyralid, clopyralid, imazapyr, metsulfuron and triclopyr. Clopyralid (Transline®) is the base program. With the exception of the treated sites, all other known sites of kudzu in Pennsylvania are flowering and producing seed pods on an annual basis and seed production at many locations has been documented since the 1980's. Most, but not all of the kudzu sites in Pennsylvania are more than 30 years old if not decades older and were purposely planted for soil stabilization purposes. The program has successfully killed the crowns at all of the small sites and in the portions of the large sites that could be treated. Seed bank germination has occurred at all treated sites the year after treatment but all treated sites have significantly less seed bank germination by the 3rd year of the program.

RESPONSE OF ROADSIDE BRUSH SPECIES TO METSULFURON-FREE HERBICIDE MIXTURES. J.M. Johnson, A.E. Gover, K.L. Lloyd and J.C. Sellmer, Pennsylvania State University, University Park.

ABSTRACT

Triclopyr plus metsulfuron is commonly used for roadside weed and brush management. This combination has shown weakness in control of exotic shrub honeysuckle (*Lonicera* spp.) and metsulfuron has been shown to inhibit desirable roadside grass species[1/].

Trials evaluating metsulfuron-free treatments were established in a mixed species stand in State College, PA; and on Morrow's honeysuckle (*Lonicera morrowii* Gray, LONMO) in Indiana, PA. The treatments included an untreated check; 1.7 kg/ha triclopyr alone or combined with 0.042 kg/ha metsulfuron, 1.1 kg/ha dicamba, 0.12 kg/ha aminopyralid, 0.28 kg/ha dicamba plus 0.11 kg/ha diflufenzopyr, or 0.30 kg/ha picloram plus 1.1 kg/ha 2,4-D; and 0.84 kg/ha triclopyr plus 0.12 kg/ha aminopyralid combined with 1.1 kg/ha dicamba or 0.28 kg/ha dicamba plus 0.11 kg/ha diflufenzopyr. All herbicide treatments included a nonionic surfactant (Activator 90) at 0.25% v/v. The experimental design was a randomized complete block design with three replications. Treatments were applied in a vertical pattern to plots 14 m long by 2.4 m high at the State College site using a CO_2-powered, single nozzle sprayer with a XP20L TeeJet BoomJet delivering 281 L/ha at 276 kPa. At the Indiana site, individual shrubs within plots approximately 8 by 9 m in size were treated using CO_2-powered sprayers with a spray wand equipped with TeeJet #5500 Adjustable ConeJet nozzles with X-12 tips targeting 935 L/ha at 207 kPa. Treatments were completed on September 13 and 17, 2007 at the State College and Indiana sites, respectively. The same treatments were also applied to roadside tall fescue (*Lolium arundinaceum* Schreb.) at State College and Duncansville, PA, on October 22 and 30, 2007, to assess phytotoxicity.

Target species at State College included Morrow's honeysuckle, multiflora rose (*Rosa multiflora* Thunb. ex Murr., ROSMU), and border privet (*Ligustrum obtusifolium* Sieb. and Zucc., LIGOB). Control evaluations were taken October 10, 2007, May 6, 2008 and September 10, 2008, or 27, 236, and 363 days after treatment (DAT), respectively. Control evaluations in Indiana, PA were taken October 15, 2007, April 30, 2008, and September 11, 2008, or 28, 226, and 360 DAT. Only the September 2008 ratings for each site are shown in Table 1.

The mixtures triclopyr plus dicamba plus aminopyralid, or triclopyr plus picloram plus 2,4-D were among the highest rated across all species at both sites. Triclopyr plus metsulfuron was effective against ROSMU and LIGOB, but ineffective against LONMO.

No treatments provided unacceptable levels of injury to tall fescue. The later timing of the treatments may have resulted in reduced evidence of herbicide injury compared to previous investigations.

[1/] Gover, A.E., L.J. Kuhns, and D.A. Batey. 1994. Effect of application date on response of tall and fine fescues to applications of metsulfuron methyl or chlorsulfuron. Proc. NEWSS, 48: 31-33.

Table 1. Herbicides were applied September 13, 2007 to mixed brush including Morrow's honeysuckle, multiflora rose, or border privet in State College, PA; and September 17, 2007 to LONMO in Indiana, PA. The State College site was treated with a vertical, broadcast pattern using a carrier volume of 281 L/ha while individual shrubs were targeted at the Indiana site using a carrier volume of 935 L/ha. Final evaluations of percent control were taken September 2008. Each value is the mean of three replications. Multiflora rose was not present in all plots, so a single LSD value cannot be reported.

		Indiana	----------- State College	--------------	
treatment	application rate	LONMO control	LONMO control	ROSMU control	LIGOB control
	kg ae/ha	-------------------------	%	-------------------------	
untreated	---	0	0	0 c	0
triclopyr	1.7	28	12	33 bc	12
triclopyr metsulfuron	1.7 0.042	67	33	75 ab	93
triclopyr dicamba	1.7 1.1	66	17	5 c	55
triclopyr aminopyralid	1.7 0.12	73	62	38 bc	72
triclopyr dicamba aminopyralid	0.84 1.1 0.12	98	60	92 a	60
triclopyr dicamba + diflufenzopyr	1.7 0.28 0.11	90	20	5 c	42
triclopyr dicamba + diflufenzopyr aminopyralid	0.84 0.28 0.11 0.12	75	35	33 bc	42
triclopyr picloram + 2,4-D	1.7 0.30 1.1	93	87	58 ab	63
Protected LSD (p=0.05)		19	41	---	42

RESPONSE OF WOODY SPECIES TO FOLIAR APPLICATIONS OF DPX-KJM44 .

J.M. Johnson, A.E. Gover, K.L. Lloyd and J.C. Sellmer, Pennsylvania State University, University Park.

ABSTRACT

DPX-KJM44 (proposed common name, aminocyclopyrachlor-methyl) is an experimental herbicide that was investigated for use in foliar treatments to control woody species. Control of three species was evaluated in the field using multiple rates of DPX-KJM44.

Two trials investigating DPX-KJM44 were established along a forest road within the Stone Valley Experimental Forest near McAlevy's Fort, PA on tulip poplar (*Liriodendron tulipifera* L., LIRTU) and red oak (*Quercus rubra*, QUERU). A third trial was conducted along an unopened section of I-99 near State College, PA targeting black locust (*Robinia pseudoacacia* L., ROBPS). Treatments included an untreated check; 70, 140, 210, 245, 280, or 350 g/ha aminocyclopyrachlor-methyl; 840 g/ha imazapyr; 84 g/ha metsulfuron; 6720 g/ha fosamine; and 3400 g ae/ha glyphosate. All herbicide treatments included methylated seed oil at 1% v/v. The experimental design was a completely randomized with five replications. Fifty-five individual trees or clusters ranging from 1.8 to 3 m tall were tagged and measured to determine average canopy width. Carrier volumes for each tree or cluster were derived using the calculated canopy area and a targeted application volume of 936 L/ha (black locust application volume was 468 L/ha). Treatments were applied using a CO_2-powered, single nozzle sprayer with a spray wand and TeeJet adjustable ConeJet nozzle and X-6 or X-12 tip. Black locust and red oak were treated August 28 and 31, 2007, respectively, while tulip poplar was sprayed September 5, 2007.

Visual ratings of percent injury to the canopy were taken October 1 or 2, 2007, 34 or 32 days after treatment, DAT, for black locust and red oak. Tulip poplar injury was evaluated September 26, 2007, 21 DAT. Percent control was evaluated June 17, 2008, 294 DAT for black locust; June 20, 2008, 294 DAT for red oak; and June 20, 2008, 289 DAT for tulip poplar.

The three species were effectively controlled by all treatments. In 2008, black locust control ranged from 93 to 100 percent, red oak control ranged from 98 to 100 percent, and tulip poplar control ranged from 85 to 100 percent. Control for DPX-KJM44 treatments was 99 to 100 percent for black locust, 98 to 100 percent for red oak, and 91 to 100 percent for tulip poplar.

SUPPRESSION OF ALS INHIBITOR-RESISTANT KOCHIA ALONG HIGHWAY GUIDERAILS.

K.L. Lloyd, A.E. Gover, J.M. Johnson, and J.C. Sellmer, Pennsylvania State University, University Park.

ABSTRACT

Kochia (*Kochia scoparia* L.) poses a threat to roadside management programs, especially in bareground settings. This species thrives in roadside and other harsh environments. Kochia has widespread resistance to sulfometuron and is beginning to show resistance to diuron. Several diuron alternatives were evaluated for early-season activity against kochia, and in a separate experiment, postemergence kochia control was assessed for fifteen non-crop herbicides.

In May 2007, trials were established in right-of-way settings in State College and Enola, PA to compare early-season activity among herbicide mixtures containing sulfometuron plus chlorsulfuron at 0.16 and 0.079 kg/ha, respectively, either alone, or combined with 7.2 kg/ha diuron, 0.28 kg/ha flumioxazin, 4.5 kg/ha pendimethalin, 1.1 kg/ha prodiamine, or 0.42 kg/ha sulfentrazone. Glyphosate at 1.7 kg ae/ha was applied alone and included with the other herbicide treatments. The experiment was repeated at a roadside location in State College, PA in May 2008, with the additional treatment of bromacil plus diuron at 3.6 plus 3.6 kg/ha.

In July 2008, postemergence kochia control was compared at sites in Bellefonte and Jersey Shore, PA, using the following herbicides (in kg ae/ha): 2.4-D at 2.1, aminocyclopyrachlor at 0.056, aminopyralid at 0.070, clopyralid at 0.11, dicamba at 0.84, dicamba plus diflufenzopyr at 0.14 plus 0.056, fluroxypyr at 0.21, glyphosate at 1.7, hexazinone at 1.1, imazapic at 0.21, imazapyr at 0.28, metsulfuron at 0.042, triclopyr at 0.84, saflufenacil at 0.098, and sulfometuron plus metsulfuron at 0.11 plus 0.042.

Results from the early season trials were variable, possibly due to differences in kochia size and vigor at time of treatment. At State College in 2007, larger kochia plants, approximately 15 cm tall, were not eliminated by the glyphosate component as intended and were released. Treatment effect was not significant in the analysis of variance, but an orthogonal contrast comparing kochia cover in sulfentrazone-treated plots (2 percent) to the other herbicide treatments (33 to 78 percent) was significant. Differences in kochia cover were not significant at Enola, although kochia was less vigorous with 25 percent cover in untreated plots at season end. At State College in 2008, treatments containing sulfometuron plus metsulfuron combined with either diuron, flumioxazin, pendimethalin, prodiamine, or sulfentrazone, and the bromacil plus diuron treatment were rated significantly lower for kochia cover (2 to 23 percent) than sulfometuron plus metsulfuron alone (48 percent) at the end of the trial.

Postemergence kochia control also appeared to vary with plant size and vigor. Significant differences in injury and control ratings at the poor-quality, low vigor Jersey Shore site did not translate into differences in percent kochia cover. Kochia was more vigorous at the Bellefonte site, with some plants as tall as 1.3 m at time of treatment. Dicamba, glyphosate, dicamba plus diflufenzopyr, fluroxypyr, and 2,4-D provided significant reduction in kochia cover compared to the untreated plots.

PALE SWALLOW-WORT MANAGEMENT WITH FOLIAR HERBICIDE TREATMENTS.

T. L. Mervosh, Connecticut Agricultural Experiment Station, Windsor.

ABSTRACT

Pale swallow-wort (PSW) [*Cynanchum rossicum* (Kleopov) Borhidi or *Vincetoxicum rossicum* (Kleopov) Barbar.], an invasive herbaceous perennial in the milkweed family (Asclepiadaceae), is spreading in many parts of New England. Minimal data have been published regarding herbicidal efficacy in controlling swallow-wort species. In cooperation with the Silvio O. Conte National Fish and Wildlife Refuge (U.S. Fish and Wildlife Service), an experiment was initiated on Conte Refuge property in 2007. The study site is within a PSW incursion on a former ski slope on Mt. Tom, near Holyoke, MA. Refuge officials are concerned about the threat that PSW poses to rare native plants found on the mountain. The objective is to identify herbicide treatments that control PSW with minimal harm to perennial grasses and other plants present.

Plots (5 ft by 9 ft) were established in May 2007 in a randomized complete block design with three replicates of each treatment. Pre-treatment assessments were recorded for the prevalence of PSW and other plants in each plot. Herbicides were applied with a hand-held, three-nozzle spray boom (TeeJet 8003VS tips) pressurized with CO_2 at 23 psi. Spray volume was 25 gallons per acre. Treatments were sprayed over whole plots on June 15; the lower halves of the same plots were sprayed on August 29. In addition to an untreated check, treatments consisted of ammonium salt of imazapic (Plateau®) at 1.5 or 3.0 oz/A ai, metsulfuron-methyl (Escort® XP) at 0.6 or 1.2 oz/A ai, triethylamine salt of triclopyr (Garlon® 3A) at 1.13 or 2.25 lb/A ae, triclopyr at 1.13 lb/A ae plus metsulfuron methyl at 0.6 oz/A ai, isopropylamine salt of glyphosate (Accord® Concentrate) at 1.0 or 2.0 lb/A ae, and triclopyr at 1.13 lb/A ae (on June 15) plus glyphosate at 1.0 lb/A ae (on August 29). A nonionic surfactant (0.5% v/v) was included in each spray bottle. Plots were evaluated several times in 2007 and 2008 for treatment effects on PSW and other vegetation. Separate ratings and data were collected from upper and lower halves of each plot. Visual estimates were taken of percentage of area covered by PSW and other plants, and ratings of PSW vigor. These evaluations plus quantitative data for PSW heights and fruit (pod) production were factors in assigning overall PSW control ratings (0 to 10 scale).

Plots were evaluated for the last time in August 2008. Imazapic treatments and low dose of metsulfuron had little effect on PSW growth in 2008. The other herbicide treatments provided greater reduction in PSW cover and pod weights when applied twice (June and August 2007) than when applied in June only. The higher dose of each herbicide (except imazapic) reduced PSW to a greater extent in 2008. Triclopyr applied once at 1.13 lb/A ae reduced PSW pod production by 66% and had a control rating of 7.0 in August 2008; the same dose of triclopyr applied twice reduced pods by 87% with a control rating of 8.3. Glyphosate applied once at 1.0 lb/A ae reduced PSW pod production by 71% and had a control rating of 7.8; the same dose of glyphosate applied twice reduced pods by 97% with a control rating of 9.5. Triclopyr was more selective than glyphosate in terms of effects on other vegetation. Perennial grasses were much more prevalent in triclopyr-treated plots than in glyphosate-treated plots in 2008

PERENNIAL GRASS CONTROL WITH THE WAIPUNA HOT FOAM WEED CONTROL SYSTEM. R.G. Prostak, University of Massachusetts, Amherst and O.E. Wormser, Waipuna Northeast, Northampton, MA.

ABSTRACT

In recent years there has been a significant increase in the number of requests for non-chemical weed management strategies. Research was conducted at University of Massachusetts Crop Research and Education Center in Deerfield, Massachusetts, to evaluate the efficacy of the Waipuna Organic Hot Foam Weed Control System.

The Waipuna Organic Hot Foam Weed Control System by Waipuna Systems Ltd of Auckland, New Zealand delivers 12 to 14 liters per minute of hot foam at an operating temperature from 95 to 98o C. A plant sugar extract from corn and coconut is mixed with water at 0.4% vol/vol to produce the foam. Three types of wand-end applicators are available. The foam is heated with number 2 oil burner.

The experimental site was a mixed stand of tall fescue (*Festuca arundinacea* Schreb.), quackgrass (*Elytrigia repens* Nevski), sweet vernalgrass (*Anthoxanthum odoratum* L.), orchardgrass (*Dactylis glomerata* L.), timothy (*Phleum pratense* L.), Kentucky bluegrass (*Poa pratensis* L.) and large crabgrass [*Digitaria sanguinalis* (L.) Scop.]. Plots were 1.52 by 1.52 meters. Waipuna treatments were applied once (May 12), twice (May 12 and June 11), three (May 12, June 11, and July 14), four (May 12, June 11, July 14, and August 14) or five (May 12, June 11, July 14, August 14, and September 12) times in 2008. Foam application treatment times range from 0.75 to 2 minutes depending on the amount of vegetation present. Plots were assessed at 2, 9, 15, 25, 30, 32, 38, 52, 65, 77, 94, 97, 106, and 137 days after initial treatment (DAIT).

Plots treated once in May provided 70 and 56% control of vegetation at 38 and 52 DAIT, respectively. Plots treated with four or five monthly applications provided greater that 70% control throughout the growing season. All treatments effectively controlled tall fescue, sweet vernalgrass, orchardgrass and timothy. Quackgrass was not control controlled by any treatment. Treatments with a July application provided greater than 67% control of large crabgrass.

HISTORY OF AND LESSONS FROM A 20 YEAR OLD WEED COOPERATIVE MANAGEMENT AREA: LAKE GASTON, NC AND VA. R.J. Richardson, North Carolina State University, Raleigh.

ABSTRACT

Lake Gaston is a 8,100 ha Roanoke River impoundment on the Virginia-North Carolina border. It serves as a fishery, hydroelectric power generation supply, drinking water reservoir, recreational body, and focal point for development and the local economy. Construction of Lake Gaston was completed in 1963 and Brazilian elodea (*Egeria densa* Planch) was first identified in the lake in 1982, followed by hydrilla *[Hydrilla verticillata* L. f. (Royle] in 1985. Since then, Lake Gaston has also been invaded by Eurasian watermilfoil (*Myriophyllum spicatum* L.), brittle naiad (*Najas minor* All.), and the cyanobacteria (*Lyngbya spp)*. To address emerging weed issues, the Lake Gaston Weed Control Council (LGWCC) was formed in 1985. County commissioners of the five lake counties each appointed three members to the LGWCC and membership remains similar today. Over the last 23 years, the LGWCC has successfully obtained funding and increased funding levels over time. In 1995, just over $400,000 was reported while in 2008 over $1.2 million was budgeted. Current annual funding comes from the five lake counties, North Carolina, Virginia, Virginia Beach, and Dominion Power. The LGWCC has also obtained federal funding on an irregular basis from federal sources. Through the LGWCC, various management techniques have been implemented on Lake Gaston including physical, chemical, and biological. The predominant methods, however, have included lake herbicides and triploid grass carp (*Ctenopharyngodon idella* Val.). These management techniques have generally stabilized weed infestation to around 1,200 ha over the last 10 years, although infested acreage did decline to about 500 ha in 2007.

CONTROLLING JAPANESE HOPS. P.D. Pannill, U.S. Fish and Wildlife Service, and A.M. Cook, Western Maryland Resource Conservation and Development Council.

ABSTRACT

Japanese Hops (*Humulus japonicus* Siebold & Zucc.) is an invasive exotic annual vine that has recently created problems on riparian tree planting sites in Maryland and nearby States. In 2007 and 2008 research was conducted on hops-infested riparian sites in Frederick County, Maryland using various methods of control, including the use of herbicide.

Post-emergent herbicide treatments were applied in June 2007 using metsulfuron-methyl (0.6 oz ai/A), glyphosate (0.5 and 1 lb ae/A), aminopyralid (0.125 lb ae/A), dicamba (1 lb ae/A), 2,4-D (0.96 lb ae/A), triclopyr (0.375 and 0.75 lb ae/A), sulfometuron-methyl (0.6 oz ai/A), clopyralid (0.375 lb ae/A), and imazapic (0.125 lb ae/A). A nonionic surfactant at 0.5% v/v was included, and the solution was applied at 66 gallons per acre. While most of these products appeared to have killed or severely damaged the hops plants at 1 MAT, many of them had recovered or re-grown from the roots. At 3 MAT (September) metsulfuron-methyl showed the best results at 97% control, and the higher rate of glyphosate gave control of 86%. Products moderately effective included aminopyralid (67%), dicamba (61%), 2,4-D (58%), the lower rate of glyphosate (54%), the higher rate of triclopyr (53%), and sulfometuron-methyl (50%). Products showing poor results were the lower rate of triclopyr (38%), imazapic (22%) and clopyralid (18%).

Pre-emergent herbicide applications were applied in March 2008 using sulfometuron-methyl (0.75 oz ai/A), metsulfuron-methyl (0.3 oz ai/A), simazine (4 lb ae/A), imazapic (3 oz ae/A), pendimethalin (4.2 lb ae/A), flumioxazin (6.12 oz ai/A), and oxyfluorfen (1 lb ae/A). The spray solution was applied at 100 gallons per acre. At 3 MAT all products provided control of 94% or more. However, at 4 MAT (July) hops seedlings were sprouting and growing vigorously in plots treated with every product except sulfometuron-methyl, which had a control rating of 99.9%.

A NEW HERBICIDE FOR WINTER ANNUAL WEED CONTROL IN DORMANT BERMUDAGRASS TURF. J.T. Brosnan, G.K. Breeden, and D.L. Lewis, University of Tennessee, Knoxville.

ABSTRACT

Annual bluegrass (*Poa annua* L.) and winter annual broadleaf weeds such as henbit (*Lamium amplexicaule* L.) often infest dormant bermudagrass [*Cynodon dactylon* (L.) Pers.] turf in the transition zone. The objective of this project was to evaluate the efficacy of an experimental herbicide, F7120, for postemergence control of annual bluegrass and various winter annual broadleaf weeds. Research was conducted in 2008 at the East Tennessee Research and Education Center of the University of Tennessee (Knoxville, TN) on a dormant stand of ‘Riveria’ bermudagrass maintained as a golf course fairway. Plots (1.5- by 3.0-m) were arranged in a randomized complete block design with three replications. Treatments included F7120 at rates of 343.2, 499.2, 686.4, 998.4, and 1404.0 g ai/ha, sulfentrazone at 210 g ai/ha, and glyphosate at rates of 280.4, 420.7, 560.9, 841.4, and 1121.8 g ai /ha. All treatments were applied on 25 February 2008 using a CO_2 powered boom sprayer calibrated to deliver 280.5 L/ha utilizing four, flat-fan, 8002 nozzles at 124 kPa, configured to provide a 1.5-m spray swath. Weed control and bermudagrass green-up were evaluated visually utilizing a 0 to 100 % scale, with greater than 70% weed control considered acceptable. F7120 at 499.2 g ai/ha provided 80% control of annual bluegrass at 21 days after treatment (DAT) and 98.3 % control at 50 DAT. No significant differences in annual bluegrass control were reported following applications of F7120 and glyphosate at rates ≥ 499.2 and 560.9 g ai/ha, respectively. While F7120 and glyphosate at rates of 499.2 and 560.9 g ai/ha provided the same level of annual bluegrass control at 21 DAT, F7120 provided 93.3% control of henbit at 21 DAT compared to 30.0% for glyphosate. No glyphosate treatment controlled mouseear chickweed [*Cerastium fontanum* ssp. *vulgare* (Hartman) Greuter & Burdet] at 7 DAT, and at 14 DAT the highest level of control observed was only 16.7%. Conversely, mouseear chickweed control with F7120 at 499.2 g ai/ha was 33.3 % at 7 DAT and 40.0 % at 14 DAT.

PRE AND POSTEMERGENCE CRABGRASS CONTROL IN TURF USING VARIOUS HERBICIDE TIMINGS. P.H. Dernoeden and R.L. Pigati, University of Maryland, College Park.

ABSTRACT

Two field studies were conducted in 2008 to control smooth crabgrass (*Digitaria ischaemum*) in tall fescue (*Festuca arundinacea*) turf. In Study I, single and sequential herbicide applications in a preemergence (pre) and three postemergence (post) timings were assessed. Rates and dates of herbicide applications appear Table 1. Study II was a post study in which three rates of mesotrione in three timings and one rate of three sources of quinclorac in two timings were compared to fenoxaprop. Mesotrione and quinclorac were tank-mixed with 0.25% nonionic surfactant (NIS) and 1% methylated seed oil (MSO), respectively. The turf was mowed to a height of 2.5 inches two times weekly and the site was irrigated as needed. Soil was a Keyport silt loam with a pH of 5.7 and 3.4% OM. Plots were 5 ft x 5 ft and arranged in a randomized complete block with four replications. Sprayable herbicides were applied in 50 GPA using a CO_2 pressurized sprayer equipped with an 8004E flan-fan nozzle. Granular herbicides were applied with a shaker jar. Smooth crabgrass pressure was uniform and severe across the site. Crabgrass cover was rated on a visual linear 0 to 100% scale where 0 = no crabgrass present and 100 = entire plot area covered with crabgrass. Data were subjected to analysis of variance and significantly different means were separated using Fisher's protected least significant difference at $P \le 0.05$. Only data from the final observation date (i.e., 22 Aug.) are discussed.

In Study I, two formulations of prodiamine were evaluated. Prodiamine 4F was applied alone or tank-mixed with mesotrione in various timings (Table 1). Prodiamine 4F applied once at 0.75 lb/A provided poor control; whereas, prodiamine 65 DG applied once at 0.75 lb/A provided 91% control. Prodiamine 4F applied at 0.38 + 0.38 lb/A provided outstanding crabgrass control (94%). Prodiamine 4F applied alone or mixed with prodiamine 4F + mesotrione on 8 April followed by prodiamine 4F + mesotrione on 29 May also provided outstanding control. Pendimethalin applied sequentially (2.0+1.5 lb/A) provided excellent pre control (94%). Prodiamine + sulfentrazone (both formulations) applied once pre provided poor crabgrass control. Dithiopyr applied pre was ineffective. Both prodiamine + sulfentrazone formulations provided excellent (92 to 94% control) early post and subsequent pre control in the 1-2 tiller timing. Dithiopyr (0.5 lb/A) applied in the 1- 4 L timing failed to reduce crabgrass, but in the 1-2 tiller timing reduced crabgrass 80%. All treatments applied in the 2 to 3 tiller timing were ineffective.

In Study II, there were five post mesotrione treatments applied at three rates either 2, 3 or 6 weeks apart. Mesotrione applied three times (16 June and 7 and 28 July) at 0.156 lb/A or twice at 0.25 lb/A (16 June + 7 July or 16 June + 28 July) provided an equivalent level of control (94 to 99%). Mesotrione applied twice at 0.184 lb/A on either 16 June and 7 July or 14 July and 28 July provided equivalent control (94-99%). Data showed that mesotrione has a wide window of post activity against crabgrass. Three sources of quinclorac were assessed (XLR8; generic; commercial) at 0.75 lb/A at mid-June (4-leaf to 1 tiller crabgrass) and mid-July (4-leaf to 2 tiller) timings. At mid-June, commercial and generic quinclorac provided a similar level of post crabgrass

control (85-90%), which was superior to XLR8 (9%). In the mid-July timing, all quinclorac sources provided equivalent control (93-96% control). Fenoxaprop provided fair (83%) and excellent (98%) control in the mid-June and mid-July timings, respectively. All quinclorac sources and fenoxaprop provided effective crabgrass control when applied once in mid-July.

Table 1. Pre and early postemergence smooth crabgrass control with herbicides, College Park, MD, 2008.

Herbicides	Timing*	Rate (lb ai/A)	% crabgrass cover		
			14 July	28 July	22 Aug
Prodiamine 4F	Pre	0.75	1.3 c**	21 g-j	49 c-f
Prodiamine 4F+Prodiamine 4F	Pre + 29 May	0.38+0.38	0.0 c	3 ij	6 g
Prodiamine 4F+Mesotrione 4SC +	Pre	0.38+0.156	0.0 c	<1 j	2 g
Prodiamine 4F+Mesotrione 4SC	29 May	0.38+0.156			
Prodiamine 4F +	Pre	0.38	0.0 c	1 j	4 g
Prodiamine 4F+Mesotrione 4SC	29 May	0.38+0.156			
Prodiamine + Sulfentrazone 4SC	Pre	0.75	0.5 c	15 hij	30 efg
Prodiamine + Sulfentrazone 0.3G	Pre	0.75	0.8 c	32 fgh	55 b-e
Dithiopyr 2EW	Pre	0.5	7.0 c	59 a-d	71 a-d
Prodiamine 65WG	Pre	0.75	0.0 c	5 ij	8 g
Pendimethalin 3.8CS	Pre + 29 May	2.0+1.5	0.0 c	3 ij	6 g
Prodiamine + Sulfentrazone 4SC	1 – 4 L	0.75	0.0 c	5 ij	8 g
Prodiamine + Sulfentrazone 0.3G	1 – 4 L	0.75	0.0 c	5 ij	5 g
Dithiopyr 2EW	1 – 4 L	0.5	6.0 c	36 fgh	88 a
Prodiamine + Sulfentrazone 4SC	1 – 2 T	0.75	4.8 c	56 c-f	88 a
Prodiamine + Sulfentrazone 0.3G	1 – 2 T	0.75	8.5 c	64 abc	76 a-d
Dithiopyr 2EW	1 – 2 T	0.5	0.5 c	14 hij	19 fg
Dithiopyr 2EW	1 – 2 T	0.38	1.0 c	28 ghi	54 b-e
Prodiamine 65WDG	1 – 2 T	0.75	5.5 c	58 a-f	47 def
Pendimethalin 3.8CS	1 – 2 T	3.0	6.3 c	38 d-h	68 a-d
Prodiamine + Sulfentrazone 4SC	2 – 3 T	0.75	***	70 ab	78 abc
Dithiopyr 2EW	2 – 3 T	0.50	***	44 c-g	82 ab
Prodiamine 65DG	2 – 3 T	0.75	***	63 a-d	79 abc
Untreated	--	--	33.9 ab	84 a	97 a

*Preemergence treatments were applied 8 April and sequentials 29 May 2008; 1-4 leaf (L) treatments were applied 7 May; 1-2 tiller (T) treatments were applied 25 June; and 2-3 tiller (T) treatments were applied 14 July 2008.

**Means in a column followed by the same letter are not significantly different according to Fisher's protected least significant difference test, $P \leq 0.05$.

***Treatments were applied 14 July 2008.

PREEMERGENCE ANNUAL BLUEGRASS CONTROL IN A SEEDBED. J.A. Borger, M.B. Naedel, and M.T. Elmore. Pennsylvania State University, University Park.

ABSTRACT

Two separate studies were conducted using different materials and application timings. Both studies evaluated the percent cover of newly seeded turfgrass. The first study employed 'Phenom' perennial ryegrass (*Lolium perenne*, L.), multiple herbicide timings, and was conducted in 2007. The second study used similar herbicides applied only at the time of seeding with perennial ryegrass, ‘Amazing GS’. Both of these studies were conducted at the Valentine Turfgrass Research Center, Pennsylvania State University, University Park, Pa. The objective of these studies was to determine the control of the annual bluegrass (*Poa annua* L.) during the establishment of turfgrass. The studies were a randomized complete block design with three replications. Treatments of the first study were applied on June 29 (4 WBS), July 12 (2 WBS), July 26 (SEED), August 24 (3 WAS), and September 6 (5 WAS), 2007 using a three foot CO_2 powered boom sprayer calibrated to deliver 80 gpa using one, flat fan, 11008E nozzle at 40 psi. Treatments of the second study were applied at seeding on July 2, 2008 using the same application equipment. The sites had glyphosate at 6 qts/A applied prior to the application of test materials and was seeded July 26, 2007 and July 2, 2008. Perennial ryegrass germination was first noted on the first study on August 1, 2007 and on July 7, 2008 for the second study. Once established, the new turf was mowed once weekly at 2 inches with a rotary mower with clipping returned to the site for the first study. Once the second study was established, it was maintained at fairway height (0.500") and mowed three times weekly. Perennial ryegrass cover, of the first study, was evaluated four times. All treated turfgrass revealed some level of perennial ryegrass growth during the study. On the final rating date, September 19, 2007 there was 90% or greater perennial ryegrass cover of treated or non treated turfgrass. Turfgrass cover of the second study was rated on August 14, 2008. On the final rating date of the first study, October 5, 2007, all treated and non treated turfgrass had at least 78% cover or greater. The percent cover of annual bluegrass, of the first study, was rated on September 25, 2007. All mesotrione treated turfgrass had significantly less annual bluegrass cover when compared to non treated turfgrass. The percent cover of annual bluegrass, of the second study, was rated on October 15, 2008. In general, the single application of materials at the time of seeding did not reduce the annual bluegrass populations as dramatically as did the multiple applications of materials in the 2007 study.

MULTIPLE APPLICATIONS FOR PREEMERGENCE SMOOTH CRABGRASS CONTROL.
M.B. Naedel, J.A. Borger, M.T. Elmore, Pennsylvania State University, University Park, and D.L. Loughner, Dow AgroSciences, Huntingdon Valley, PA.

ABSTRACT

Preemeergence control of smooth crabgrass [*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.] was evaluated on a mature stand of 'Jet Elite' perennial ryegrass (*Lolium perenne* L.) in two consecutive years at the Valentine Turfgrass Research Center, Pennsylvania State University, University Park, PA. The objective of the studies was to determine the efficacy of selected preemergence herbicides for the control of smooth crabgrass when applied two or three times at lighter rates compared to industry standard rates and application timings. Both studies were randomized complete block designs, each with three replications. Treatments in the 2007 trial were applied on March 27, (MARCH 07), April 26 (APRIL 07), and June 7 (JUNE 07), 2007 and treatments in the 2008 trial were applied on March 27, (MARCH 08), April 24 (APRIL 08), and June 17 (JUNE 08) using a three foot CO_2 powered boom sprayer calibrated to deliver 80 gpa using one, flat fan, 11008E nozzle at 40 psi. After the second and third application of both studies, the test areas received approximately 0.5 inch of water. In early May of both years, 0.5 lb N/M from a 46-0-0 urea and 0.5 lb N/M from a 31-0-0 IBDU fertilizer was applied to the test areas. The sites were mowed once per week with a rotary mower at one inch with clippings returned. The test areas were overseeded with a native source of smooth crabgrass seed in the fall of at least two of the pervious growing seasons. The test sites consistently revealed approximately 90% cover of smooth crabgrass in the non-treated areas at the conclusion of each study. Smooth crabgrass germination was first noted in the non-treated areas of the test site on May 1, 2007 and April 29, 2008. Rates of Dimension® were compared by total amount of active ingredient (dithiopyr) applied per growing season. On the August 15, 2008 rating for the first study, Dimension® 2EW applied at 0.25 lb ai/A once in March had significantly less control of smooth crabgrass than Dimension 2EW applied at 0.125 lb ai/A twice in March and April and Dimension® 2EW applied at 0.083 lb ai/A three times in March, April, and June. Dimension® 2EW applied at 0.38 lb ai/A once in March and Dimension® 2EW applied twice at 0.18 lb ai/A had significantly less crabgrass control than Dimension® 2EW applied three times at 0.125 lb ai/A. Dimension® 2EW applied three times at 0.167 lb ai/A revealed significantly greater control of smooth crabgrass than Dimension® 2EW applied twice at 0.25 lb ai/A or once at 0.5 lb ai/A. On the August 6, 2007 rating date for the second study, Dimension® 40WP applied three times at 0.2, 0.1, and 0.2 lb ai/A and Dimension® 40WP applied three times at 0.125 lb ai/A revealed significantly greater crabgrass control than Dimension® 40WP applied once at 0.5 lb ai/A.

PREEMERGENCE SMOOTH CRABGRASS CONTROL WITH FALL APPLICATIONS.

M.T. Elmore, J.A. Borger, M.B. Naedel, Pennsylvania State University, University Park, and D.L. Loughner, Dow AgroSciences, Huntingdon Valley, PA.

ABSTRACT

Preemeergence control of [*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.] was evaluated on a mature stand of 'Midnight' Kentucky bluegrass (*Poa pratensis*) in two studies, one conducted in 2005 and one in 2007. Both studies were conducted at the Valentine Turfgrass Research Center, Pennsylvania State University, University Park, PA. The objectives of the studies were to determine the efficacy of selected preemergence herbicides for the control of smooth crabgrass when applied in the fall to normal application timing and the rates of materials. Both studies were a randomized complete block design with three replications. Granular treatments were applied on October 18, 2005 and November 8, 2007 (early fall), November 22, 2005 and November 29, 2007 (late fall), and April 17, 2008 (spring) using a shaker box. Liquid treatments were applied with a CO_2 powered single nozzle boom-type sprayer using an 11004E flat fan nozzle at 40 PSI calibrated to deliver 40 gal/A. The sites were mowed once per week with a rotary mower at one inch with clippings returned to the site. The test sites were overseeded with a native source of smooth crabgrass seed in the fall of at least two of the previous growing seasons. The test sites had approximately 95% cover of smooth crabgrass in the non treated areas at the conclusion of the studies. Smooth crabgrass germination was first noted in the non treated areas of the test sites on April 25, 2005 and May 1, 2007. The percent control of smooth crabgrass was evaluated on August 15th and 20th in 2005 and 2007, respectively. In both 2005 and 2007 all treated turfgrass had significantly less crabgrass than non treated turfgrass. In 2005, turfgrass treated with Dimension® 0.21G (dithiopyr) at 0.5 lb ai/A in either early or late fall contained significantly less crabgrass than turfgrass treated with Barricade® 0.43G (prodiamine) at 0.75 lb ai/A in either early fall or late fall. In 2007, similar results were observed as turfgrass treated with Dimension® 0.103G at 0.5 lb ai/A in either early or late fall contained significantly less crabgrass than turfgrass treated with Barricade® 0.21G at 0.65 lb ai/A in early or late fall. However, in 2005, turfgrass treated with Dimension® 40WP at 0.5 lb ai/A in either early or late fall was compared to turfgrass treated with Barricade® 65WG at 0.75 lb ai/A in early or late fall, no significant differences in crabgrass control were observed. Results were similar in 2007, when crabgrass populations in turfgrass treated in late fall with Dimension® 40WP at 0.5 lb ai/A and Barricade® 65WG at 0.75 lb ai/A did not differ significantly. When evaluating lower rates in 2005, treatments with Dimension® 0.21G at 0.38 lb ai/A applied in early fall or late fall contained significantly less crabgrass than turfgrass treated with Barricade® 0.43G at 0.5 lb ai/A in early or late fall. In 2007, similar results were observed as turfgrass treated with Dimension® 0.103G at 0.38 lb ai/A in early or late fall contained significantly less crabgrass than turfgrass treated with Barricade® 0.21G at 0.5 lb ai/A. Finally, crabgrass control in turfgrass treated in 2007 with Dimension® 0.103G at 0.5 lb ai/A applied in early fall and Dimension® 0.103G at 0.38 lb ai/A applied in spring were not significantly different.

NEW HERBICIDES FOR DIRECT-SEEDED GREENS. R.R. Bellinder and C.A. Benedict, Department of Horticulture, Cornell University.

ABSTRACT

Increasingly, vegetable acreage is being planted to alternative crops such as leafy Brassica greens because of their nutritional and health benefits. Currently there are few herbicides registered for these crops, thus producers need new weed management tools to improve profitability. Two trials evaluated single rows of collards, kale (both *Brassica oleracea* var. acephala), mustard greens (*Brassica juncea*), and turnip greens (*Brassica rapa* spp. rapa) direct-seeded into four rows on 6' beds. Twenty-two (2006) and twelve (2008) pre-emergent treatments were compared to an untreated and a handweeded control. Turnip greens were the most tolerant of the four greens across herbicide treatments. Dimethenamid-P (0.4, 0.5 lb ai/A), ethofumesate (2.0 lb), flucarbazone (0.02, 0.04 lb), oxyfluorfen (2L and 4F), pendimethalin (1.0 lb), prodiamine (1.0 lb), and pronamide (2.0 lb) caused significant injury and reduced yields as compared to a handweeded control. In most of these cases (pendimethalin, pronamide, oxyfluorfen, flucarbazone, and prodiamine) weed control was inadequate and contributed to yield losses, but in others (dimethenamid-p, ethofumesate) adequate weed control was achieved. Both trials were conducted on silt-loam soils which were dominated by hairy galinsoga (*Galinsoga ciliata*), redroot pigweed (*Amaranthus retroflexus*), common purslane (*Portulaca oleracea*), common lambsquarters (*Chenopodium album*), and Pennsylvania smartweed (*Polygonum pensylvanicum*). S-metolachlor (0.65 lb) showed the greatest crop tolerance across all of the greens and also provided adequate weed control.

POTENTIAL USES FOR SAFLUFENACIL (KIXOR™) IN VEGETABLE CROPS. R.R. Bellinder and C.A. Benedict, Department of Horticulture, Cornell University.

ABSTRACT

Saflufenacil (Kixor™) is a new active ingredient which belongs to the pyrimidinedione class of herbicides and is a PPO inhibitor. It has both contact and residual activity on dicot weeds and previous studies have determined crop safety in corn, sorghum, small grains, legumes, tree nuts, and pome/stone fruit.

Field trials in 2008 evaluated crop tolerance and weed control spectrum in ten different crops (garden peas, potato, snap beans, dry beans, carrots, cilantro, summer squash, pumpkins, sweet corn, and strawberries). Five different pea varieties, planted two at a time, had saflufenacil applied (0.044 lb ai/A) pre-emergence. Varieties were evaluated up to 48 days for visual injury and plant subsamples were evaluated for reduction in growth. No significant stunting injuries occurred during this period, and plant growth was not reduced as compared to a chemical standard. The potato variety 'Yukon Gold' did not exhibit any visual injury symptoms at 0.044 lb or 0.088 lb, but yield reductions were observed at the higher (0.088) rate. No injury in sweet corn was observed at 0.056 lb, but at 0.112 lb plants were stunted, however for both rates yields were comparable to a chemical standard. At the same rate in cilantro, plants were severely injured (47 % + stunting) and yields were reduced. Both cucurbit crops (s. squash and pumpkins) reacted similarly; early visual injury was noted but yields were comparable to the chemical standard (0.044 lb). All four snap bean varieties very severely stunted (>80% and >94%) and necrotic (>50 % and >93%) at both rates (0.022 lb and 0.044 lb, respectively). This injury resulted in no yield six-weeks later for all varieties. Four dry bean types (light red, dark red, cranberry, and black turtle soup) were tested at the same rates (0.022 lb and 0.044 lb). Early notable stunting (18-48%) lead to significant stunting (>77%) at 0.022 lb in all types and severe injury (>75%) was present 10 DAT at 0.044 lb from all types. Significant yield losses for all types at 0.044 lb, but two of the four types did not have yields reduced at 0.022 lb as compared to a chemical standard. No injury was observed in either carrot or transplanted strawberries at 0.022 lb.

Across sixteen trials and three soil types, saflufenacil was also evaluated for weed control. Applied at 0.022 lb saflufenacil controlled common lambsquarters (*Chenopodium album)*, hairy galinsoga (*Galinsoga ciliata)*, and marsh yellowcress (*Rorippa islandica*). Once the rate was increased to 0.044 lb weed species controlled included wild buckwheat (*Polygonum convolvulus*), redroot pigweed (*Amaranthus retroflexus*), shepherd's purse (*Capsella bursa-pastoris*), common chickweed (*Stellaria media*), common purslane (*Portulaca oleracea*), and hairy nightshade (*Solanum sarrachoides*). At 0.056 lb Pennsylvania smartweed (*Polygonum pensylvanicum*), common ragweed (*Ambrosia artemisiifolia*), and wild radish (*Raphanaus raphanistrum*) were controlled and yellow nutsedge (*Cyperus esculentus*), *Setaria faberi* were suppressed.

POSTEMERGENCE GRASS WEED CONTROL IN SWEET CORN. D.H. Johnson, D.D. Lingenfelter, Pennsylvania State University, Manheim and University Park, M.J. VanGessel, Q.R. Johnson, and B.A. Scott, University of Delaware, Georgetown.

ABSTRACT

Weed control in sweet corn (*Zea mays*) from several current and potential products were tested in at two locations in Pennsylvania and one in Delaware. Poast-Protected sweet corn was planted in Lancaster (Landisville) and Centre (Rock Springs) Counties, PA, and Sussex County (Georgetown), DE. Several herbicides were applied preemergence just after planting, followed by postemergence herbicides approximately one month later. Mesotrione (Callisto®), topramezone (Impact®), and tembotrione (Laudis™) were applied postemergence combined with atrazine either alone (total post) or in a sequential program following s-metolachlor + atrazine (Bicep II Magnum®). In addition, sethoxydim (Poast®) was applied in combination with 2,4-D amine (after Bicep II Magnum®), or total post in combination with Callisto, or Laudis™. The plots were evaluated for weed control and yield measured at all three sites.

Most herbicide programs controlled annual grasses very well at Rock Springs and Georgetown. Impact® and Laudis™ (both with atrazine), when used after Bicep II Magnum®, controlled giant foxtail (*Setaria faberi*) and yellow foxtail (*Setaria glauca*) at Rock Springs and large crabgrass (*Digitaria sanguinalis*) at Georgetown at least 95% season long. At Landisville, these products gave good initial giant foxtail control but failed to provide season-long control in a very heavy population. Foxtail control by Callisto® + atrazine was generally less than about 80%. Adding Poast® to Callisto® improved initial control to over 90%.

Broadleaf weed control was evaluated at Rock Springs and Georgetown. Overall, most of the treatments gave acceptable velvetleaf (*Abutilon theophrasti*), smooth pigweed (*Amaranthus hybridus*), common ragweed (*Ambrosia atremisiifolia*), and common lambsquarters (*Chenopodium album*) control.

Sweet corn had adequate tolerance to these herbicides.

THE IR-4 PROJECT HERBICIDE REGISTRATION UPDATE (FOOD USES).

M. Arsenovic, D.L. Kunkel, and J.J. Baron, Rutgers University, IR-4 Project.

ABSTRACT

The IR-4 Project is a publicly funded effort to support the registration of pest control products on specialty crops. The IR-4 Project continues to meet specialty-crop grower's needs for weed control options despite the challenges of a mature market for herbicides and the selectivity of specialty crops to many of the more-recently-introduced herbicides. The Pesticide Registration Improvement Act continues to effect IR-4 submissions and EPA reviews of packages. IR-4 submitted herbicide petitions to the EPA from October 2007 to September 2008 for: Endothall on vegetable, root and tuber group; vegetable, leaves of root and tuber group; vegetable, bulb group; vegetable, leafy except Brassica group; vegetable Brassica, leafy group; vegetable, legume group; vegetable fruiting group; vegetable cucurbit group; fruits, citrus group; fruit, pome group; fruit, stone group; berry and small fruit group; grape; nut tree group; grain, cereal group; grain, cereal, forage, fodder, and straw group; grass, forage, fodder, and hay group; animal feed, nongrass group; mint and rice; MCPA on pea (re-registration); pendimethalin on olive; prometryn on carrot, celeriac, cilantro, okra and parsley. From October 2007 through September 2008, EPA has published Notices of Filing in the Federal Register for: Cyhalofop-butyl on wild rice; pronamide on lowgrowing berry subgroup, except strawberry; and sulfentrazone on vegetable, tuberous and corm subgroup; Brassica, head and stem subgroup, Brassica, leafy greens subgroup, vegetable, fruiting group, okra, succulent pea, flax, and strawberry. EPA established tolerances from October 2007 to September 2008 for: Dicamba on sweet corn; dichlobenil on caneberry subgroup; bushberry subgroup and rhubarb; dimethanamid on radish, rutabaga, turnip (rootsand tops greens), pumkin and winter squash; ethafluralin on dill, mustard, potato, rapeseed; flumioxazin on asparagus, dry bean, vegetable fruiting group, okra, melon subgroup, bushberry subgroup, and nut tree group; fluroxypyr on fruit, pome group, and millet; mesotrione on cranberry; sethoxydim on gold of pleasure, crambe, cuphea, echium, hare’s ear mustard, lesquerella, lunaria, meadowfoam, milkweed, mustard, oil radish, poppy, sesame, and sweet rocket.

LOW AND NO ATRAZINE HERBICIDE PROGRAMS IN SWEET CORN: DOES ATRAZINE REALLY IMPROVE WEED CONTROL? D.D. Lingenfelter, D.H. Johnson Pennsylvania State University, University Park and Manheim, M.J. VanGessel, Q.R. Johnson, and B.A. Scott, University of Delaware, Georgetown.

ABSTRACT

Field studies were conducted in 2008 at two locations in Pennsylvania (Rock Springs, Centre Co. and Landisville, Lancaster Co.) and one location in Delaware (Georgetown, Sussex Co.) to examine various herbicide programs in sweet corn (*Zea mays* succharata, var. 'BC0805') that contain either low (≤0.5 lb/A) or no atrazine to determine their effectiveness on annual weed control. PRE and PRE fb POST programs were evaluated. PRE only treatments included: s-metolachlor (1.53 lb ai/A) and pendimethalin (1.43 lb ai/A), s-metolachlor + atrazine premix (2.9 lb ai/A) and pendimethalin (1.43 lb ai/A), s-metolachlor + atrazine + mesotrione premix (2.47 lb ai/A), and s-metolachlor + mesotrione premix (1.83 lb ai/A). S-metolachlor (1.53 lb ai/A) was applied PRE to most of the treatments followed by a POST application of one or a combination of the following herbicides: atrazine (0.5 lb ai/A), tembotrione (0.08 lb ai/A), topramezone (0.0164 lb ai/A), halosulfuron (0.032 lb ai/A), nicosulfuron (0.023 lb ai/A), carfentrazone (0.0078 lb ai/A), glufosinate (0.4 lb ai/A), dicamba + synergist + safener premix (0.088 lb ai/A), and 2,4-D (0.5 lb ai/A). Necessary adjuvants were included in the POST spray mixtures. Visual phytotoxicity and weed control ratings were taken periodically throughout the growing period. Studies were arranged in a RCBD with three replications. In general, most herbicide treatments provided >85% control of annual weeds including, smooth pigweed (*Amaranthus hybridus*), common lambsquarters (*Chenopodium album*), velvetleaf (*Abutilon theophrasti*), common ragweed (*Ambrosia artemisiifolia*), giant foxtail (*Setaria faberi*), and large crabgrass (*Digitaria sanguinalis*). In Delaware, s-metolachlor + pendimethalin; s-metolachlor + atrazine premix + pendimethalin; and s-metolachlor + mesotrione premix only provided 22 to 60% control of common ragweed, whereas in Centre Co. Pennsylvania, s-metolachlor + pendimethalin provided 45% control. In Lancaster Co. Pennsylvania, only topramezone + atrazine and glufosinate provided 88 to 90% control of giant foxtail (the dominate weed species), while all other treatments provided 32 to 78% control. With the exception of halosulfuron + 2,4-D (83% control), all other treatments only provided limited suppression (20-75%) of annual morningglory (*Ipomoea* spp.) in Delaware. The addition of atrazine POST did provide some additional suppression of this weed.

In summary, atrazine does improve control of certain weed species and is still a very effective yet economical herbicide for broadleaf weed control in sweet corn. However, depending on weed species present, reducing the rate of atrazine or eliminating it could be possible if there are concerns about carryover to rotational crops, especially vegetables, and cover crops following field or sweet corn production. Problems with atrazine residues causing injury to rotational crops varies depending on use rates, soil types, rainfall, and other environmental conditions. The use of atrazine at lower rates or none at all in sweet corn herbicide programs could potentially alleviate residue problems with successional crops, especially since some newer herbicide options are available for use in sweet corn.

EVALUATING FLOOD DURATION AND INITIATION UNDER CONTROLLED CONDITIONS FOR DODDER MANAGEMENT IN CRANBERRIES. J.M. O'Connell, H.A. Sandler, University of Massachusetts-Amherst Cranberry Station, East Wareham, L.S. Adler, University of Massachusetts, Amherst, and F.L. Caruso University of Massachusetts-Amherst Cranberry Station, East Wareham.

ABSTRACT

Previous demonstration-style field studies and grower observations have indicated that short-term floods may be a viable nonchemical practice that can be integrated into the management of dodder (*Cuscuta gronovii* Willd.) in commercial cranberry production. Since many of the flooding parameters in these earlier studies were dictated by other pest pressures or grower constraints (i.e., nonuniform timings were used), questions still remain with respect to determining the optimal duration of the flooding regime and the best time to actually initiate the flood itself. The focus of this study was to evaluate the effect of various flood durations and initiations on dodder germination, attachment, and seed production using defined (controlled) parameters.

Field observations indicated that emergent herbaceous weeds on cranberry bogs may serve as early-season alternate hosts for dodder (i.e., before the extension of new cranberry growth), thus the study simulated two scenarios: cranberry beds with no weeds and cranberry beds with emergent weed populations. The first experiment used cranberry uprights only; the second experiment used tomatoes as an additional host. Each study had 3 flood duration treatments (0, 24, and 48 hrs) and 4 flood initiation treatments (1, 2, 3, and 4 weeks after first seedling emergence) that were arranged in a split-plot randomized complete block design with five replicates.

Dodder seeds, soaked in concentrated sulfuric acid, were divided into batches of ca. 200 seeds, placed into small cloth pouches, and submerged in water held in 19L buckets inside a growth chamber. After immersion, the seeds were planted to pots containing cranberries only, pots with cranberries + host, or placed in Petri dishes (to establish % germination in a controlled environment). Pots were rated weekly for level of dodder attachment. Cranberry, tomato, and dodder biomass were determined; dodder seed were separated, weighed and tested for germination.

Contrary to previous demonstration studies, flood duration had no impact on attachment rating, dodder biomass, or seed production. For cranberry alone, dodder attachment ratings were lower in pots receiving seeds that were submerged 4 weeks after the sighting of the first emergent seedling compared to seeds that were submerged at 1 week post-sighting. When an additional host was present along with the cranberry vines, the timing of the flood initiation did not impact dodder attachment ratings, indicating the presence of the additional host may have negated the suppressive effect of the 4-week flood timing.

It is disappointing that, in this controlled study, we could not corroborate previous field experiences (both grower observations and research demonstration studies) that have documented dodder suppression with flooding. It is possible that environmental conditions present in the field were not adequately duplicated in the growth chamber, resulting in data and results that do not confirm or clarify past research.

EVALUATION OF THE EXPERIMENTAL HERBICIDE DPX-KJM44 FOR WEED CONTROL AND SAFETY TO PUMPKINS AND OTHER SPECIALTY CROPS. G.R. Armel, University of Tennessee, Knoxville, C.A. Mallory-Smith, Oregon State University, Corvalis, R.R. Bellinder, Cornell University, Ithaca, L.H. Hageman, N.D. McKinley, D.D. Ganske, P.L. Rardon, and J.D. Smith, DuPont Crop Protection, Newark.

ABSTRACT

Initial field studies were conducted at various locations in Oregon, New York, and Illinois in 2005 to evaluate preemergence (PRE) and postemergence (POST) applications of the experimental herbicide DPX-KJM44 (proposed common name aminocyclopyrachlor-methyl) at 8 to 300 g ai/ha for safety to several crops including field corn (*Zea mays*), sweet corn (*Zea mays* var. saccharata), popcorn (*Zea mays* var. everta), winter oat (*Avena sativa*), sorghum (*Sorghum bicolor*), winter and spring wheat (*Triticum aestivum*), soybean (*Glycine max*), alfalfa (*Medicago sativa*), cabbage (*Brassica oleracea*), pea (*Pisum sativum*), spring rape (*Brassica napus*), sugarbeet (*Beta vulgaris*), pumpkin (*Cucurbita maxima*), and potato (*Solanum tuberosum*). Corn, sweet corn, oats, and popcorn displayed excellent safety to PRE applications of DPX-KJM44 at rates up to 300 g ai/ha. POST applications of DPX-KJM44 at 15 g ai/ha caused no visual foliar response on any monocot crop, except sorghum. All broadleaf crops exhibited greater than 20% injury from PRE applications of DPX-KJM44 at 25 g ai/ha with the exception of spring rape, pumpkin, pea, and soybean. POST DPX-KJM44 treatments caused unacceptable injury to broadleaf crops.

In 2008, field studies were conducted near Crossville, TN to evaluate PRE applications of DPX-KJM44 for crop safety in pumpkin, cucumber (*Cucumis sativus*), watermelon (*Citrullus lanatus*), and cantaloupe (*Cucumis melo*). DPX-KJM44 was also evaluated PRE and POST-directed alone and in combinations with ethalfluralin, halosulfuron, naptalam, and/or clomazone for weed control in pumpkins. DPX-KJM44 PRE at rates up to 70 g ai/ha did not injure pumpkin more than 11%. Similarly, watermelons were tolerant to PRE DPX-KJM44 applications up to 18 g ai/ha. Injury among all curcurbit varieties was similar among all PRE applications of DPX-KJM44, halosulfuron at 39 g ai/ha, and fomesafen at 280 g ai/ha. DPX-KJM44 at 35 g ai/ha plus ethalfluralin at 1680 g ai/ha provided similar control of common ragweed (*Ambrosia artemissifolia*), ivyleaf morningglory (*Ipomoea hederacea*), smooth groundcherry (*Physalis subglabrata*), ladysthumb (*Polygonum persicaria*), carpetweed (*Mollugo verticillata*), and annual grasses in comparison to halosulfuron at 39 g ai/ha plus ethalfluralin at 1680 g ai/ha. The addition of DPX-KJM44 at 35 g ai/ha to PRE applications of clomazone at 420 g ai/ha plus ethalfluralin at 1680 g ai/ha improved control of common ragweed and ladysthumb in comparison to clomazone plus ethalfluralin applied alone. POST-directed applications of DPX-KJM44 at 17 to 35 g ai/ha caused less than 6% injury to pumpkin. DPX-KJM44 applied POST-directed at 35 g ai/ha provided 83 to 91% control of hairy galinsoga (*Galinsoga ciliata*), carpetweed, smooth groundcherry, and morningglory spp. DPX-KJM44 alone at 17 and 35 g ai/ha controlled common ragweed 52 and 77%, respectively. The addition of naptalam (560 or 1120 g ai/ha) or halosulfuron (26 or 53 g ai/ha) to DPX-KJM44 controlled common ragweed 85 to 96%.

WEED CONTROL POTENTIAL OF EIGHT NATURAL PRODUCTS. G.J. Evans and R.R. Bellinder, Cornell University, Ithaca NY.

ABSTRACT

Natural products have the potential for use in organic weed management. In the past few years, a host of new products have been developed with natural active ingredients. Research was conducted at Cornell University, as one participating university in a multi-state NE-1026 Hatch project, to assess the efficacy of natural products over a range of application volumes and concentrations. In the summer of 2008, field trials were conducted using eight different contact-based natural products: WeedPharm (200 grain vinegar), Matran® EC (clove oil), Racer™ (ammonium nonanoate), RAPS (ammonium nonanoate and a dimethyl ester), C-Cide (citric acid), WeedZap™ (clove and cinnamon oil), GreenMatch™ EX (lemon grass oil), and Kainit (potassium salt). Products were broadcast on a non-crop field area containing natural populations of hairy galinsoga (*Galinsoga ciliata*), common lambsquarters (*Chenopodium album)* and redroot pigweed (*Amaranthus retroflexus*). The trial was conducted in a randomized complete block design with four replications per treatment. In each plot, rows of two mustard varieties, 'Florida Broadleaf' and 'Ida Gold', were seeded as surrogate weed species. All treatments were applied when mustard was at the four leaf growth stage. Weed control was assessed at five and fifteen days after treatment. Aboveground fresh and dry weights were collected from both mustard species at fifteen days after treatment. Applications of WeedPharm at 70 GPA, 12.5% Racer™ at 35 GPA, 10% WeedZap™ at 35 GPA, and 10% RAPS at 35 GPA provided greater than 85% control of both mustard species at 5 DAT. With the exception of the 10% WeedZap™, these same treatments provided better than 87% control of galinsoga, pigweed, and lambsquarters at both 5 and 15 DAT. Compared to the untreated control, all products significantly reduced the biomass of both mustard varieties (P=0.10). However, only applications of WeedPharm at 70 GPA, 12.5% Racer™ at 35 GPA and 10% RAPS at 35 GPA provided greater than a 90% biomass reduction of both mustard species. Natural products can provide efficacious organic weed control of small broadleaf weeds, though the degree of that control is strongly dependant on product concentration and application volume. Current product costs, and the potential for incidental crop injury, may prove to be limiting factors for the integration of these products into organic weed management programs.

WEED COMMUNITY RESPONSE TO NO-TILLAGE PRACTICES IN ORGANIC AND CONVENTIONAL CORN. M.R. Ryan, Pennsylvania State University, University Park, D.A. Mortensen, Pennsylvania State University, University Park, R. Seidel, Rodale Institute, Kutztown, PA, R.G. Smith, Pennsylvania State University, University Park, and A.M. Grantham, Rodale Institute, Kutztown, PA.

ABSTRACT

No-tillage management practices have become increasingly popular in Pennsylvania with 48 and 62% of corn (*Zea mays* L.) and soybean (*Glycine max* (L.) Merr.], respectively, no-till planted in 2008. These systems have environmental benefits such as reduced soil erosion; however, they require increased weed management and are thus more dependent on herbicides than tillage-based systems. Organic farmers have expressed interest in no-tillage management but are prohibited from using most herbicides, and those that are permitted in organic production are usually cost prohibitive. A hybrid system has been developed which utilizes mulch from rolled/crimped cover crops such as cereal rye (*Secale cereale* L.) and hairy vetch (*Vicia villosa* Roth) to suppress weeds in place of herbicides. Although cover crops can provide effective weed suppression in these systems, continuous no-tillage in organic systems is not yet possible due to incomplete weed control provided by cover crops alone. Therefore, rotational no-tillage systems may be a more realistic strategy for organic producers. Since these systems are still in their infancy, it is unclear how organic rotational no-tillage practices will alter weed abundance and community composition.

Conventional no-tillage and organic rotational no-tillage systems were tested in a long term cropping systems trial that compared two organic grain operations that differed primarily in the source of N inputs (MNR-manure and LEG-legume) to a conventional (CNV) grain operation that utilized mineral fertilizer. The three no-tillage systems were incorporated into the long-term trial by transitioning four of the original eight blocks. The other four blocks were maintained as traditional tillage systems, with chisel plow tillage used in the CNV system and moldboard plow tillage used in the MNR and LEG systems. This approach allowed us to assess the no-tillage systems while conserving the original tillage systems for comparisons. Here we report results from 2008, the first year of the transition to no-tillage. Our hypotheses were: 1) organic tillage systems would have fewer weeds than no-tillage systems and 2) perennial weeds would be more abundant in the no-tillage systems. Interestingly, there was no difference in total weed biomass between the organic tillage and organic no-tillage systems. This result shows that organic no-tillage systems can be competitive with organic tillage systems. Perennial weeds accounted for 27–36% of total biomass in the organic no-tillage systems, whereas they were completely absent in the organic tillage systems. There was no difference in the abundance of perennial versus annual weeds between conventional tillage and conventional no-tillage. Additional research is necessary to determine whether observed trends in weed abundance and community composition in organic no-tillage systems remain consistent over time.

OPTIMUM® GAT® HERBICIDE PROGRAMS AS TOOLS FOR MANAGING ALS AND/OR GLYPHOSATE RESISTANT WEEDS. D.R. Forney, D.W. Saunders, J. Beitler, and S. Strachan, DuPont Crop Protection, Newark, DE

ABSTRACT

As new herbicide tolerance traits are commercialized in row crops, a broader range of herbicide tools for managing resistant weeds will be possible. Improved management tools from DuPont will allow for: a) the choice of the most efficacious active ingredients within an herbicide family independent of native crop tolerance; b) the introduction of new herbicidal modes-of-action not presently available for use on a particular weed problem; and c) the development of new herbicide programs that will integrate multiple herbicide families and sequential application timings to fit local agronomic practices. Weed control strategies developed for managing weed resistance problems in crops containing the Optimum® GAT® trait are founded on three simple fundamentals: 1) Use an effective alternate mode-of-action (MOA) herbicide in addition to ALS and/or glyphosate to control known herbicide-resistant weeds; 2) Include an effective alternate MOA at least every-other year for “at-risk” weeds (per local University experts); and 3) Scout fields to monitor effectiveness of the herbicide program. Products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT® trait are not currently registered for sale or use in the United States.

THE VASCULAR FLORA OF DISTURBED SIDEWALK PLOTS IN QUEENS AND KINGS COUNTIES, NEW YORK. R. Stalter, A. Jung, K. Frank, J. Urrutia, S. Bhuiyan, S. Mohan, St. John's University, Queens, NY.

ABSTRACT

The vascular flora at 50 small sidewalk plots in Green Point, Kings County and Jamaica, Queens County, New York was identified and compared during the fall 2007, and spring 2008 growing seasons. In May 2008, 38 species were observed in Brooklyn, while 48 were identified at Queens. During October 2007, 25 were observed in Queens, while 41 were identified in Brooklyn. Sixty five percent of the flora in Brooklyn and 67 percent of the flora in Queens were non-native for the region. Species diversity, number of taxa/hectare, was high at both sites exceeding 100 vascular plant species per hectare. The high diversity at both sites may be a product of local disturbance.

INTRODUCTION

Scientists have long recognized the injurious affect of invasive non-native species by displacing native vascular plant species. Non-native or alien bioinvaders wreak havoc on native plant and animal populations through competition, predation, and by the introduction of diseases. For example, the accidental introduction of chestnut blight, *Endothea parasitica*, to the United States at the Bronx Zoo in the early 1990's on Chinese chestnut resulted in the near eradication of one of our most valuable trees, the American chestnut, *Castanea dentata*. Water hyacinth, *Eichhornia crassipes*, was brought to this country in the 19th century. Floods released this aquatic pest to the Mississippi River. Today, water hyacinth is found in every subtropical state of the continental United States.

In the present study, a compilation was made of the vascular flora at disturbed sidewalk plots at Green Point, Brooklyn and Jamaica, Queens. The data presented is part of a larger long-range study of the vascular flora at these two sites that will be based on collections over a three-year period, 2007-2009. The primary objective of this preliminary study was to identify and compare the vascular flora at Green Point, Brooklyn and Jamaica, Queens for the fall, 2007 and spring 2008. A second objective was to identify the continent or country of origin of the non-native vascular flora at both sites. An additional objective was to determine the most frequently occurring taxa at each site during fall 2007 and spring 2008 growing seasons.

METHODS

The vascular plant species occurring at 50 small sidewalk plots, Green Point, Brooklyn, and Jamaica, Queens, were sampled in October 2007 and May 2008. No specimens at either site were collected as voucher material since both sites are actively utilized by dog walkers.

The vascular flora identified at both sites in October 2007 and May 2008 is presented in Table 1. Frequencies of native versus non-native vascular plant species at both sites were compared with those present at Ellis Island, NY, Ruffle Bar, NY and Jamaica Bay Wildlife Refuge, New York Table 2. Frequency (percent plots occupied) of taxa found at twenty percent or more of the sidewalk plots are presented in (Table 3). Continent or country of origin is presented in Table 4. Nomenclature and native and non-native status of the vascular plant species follows Gleason and Cronquist (1971).

RESULTS AND DISCUSSION

Forty one species were identified in Greenpoint, Brooklyn, fall 2007 while 38 species were identified at Brooklyn in spring 2008. The greatest numbers of species, 48, occurred at Jamaica, Queens, in the spring of 2008; the least number of species, 25, occurred at Jamaica, Queens, fall 2007. The *Asteraceae* with 22 species was the largest family in the flora. The other well-represented family was the *Poaceae* with 13 species.

The percentage of non-native vascular plant species ranged from 60.9% in Brooklyn, fall 2007, to 68.8% in Queens, spring 2008. The overall percentage of non-native flora for the fall and spring growing season was slightly higher in Queens.

Fifty eight percent of the monocots were composed of non-native species in Brooklyn while 70% the monocots were not native in Queens. The percentage of non-native dicots at both sites was similar, 67% for Queens, 65% for Brooklyn.

The percentage of non-native species at both sites was higher than that found on Ellis Island, but was significantly higher than that found on Ruffle Bar, an uninhabited island in Jamaica Bay (Table 2). The percentage of non-native vascular plant species at the sidewalk plots was significantly higher than that reported at Jamaica Bay Wildlife Refuge, where 48% of the flora was non-native.

Species occurring on 50% of the plots were prostrate knotweed (*Polygonum aviculare*), common lambsquarters (*Chenopodium album*), large crabgrass (*Digitaria sanguinalis*) and annual bluegrass (*Poa annua*), all in Queens. With the exception of large crabgrass, the frequency value was generally lower in the fall for all species sampled at Queens. Selective herbicide treatment of the plots in Queens was probably responsible for the decline in species frequency. No taxa were found in more than 14 plots at Brooklyn during the spring 2008 and fall 2007 (Table 3).

Fifty four non-native vascular plant species have been identified at the sidewalk plots. Twenty five originated in Europe, nineteen in Eurasia, five in Asia and three in Tropical America and none in Africa (Table 4). Honeylocut (*Gleditsia triacanthos*) and pineapple weed (*Matricaria matricarioides*) are native to the United States but did not naturally occur in the Eastern United States.

The area of the individual plots ranged from $0.75m^2$ to $15m^2$. Most plots were approximately $1.0m^2$ in size. The total area for all 50 plots in both Brooklyn and Queens was approximately $200m^2$, (0.02 ha). Species diversity at the small plots is higher than 100 species/hectare.

Several factors contributed species to diversity at the sidewalk plots. Some plots in Brooklyn were maintained as “flower gardens”. In these plots, only “weedy” “naturally “ occurring invasives were included in the species list. Some Brooklyn plots were mulched. Plots at both sites were subjected to road salting, dog waste and urine. Some plots were shaded most of the day while others received at least 10 hours of sun.

There may be considerable variation in soil texture and soil fertility, though no samples were taken and tested for mineral analysis for blatantly obvious reasons. At Queens, all plots have been treated with glyphosate (Roundup at 1 oz/gallon/ in late May and August. Herbicide treatment may account for the low number of vascular plant species, 25, at Queens in the fall, 2007.

Table 1. A preliminary summary of the vascular flora of 50 sidewalk plots, Brooklyn and Queens, New York. The sites were sampled in May 2008 and October, 2007.

	Locality			
	Brooklyn		Queens	
	May 08	October 07	May 08	October 07
Native Species	12	16	15	8
Introduced Species	26	25	33	17
% Non-Native Species	68	60.9	68.8	68
Total Number of Species	38	41	48	25

Table 2. Frequencies of native versus non-native vascular plant species at Ruffle Bar, NY (Stalter et al 2002), Jamaica Bay Wildlife Refuge, NY (Stalter and Lamont 2002), Ellis Island, NY(Stalter and Scotto 1999) and 50 small plots, Brooklyn and Queens, NY. The total number of species at Brooklyn and Queens includes some species that were sampled twice in both the spring and fall.

	Locality				
	Ruffle Bar	Jamaica Bay WR	Ellis Island	Brooklyn	Queens
Native species	59	234	98	28	22
Non-Native species	53	222	49	51	50
% Non-Native species	47.3	48.7	60.3	64.5	68.5
Total Number of Species	112	456	247	79	73

Table 3. Frequency values, % plots occupied by vascular plant species found in at least 20% or more of the sidewalk plots in Brooklyn and Queens, New York, May 2008 and October, 2007.

	Locality			
Species	**Brooklyn**		**Queens**	
	Fall 07	Spring 08	Fall 07	Spring 08

Eleucine indica	22		30	-
Digitaria sanguinalis	28	28	58	18
Setaria sp	26		20	-
Lactuca serriola	2	28	-	14
Conyza Canadensis	4	14	-	28
Plantago rugelii	2	8	4	36
Polygonum aviculare	2	12	6	56
Chenopodium album	12	24	24	50
Poa annua	-	4	2	72
Cerastium fontanum	-	2	-	30
Trifolium repens	-	-	8	34
Capsella bursa-pastoris	-	-	-	20
Matricaria matricarioides	-	-	6	32

Table 4. Continent or Country of origin of vascular plant species identified in 50 small sidewalk plots, Brooklyn and Queens, New York.

Continent/Country	**# of species**
Europe	25
Eurasia	19
Asia	5
Tropical America	3
*United States	2

* These taxa did not originally occur in the eastern Unites States.

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PRELIMINARY EVALUATION OF POSTEMERGENCE CONTROLS FOR WAVYLEAF BASKETGRASS. B.H. Marose, University of Maryland, College Park, K.L. Kyde, Maryland Department of Natural Resources, Gaithersburg, and R.L. Ritter, University of Maryland, College Park.

ABSTRACT

Wavyleaf basketgrass, [*Oplismenus hirtellus* ssp. *undulatifolius* (Ard.) U. Scholz], is an aggressive and rapidly spreading invader of Central Maryland forests. Wavyleaf basketgrass (WLBG), was first detected in Maryland in 1996 and reported in the literature in 1999 as the first find in North America. By 2008, WLBG infested over 1500 acres in the Patapsco Valley State Park (PVSP) where Baltimore, Carroll, and Howard Counties intersect. Additional small infestations have been found in Prince George's County, Maryland and Northern Virginia.

Wavyleaf basketgrass is a shade tolerant, stoloniferous perennial, 8-16" tall, with alternate leaves .75-1.25" wide and 2-3.5" long. Stem sheaths are densely hairy. Leaf surfaces are hairy above and below, and have a distinctive wavy or undulating horizontal pattern. Racemes with 3-7 spikelets are produced from late August to November. The awns secrete a sticky substance that facilitates seed dispersal and greatly increases the risk of long distance movement. WLBG forms dense, monospecific stands that appear to be more competitive than Japanese stiltgrass (*Microstegium vimineum*).

In 2008, an herbicide trial was initiated in a wooded area of PVSP where WLBG carpeted the ground. Treatments applied on September 10, when plants were in flower, included a single rate of sulfometuron and two rates each of glyphosate, imazapic, clethodim, sethoxydim, quizalofop, fluazifop, fluazifop plus fenoxaprop. Herbicides were applied with appropriate adjuvants and at label-recommended rates with a back pack CO_2 sprayer. Replicated plots were 10' by 20' and in a RBCD. Efficacy ratings used a standard visual scale of 0-10 where 0 equals no effect and 10 equals complete control.

At three weeks after application, treatments showed minimal herbicide effect, with none receiving ratings higher than 3. Yellowing of the lowest leaves was visible in the glyphosate plots. In some treatments plants had a tired or disheveled appearance and a slight, difference in seed stickiness, but no particular change in overall growth or coloration. Evaluations will continue in the fall of 2008 and into 2009 to observe the effects on seedling populations and regrowth from perennial vegetative parts.

For pictures and further information see:
http://www.dnr.state.md.us/wildlife/download/wlbg_poster011108.pdf
Maryland Department of Agriculture and associated county teams treated trails and adjacent areas and the entire golf course in McKeldin. We conservatively estimate that WLBG eradication will be a 10-year process. Extremely dry in the preceding month of August, but cooling temperatures and rain the week before applications equipped with flat fan nozzles delivering 18 gpa at 20 psi. Treatments were clethodim (.12 and .24 lb ai/A), sethoxydim (.14 and .28 lb ai/A), quizalofop (.04 and .08 lb ai/A), fluazifop (0.1875 and .375 lb ai/A), fluazifop plus fenoxaprop (.12 and .24 lb ai/A of Fusion), glyphosate (0.77 and 1.55 lb ai/A), imazapic (.078 and .156 lb ai/A), sulfometuron (0.1875 lb ai/A), and handweeded and weedy controls. All herbicide treatments except glyphosate included 1% v/v crop oil concentrate.

MODES OF JAPANESE STILTGRASS SPREAD. E.S. Rauschert and D.A. Mortensen, Department of Crop and Soil Sciences, Pennsylvania State University.

ABSTRACT

Preventing the spread of invasive species into new areas is seen as a critical for management, as eradication is often difficult, if not impossible, once populations are well established. The spread of invasives is often difficult to quantify, as many vectors may be involved in the transport of propagules. Additionally, human activities are often a key component of the spread of invasive species. Japanese stiltgrass (*Microstegium vimineum*) is a non-native pest species which is currently spreading in forests in the northeastern United States. Japanese stiltgrass is of particular concern in forest ecosystems, where its rapid invasion threatens native diversity and interferes with forest regeneration. We contrast experimental work on natural, local-scale spread of Japanese stiltgrass in different habitat types with long-distance, human-aided dispersal mechanisms. Maximum likelihood techniques were used to create models of Japanese stiltgrass spread which allow the estimation of dispersal parameters. These estimates demonstrate that natural spread alone is inadequate to account for the observed rapid large-scale spread. As Japanese stiltgrass has been shown to be positively associated with road presence, we investigate road maintenance as an important vector of spread. We present preliminary results from experiments investigating the role of road grading in spreading propagules: dispersal distances observed are two orders of magnitude larger than estimates from natural dispersal alone. We also investigate the role of road structures such as culverts in facilitating invasion into the forest interior. These results highlight the need to limit human-mediated spread when managing invasive species.

POTENTIAL GLYPHOSATE RESISTANT COMMON RAGWEED IN PENNSYLVANIA.
B. Dillehay, Monsanto, State College, PA.

ABSTRACT

Weed resistance to glyphosate herbicides is an increasing problem in Pennsylvania. Currently, horseweed (*Conyza canadensis* L.) has been the only confirmed glyphosate resistant weed in Pennsylvania. During 2008, a population of suspected common ragweed (*Ambrosia artemisiifolia* L.), was reported in Pennsylvania. Although present in several other states, glyphosate resistant common ragweed has not been previously reported in Pennsylvania. A field trial was conducted after a commercial application of 0.75 lb ae/a glyphosate did not control the common ragweed present in a soybean (*Glycine max* L.) field. From the field trial, 0.75 lb ae/a glyphosate provided 58 percent control of common ragweed and 6 lb ae/a provided 73 percent control. 0.25 oz ai/a cloransulam and 0.1675 chlorimuron provided 39 and 31 percent control respectively. Further investigation is in process.

BIOLOGY OF KYLLINGA SPECIES. P.C. Bhowmik and D. Sarkar, University of Massachusetts, Amherst.

ABSTRACT

The genus Kyllinga from the sedge (Cyperaceae) family consists of 40 to 45 different weedy species commonly known as "spikesedge". They are widely distributed in the tropical, subtropical, and warm temperate regions around the world, especially in the tropical Africa. In the United States, 5 to 6 species of Kyllinga are known as problem weeds in turfgrass, pastures and roadside environments. All these species are apparently introduced into the United States from Asia during early 19th century. They were established along sandbars, streams, or in open sites with adequate moisture. Highly maintained, frequently irrigated turfgrass and golf courses provide excellent habitat for their growth, dispersal, and proliferation of plants.

Plants are either low rhizomatous perennials or annuals with triangular stems, and with 1 to 5 grass-like basal leaves. Leaf blades are V-shaped with prominent midribs and finely toothed margins. They produce 2 to 4 spreading terminal inflorescence with cylindrical, spherical, or dome-shaped spikes (heads). The number of spikelets per spike varies from 15 to 150, and they are surrounded by a tiny scale like bracteole. All kyllinga species produce viable seeds. Achenes are laterally compressed, narrowly ovoid to oblong, or ellipsoid with finely punctuate surface.

There are three common types of kyllinga found in the United States. Green kyllinga (*Kyllinga brevifolia* Rottb.) is the most commonly found in turfgrass environment among all kyllinga species (Fig 1.). A closely related perennial species is false green kyllinga (*Kyllinga gracillima* Miq.) (Fig. 2). Green and false green kyllinga are difficult to differentiate based on vegetative characteristic as both species are rhizomatous and of similar seed heads. They can only be distinguished by time of flowering and seed morphology. Green kyllinga plants produce flowers throughout the growing season, while false green kyllinga plants produce seed heads only in late August to until frost. Green kyllinga seeds have denticulate appendages where it is absent in false green kyllinga seeds. The geographic distribution of green kyllinga within United States is largely along the coast where false green kyllinga is found in the inland from Arkansas to as far north as southern New England. Another important perennial species found in the United States is fragrant kyllinga (*Kyllinga odorata* Vahl.) (Fig. 3). It was earlier considered as annual kyllinga, but it is a perennial species. It has a distinctive sweet aroma when its leaves are mowed or crushed. Fragrant kyllinga is tufted or bunchy rather than rhizomatous as compared to the other species. They produce white, 3-lobed seed heads generally looks like “torpedo”. Comparisons of morphological features of three kyllinga species are presented in Table 1 (Adapted from Bryson et al., 1997. Weed Technology 11:838-842).

In recent years, kyllinga species are becoming more prevalent in golf courses, and they are spreading rapidly in northward and westward from their original geographic distribution. The whole plant or fragments of the perennial kyllinga species spread as contaminants in transported turfgrass sods and sprigs. Frequent irrigation, and higher mowing frequency without removal of clippings around golf course greens, enhances

vegetative reproduction of kyllinga species. Currently, this species is not listed as invasive species, however, this species should be on the alert list.


Fig 1. Green kyllinga


Fig 2. False Green kyllinga

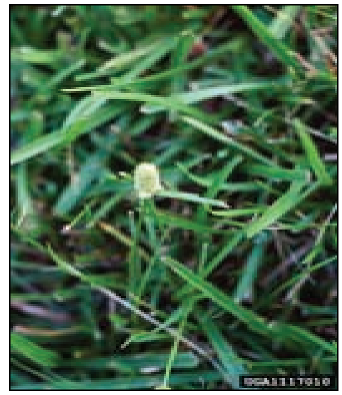


Fig 3. Fragrant kyllinga

Table 1. Morphological characteristics of three *Kyllinga* species

Morphological characteristics	**Green kyllinga** *Kyllinga brevifolia*	**False green kyllinga** *Kyllinga gracillima*	**Fragrant kyllinga** *Kyllinga odorata*
Life cycle	Perennial	Perennial	Perennial
Rhizomes	Present	Present	Absent
Culms	15-40 cm tall	12-48 cm tall	5-30 cm tall
Inflorescence	1-3 heads	Single head	1-3 heads
Bracts	Spreading	Spreading	Strongly reflexed
Spikelets	Green	Green	White
Scale	Denticulate	Smooth	Smooth or rarely denticulate
Achenes	Tan to deep reddish brown, oblong	Tan to brown, ovate	Purplish black, ovate

THRESHOLDS FOR WEED MANAGEMENT FROM A HAIRY VETCH COVER CROP AND HIGH RESIDUE CULTIVATION IN ORGANIC NO-TILL FIELD CORN. S.B. Mirsky, USDA-ARS, Beltsville, MD; W.S. Curran, Pennsylvania State University, University Park; J.R. Teasdale, USDA-ARS, Beltsville; D.A. Mortensen, Pennsylvania State University, University Park; R.W. Mangum, USDA-ARS, Beltsville, MD; M.R.Ryan, and E. Nord, Pennsylvania State University, University Park.

ABSTRACT

In general, weed suppression from cover crop surface residues in field crops has been incomplete. Effective weed management that utilizes cover crops for weed suppression while reducing tillage and herbicide use must focus on integrating multiple management tactics. The objective of this research was to test the effects of hairy vetch (*Vicia villosa* Roth) termination date and high-residue cultivation on weed management and subsequent crop yield across varying initial weed seed bank densities and emergence periodicities. Initial weed seed banks were experimentally manipulated following cover crop establishment with three dominant weed species of the Mid-Atlantic region, common ragweed (*Ambrosia artemisiifolia* L.), giant foxtail (*Setaria faberi* Herrm.), and smooth pigweed (*Amaranthus hybridus* L.) at 0, 100, 450, and 1050 seed m^2. Hairy vetch termination was conducted in the spring with a roller/crimper at 75% flowering and at the early pod stage. High residue cultivation was conducted twice, approximately four and six weeks after corn (*Zea mays* L.) emergence. We observed proportional relationships between initial seed bank densities and mature weed biomass. The effect of termination date and high residue cultivation appear to be species and site-specific. For optimal corn performance, weed management tactic diversity must increase as the density of weed propagules increase. The adherence to this principle is magnified when corn production relies primarily on cover crop residues for weed suppression and tillage and herbicide use was reduced.

SELECTION AND MANAGEMENT OF FINE LEAF FESCUES FOR NATURALIZED AREAS. P.H. Dernoeden, University of Maryland, College Park

ABSTRACT

Fine leaf fescues (FLF) generally are best suited for use in shaded sites and large grassy areas that do not receive heavy traffic, where a lower level of management is desired, and where tall and infrequent mowing is acceptable. There are several species, but not all are suited for use in naturalized areas in the mid-Atlantic region. The most important species for this region include: creeping red fescue (*Festuca rubra,* CRF); Chewings fescue (*Festuca rubra ssp. commutata*, CF); sheep fescue (*Festuca ovina*, SF); hard fescue (*Festuca brevipilia*, HF); blue fescue (*Festuca glauca*, BF); and hybrid blue sheep fescue (*F. ovina x F. glauca*, HBF). There are several fescue subspecies that will not be discussed. Research conducted at the University of Maryland indicated that HF and SF were best suited for use in naturalized and other low maintenance areas in the mid-Atlantic region. CRF and CF are very susceptible to dollar spot (*Sclerotinia homoeocarpa*), red thread (*Laetisaria fuciformis)* and summer patch (*Magnaporthe poae*) and generally exhibit below average summer color and overall quality compared to hard and sheep fescue in the region. Several of the newer strong CRF and CF cultivars that contain fungal endophyte have improved resistance to dollar spot. Research underway at Rutgers University indicates that HBF hybrids are promising for use in naturalized areas. Seed of only a few SF cultivars are commercially available. Since genetic diversity is important, especially in low maintenance sustainable situations, mixes of FLF species are highly recommended. Strong CRF produce rhizomes and are recommended components of mixtures. Mixes (wt/wt) that perform well in the region include: 90% HF plus 10% of either SF or strong CRF; 90% SF plus either 10% HF or strong CRF; and 45% HF + 45% SF + 10% strong CRF. The suggested seeding rate is 3 to 4 pounds of seed per 1000 ft^2, but more research is needed to better define the lowest effective seeding rate for naturalized areas. Cultivar selection should be based on field trials conducted at universities within the region where the grasses will be grown. Seed lose viability within one year; use current year crop for best germination or get a current year germination test. FLF should be seeded into a properly prepared seedbed in the autumn (avoid seeding in spring or summer), fertilized with a complete fertilizer and the seedbed should be rolled. FLF perform well in acid soils, but amending the seedbed with lime is suggested if pH is below 6.0. Seedlings emerge in about 10 to 14 days if there is suitable temperature and rainfall, but generally they do not tiller or fill-in prior to winter. The most important keys to success in maintaining FLF quality is to eliminate weeds the spring following autumn establishment and to never mow during periods of heat and drought stress in summer and to generally avoid summer mowing. FLF seedheads are aesthetic and managers often wait until they become necrotic in June before stands are first mowed for the season. Occasional mowing can be delayed until mid-to-late autumn or winter, and the mowing height generally should be above 4 inches. Periodic spot-applications of herbicides may be necessary. In heavy textured soils (clay and silt loams) with sufficient P and K levels, N fertilizer normally can be withheld for many years as long as stands are dense. In sandy soils, more frequent fertilizer application may be required.

HERBICIDES FOR ESTABLISHING PERENNIAL GRASSES IN NATURALIZED AREAS. S.D. Askew and J.L. Jester, Virginia Tech, Blacksburg.

ABSTRACT

The addition of adaptable perennial grasses typically referred to as “native species” to golf courses is a relatively new practice. Unlike conservation efforts, golf courses must establish cover quickly for aesthetics and weed control. Utilizing methods such as increased seeding rates and scheduled watering can expedite the maturation of the stand but weeds still pose a constant problem. Herbicide usage is critical to promote development of slow-maturing perennial grasses by reducing weed competition. Evaluating the effects of commonly used herbicides on blue grama grass *(Bouteloua gracilis*, BGG*)* and little bluestem grass *(Schizachyrium scoparium*, LBG) can provide data necessary to make herbicide selection easier while protecting the developing stand. Our objectives were to evaluate 25 herbicides or herbicide combinations for effects on BGG and LBG.

LBG and BGG were seeded in rows on June 22, 2007 in Blacksburg, VA as part of an endeavor to transition managed turf to an unmanaged meadow. Initial plant densities ranged from 1 to 78 BGG plants and 18 to 103 LBG plants per plot. The study was established as a RCBD with 3 replications and 26 treatments. LBG and BGG had a minimum of three leaves at time of application. Herbicides included in this study are: amicarbazone; aminopyralid; bentazon; carfentrazone; carfentrazone + 2,4-D + MCPP + dicamba; chlorsulfuron; 2,4-D + MCPP + dicamba; fenoxaprop; flazasulfuron; fluazifop; flucarbazone; foramsulfuron; halosulfuron; imazapic; mesotrione; metsulfuron; nicosulfuron; primisulfuron; quinclorac; simazine; sulfentrazone; sulfosulfuron; tembotrione; topramezone; and trifloxysulfuron. All herbicides were applied with appropriate adjuvant and at label-recommended rates for crops on which the products are registered. BGG and LBG levels of phytotoxicity were assessed weekly for 6 week by visually estimating plant discoloration and stunting compared to the non-treated control. Plant counts were taken at the initiation of the trial and final week, change in stand density per herbicide treatment was then calculated.

LBG was not significantly injured by the following: Aminopyralid; bentazon; carfentrazone; carfentrazone + 2,4-D + MCPP + dicamba; chlorsulfuron; 2,4-D + MCPP + dicamba; fenoxaprop; flazasulfuron; foramsulfuron; halosulfuron; mesotrione; metsulfuron; nicosulfuron; primisulfuron; quinclorac; simazine; sulfentrazone; sulfosulfuron; tembotrione. Amicarbazone; fluazifop; flucarbazone; imazapic; trifloxysulfuron and topramezone induced the greatest loss in plant counts for LBG. Trifloxysulfuron had the greatest phytotoxic injury in LBG of 37.5% at 4 WAT. BGG was not injured by the following herbicides: bentazon; carfentrazone; carfentrazone + 2, 4-D + MCPP + dicamba; fluazifop; flucarbazone; halosulfuron, metsulfuron; and sufentratzone. Topramezone; imazapic; nicosulfuron; foramsulfuron; and tembotrione induced the greatest loss in plant counts and the highest rates of phytotoxicity in BGG. Tembotrione induced phytotoxic rates of 90% or greater at 4, 5, and 6 WAT. All other herbicides caused tolerable levels of phytotoxic injury to BGG. These data indicate that several herbicides are safe to use on these adaptable perennial grasses.

HERBICIDE AND PLANT GROWTH REGULATOR SELECTION AND USE IN FESCUE NATURALIZED AREAS. S.J. McDonald, Turfgrass Disease Solutions, Pottstown, PA, and P.H. Dernoeden, University of Maryland, College Park.

ABSTRACT

Fine leaf fescues (*Festuca spp.*) are utilized by golf course superintendents as 'naturalized' areas. Many invasive weeds can become established in these areas and herbicides often are required to maintain quality stands. Information regarding the safety and selection of herbicides on immature and mature stands of fine leaf fescue is needed. Field studies were conducted in Maryland (MD) and Pennsylvania (PA) to evaluate various pre and postemergence herbicides commonly used to control grassy and broadleaf weeds in turfgrasses. The MD site was an immature stand of ‘Chariot’ hard fescue (*Festuca brevipilia*); and the PA site was a mature mixture of unknown cultivars of hard fescue (75%) and creeping red fescue (*Festuca rubra*; 25%). Single and sequential applications of 16 different herbicides were applied in four timings to meet standard use recommendations for the materials evaluated. The herbicides evaluated were: bispyribac-sodium; dithiopyr; fenoxaprop-ethyl; fluazifop; isoxaben; mesotrione; pendimethalin; prodiamine; quinclorac; sethoxydim; sulfentrazone; triclopyr ester; clopyralid + triclopyr; prodiamine + sulfentrazone; and 2,4-D + MCPP + dicamba + carfentrazone. All herbicides were applied in 50 GPA using a flat fan nozzle. Plots were 5 ft by 5 ft and arranged in a randomized complete block design with four replications. Plots were evaluated for foliar color and injury and fescue cover, and data were statistically analyzed. In MD, prodiamine (0.75 lb a.i./A) and dithiopyr (0.38 lb a.i./A) applied preemergence caused unacceptable levels of discoloration and loss of hard fescue cover. Quinclorac (0.50 lb a.i./A) and triclopyr ester (1.0 lb a.i./A) discolored hard fescue, but only triclopyr ester was considered to have provided an unacceptable level of discoloration. All other herbicides were shown to be safe to apply to hard fescue the summer following establishment. In PA, all herbicides evaluated were safe to apply to the mature mix of hard and creeping red fescue. Minor levels of discoloration were observed in plots treated with bispyribac-sodium (0.07 lb a.i./A) and triclopyr ester (1.0 lb a.i./A), however, the injury did not cause a long-term reduction in color or cover.

Another problem with ‘in-play’ fine leaf fescue naturalized areas is summer-time playability. Mature stands often create a dense canopy that can make it difficult to find and advance the golf ball. A trial was conducted in PA to evaluate four plant growth regulator treatments (trinexapac-ethyl (TE); ethephon (E); TE + E; and mefluidide) and one herbicide (glyphosate) for their ability to suppress seed heads and foliar growth, and enhance playability of a mature stand of ‘Aurora Gold’ hard fescue. Among treatments, TE + E provided the greatest reduction in seed head numbers, and seed head and canopy height , however, a single April application of mefluidide appeared most promising for maintaining the desired height, playability, and density for an ‘in-play’ naturalized hard fescue area on a golf course.

NEWSS Year-End Report

2007

Submitted by the Executive Committee
For the 62nd Annual Meeting
January 9, 2008
Sheraton Society Hill Hotel, Philadelphia, PA

PRESIDENT's REPORT – Renee J. Keese

The 61st annual meeting in Baltimore was very successful, with several symposia and excellent attendance. We were in the black financially after the meeting. New members to the Executive Committee were David Yarborough as Vice President, Greg Armel as Editor, and Dan Kunkel will continue for another term as our Legislative Committee Chair. Work began soon after the meeting for the Executive Committee – to plan another conference, schedule the Collegiate Weed Contest and continue moving the society forward.

Our new website was working quite well this year – allowing electronic submissions and posting of more current information. We have begun posting Proceedings on the website one year after the conference. We have a new look to our NEWSS Program and Proceedings – recognizing the photo contest winner by using their photograph on the cover.

As President, Board meetings were scheduled, agendas circulated and hotel arrangements made when necessary. Committee Lists were updated, reviewed, approved and posted on the website. Changes/modifications were submitted to the Manual of Operating Procedures. A draft of a new Code of Conduct for the NEWSS was presented to the EC, discussed, modified and approved as follows:

It is the expectation of the Executive Committee and NEWSS members that students and all participants involved (coaches, Executive Committee, volunteers, etc.) in the Weed Contest will behave in a professional manner, representing their institutions. This includes but is not limited to using proper, not foul, language and guarding against over-consumption of alcoholic beverages if of drinking age. Students are making contacts within the profession and should represent themselves accordingly.

Updates were provided during the year on the Sheraton Society Hill Hotel, our host hotel for 2008. Budgets and other conference issues were discussed the second half of the year, and the decision was made to keep our meeting registration fee the same as last year. Our new dues structure and corporate sponsorship has been very successful and now the society only approaches companies one time each year for a contribution. Discussions were held this year with the Mid-Atlantic Soc. for Ecological Restoration and the PA Invasive Species Council for joint meetings – none could be confirmed for 2008 but the door is open for future discussions. At several Board meetings the survey results were shared and discussed and finally prioritized.

No Resolutions were brought forward by the Resolutions Committee in 2007, and we have two excellent Vice President candidates on our slate: Dr. Mark VanGessel and Dr. Hilary Sandler. It has been a pleasure working with this Executive Committee, as they are hard-working volunteers and dedicated to weed science!

PRESIDENT ELECT REPORT – Jerry Baron

Collegiate Weed Contest: Shawn Askew from Virginia Tech in Blacksburg, VA hosted the 2007 collegiate contest on July 31, 2007. A total of 45 graduate and undergraduate students participated from six universities. The universities represented at the contest were North Carolina State, Virginia Tech, Penn State, Cornell, Guelph, and Nova Scotia Ag College. Students participated in four contest segments including weed identification, unknown herbicide identification, sprayer calibration, and farmer problems. This year's contest was very challenging and fun. Everyone will always remember the "goat" problem. Thanks from the Society go to Shawn, Julie Keating, John Willis, Scott Hagood, Lloyd Hipkins, and Jeff Derr and all the other volunteers.

The EC has had discussions with several groups about hosting the conference in 2008. At this point, no one group is willing to host the 2008 Collegiate Weed Contest in the Northeast. The North Central Weed Science Society has offered to allow teams from the Northeast participate in their contest. The NCWSS Contest is at Alvey Ag Research Station in Carlyle, Illinois, which is about 50 miles east of St. Louis. The contest dates are August 13-14, 2008.

2009 and 2011 Annual Meeting: We have signed a contract with the Renaissance Harbor Place Baltimore for our 2009 meeting, January 5 through January 8th. This is the same property that hosed the 2007 Annual Meeting. We have negotiated a room rate of $125/night single or double, complementary meeting space, a complementary reception for the Society, complementary podium and lavaliere microphones, reduced parking at $13/day, and several other incentives. The hotel has also provided NEWSS the exact contract for the 2011 Annual Meeting which is scheduled for January 3 to January 6th, 2011. NEWSS and the hotel have the ability to cancel the 2011 contract at any point without penalty until January 30, 2009.

We are having dialogue with organizations and scientific societies to have concurrent meetings. At this point, no concrete commitments have been made except that the Mid-Atlantic Nursery Growers Association will be in Baltimore at the same time of the NEWSS Annual Meeting. NEWSS has held several successful educational sessions for this group in the past.

Executive Committee Members: Replacement for Executive Committee members whose terms have been completed have been identified. Rakesh Chandran will replace Kathie Kalmowitz as Research and Education Coordinator. Carrie Judge has agreed to take on the Sustaining Membership Coordinator replacing David Spak.

VICE PRESIDENT REPORT - David E. Yarborough

Speaker titles were finalized for the general symposium on *The Effect of Climate Change on Weeds.* Cameron Wake, from Climate Change Research Center, Univ. NH, Durham agreed to do the keynote address on *Indicators of Climate Change in the Northeast over the Past 100 Years* to set the stage for the other talks. Jerry Baron arranged to have Kathy Orr, a local TV weather reporter to do the welcome address before the presidential address. Louis Ziska from the USDA-will make two presentations and Andrew McDonald of Cornell, David Mortensen from Penn State Univ, a NEWSS member, and Brent Helliker from the University of Pennsylvania completed the program for the symposium. Only one other symposium was proposed for the meeting, Michael Agnew of Syngenta arranged for seven speakers to participate in a symposium on *The Latest in Plant Growth Regulators for Turfgrass Use* which was scheduled for the last afternoon of the meeting.

Abstract title submission date was September 7 and on September 10, 66 titles were submitted, but this increased to 83 by the end of the month. This number was below average from previous meetings so an email was sent to both the general membership and contacted each of the section chairs by phone to solicit papers. The CFI session only had two papers, there were other presentations that listed CFI as a second choice but when contacted they refused to change sessions. The session chair will hold a discussion on the future viability of this session. Subsequently learned security on the web site would close if the paper application was not completed in 15 min and the member was not aware that it was not accepted. There was a lag time from when the abstract was submitted and when it was posted on the web which made it difficult to confirm that it had been accepted. The time limit for acceptance was increased to 45 min and members were asked to check the website to confirm acceptance. Titles were arranged sent to program chairs for comment; the draft program was reviewed by the EC at the October 19 meeting and was revised and emailed to the EC for comments. Abstract titles were received up to the day before the program was sent to Greg Armel (Nov. 8). All titles were not sent to the web and there were duplicates it was more difficult for Greg to confirm them. Greg finalized the program and returned it to me December 12. The program has 95 presentations, 17 student, 24 posters (includes 3 student posters), 10 Agronomy, 10 Ornamental, 15 Turf, 6 Weed Ecology/Biology, 2 Conservation, and 11 Vegetable/Fruit. There are also an additional 6 presentations in the General symposium and 7 presentations in the Turf symposium. Major changes in the Program for 2008 were the separate graduate student session and longer breaks for the membership to network.

MOP instructions to the section chairs and chairs elect the end of December to remind them of their responsibilities: bring computers and LED projectors and of the program committee meeting on Monday PM. There are a number of procedural changes that need to be addressed in the MOP.

PAST PRESIDENT REPORT - William S. Curran

The major responsibility as Past President this past year was serving as the Chair for the Awards Committee. The 2007 committee included myself, Tim Dutt, Robin Bellinder, Scott Glenn, and Dave Mayonado. A major change was the addition of the new Robert D. Sweet Graduate Student Award where we will present our first award at the annual meeting in Philadelphia. In 2007, we had a number of outstanding nominations for awards. We received two very competitive nominations each for the Outstanding Educator and Outstanding Graduate Student. I am pleased that we can honor the following individuals at our 2008 annual meeting:

a. Award of Merit – Domingo Riego
b. Distinguished Member Award – Jeff Derr
c. Outstanding Educator Award – Mike Fidanza
d. Outstanding Researcher Award – Shawn Askew
e. Outstanding Graduate Student Award – Jacob Barney

There are several necessary updates that need to take place in the MOP for 2008, so hopefully those have been completed by the annual meeting. Other activities that I have been involved in during 2007 are trying to get a better email list for Past Presidents, working on the awards presentations and arranging for plaques for the awards presentations (Award of Merit, Distinguished Member Award, Outstanding Educator Award, Outstanding Researcher Award, Bob Sweet Outstanding Graduate Student Award, and the Gavel Plaque for outgoing President, and updating and printing the MOP and Constitution. I will bring a limited number of copies to the annual meeting.

TREASURER REPORT - Chris Becker
See separate financial statement

PUBLIC RELATIONS REPORT - Dwight Lingenfelter

2007 Overview

- Compiled and edited three NEWSS Newsletters and distributed via email and web
- Submitted two NEWSS News articles to WSSA Newsletter (April and October)
- Took photos at major NEWSS events for inclusion in newsletters, website, and other media
- Continued to maintain/improve website content on server (A Small Orange) with editor (Rob Dickerson)
    - Increased memory space to 2500MB/60GB bandwith ($20/mo.)
- Worked with Kathy K., Lee V., and others to develop a flier to promote 2008 NEWSS general session/meeting
    - Sent to various key contacts, Penn State ag media outlets, etc.
- Compiled a pictorial-summary Powerpoint of 2007 NEWSS events to display/scroll during NEWSS meeting

2008

- Article requests for April newsletter will be forthcoming

EDITOR'S REPORT - Greg Armel

Upon receiving the program from Dave Yarborough, minor adjustments were made to the titles and authors in order to more closely match information provided for our proceedings. In total, there were 23 posters and 85 oral paper presentations scheduled for our meeting at the Sheraton Society Hill Hotel in Philadelphia, PA. Topics of interest included invasive weed management, effects of climate change on weeds, weed ecology and biology, herbicide resistance management, organic cropping systems, and a variety of papers on weed control techniques in fruits, vegetables, ornamentals, turf, soybean, alfalfa, and corn. The cover for both the program and the proceedings were augmented from our usual cover design to include a photo. This was provided by Omnipress at a nominal charge. It was decided at our board meeting back in October to start a new tradition whereby the winning photo from our previous photo contest will now grace the cover of our proceedings/program the following year. Our first winner of this new honor was Dr. Rob Richardson of North Carolina State University, who won our photo contest back in January 2007 with a picture of fragrant water lily (*Nymphaea odorata*). Our proceedings were approximately 48 pages shorter than the previous year due in part to not having a President's address, Annual Business Meeting Minutes from January 2007, supplemental abstracts from the previous years, and having fewer papers in general. Due to this decrease in page numbers, Omnipress will only charge us $3,020.00 for 250 copies of the proceedings in comparison to $3,175.00 quoted. In addition, 50 CDs containing Adobe PDF versions of our proceedings were created at the University of Tennessee. A special new design was created on the cover of the CDs using a graphic design program. The cost of the CD creation was $138.00 for the 50 CDs and the printer cartridges. Since the printer cartridges should last us a couple of years, the cost for CD creation in the future should be less than $50/yr.

RESEARCH & EDUCATION COMMITTEE REPORT - Kathie Kalmowitz

Worked with our PR Chair Dwight Lingenfelter on the design of information in fliers to advertise the General Meeting, Global Warming Program and the Turfgrass Symposium. These fliers were then distributed by Dwight through his list of contacts and general membership, on the website and by me directed to a targeted audience. Targeted for 'Outreach' this year were all public and private gardens and the Pennsylvania Horticulture Society for the General Meeting and the Global Warming Program. Targeted for this and the Turfgrass and Plant Growth Regulator general sessions and Thursday's Symposium were professional turfgrass organizations in the 5-state area: Pennsylvania, Maryland, New Jersey, New York and Virginia.

The following turfgrass organizations were contacted by phone and then sent the email pdf flier to be used as an Email Blast to members, to promote our turfgrass sessions: Eastern Shore GCSAA chapter, Mid Atlantic GCSAA, Philadelphia Greens GCSAA, Central Penn. GCSAA, Dave Norman of VA GCSAA, Baltimore Greens, Eastern Shore GCSAA, Maryland Turfgrass Association, Virginia Turfgrass Association, New Jersey

GCSAA, and the USGA Greens Section. Sports Turfgrass Associations for PA, NY and NJ.

The Following Gardens were contacted by phone and General Meeting pdf Flier was sent email to the following: Morris Arboretum, Chanticleer Gardens, Scott Arboretum at Swathmore University, Pennsylvania Hort Society, Bartams Arboretum, Jenkins Arboretum, Longwood Gardens, US National Arboretum, and The Virginia Native Plants Society.

The second part of the 'Outreach Committee's responsibility was to 1.) obtain approval from the states for pesticide license recertification. Packets for each session by state are available for each room, the General Session and the Turfgrass Symposium. Once again without the help of Russ Hahn, Cornell Univ., NY State approval would not have been granted. Russ walked through all this paperwork. Other states applied to were: NC, VA, W VA, PA, MD, DE, NJ, CN, MA, VT, NH, ME
2.) Also, the Outreach Chairman obtained approval for GCSAA credits through application directly with the Education Coordinator for GCSAA. This course approval code paperwork was provided to all turfgrass managers that attended the turfgrass sessions or the Symposium, respectively and is separate from pesticide recertification.
3.) Obtain the approval from the Agronomy Society of America for the CCA certification for members. This was granted again for the 2008 meeting.

WSSA REPRESENTATIVE REPORT TO NEWSS
Toni DiTommaso

Annual Meeting:

The WSSA annual meeting in 2007 was held at the Hyatt Regency Hotel in San Antonio, TX from February 5-8. A total of 490 participants attended the meeting including 68 graduate students. Nearly 90 participants attended the Leafy Greens Vegetable Tour on Sunday, Feb. 5 - one day prior to the official start of the meeting. A total of 327 papers (including 149 posters) were presented at the San Antonio Meeting. This was down some 30 papers from the New York City meeting in 2006. The meeting also included 4 symposia and a keynote address at the general session by Dr. Gale Buchanan, Undersecretary of Agriculture. Dr. Buchanan focused his presentation on the 2007 Farm Bill that was released publicly a week or so prior to start the WSSA annual meeting.

The 2008 WSSA meeting location will be the Chicago Hilton Hotel from February 4-7, 2008.

The next International Weed Science Society (IWSS) Meeting will be held in Vancouver, British Columbia, Canada June 23-27, 2008. The WSSA and Canadian Weed Science Society are co-sponsoring this meeting.

Other WSSA News:

- Dr. K. Neil Harker, Weed Scientist at Agriculture & Agri-Food Canada in Lacombe, Alberta, Canada has accepted the position of editor of *Weed Technology* after the passing of Dr. John Wilcut.
- The first issue of the new WSSA journal *Invasive Plant Science and Management* (IPSM) is on schedule to be published in early February 2008 in time for the WSSA Annual meeting. The Editor of the new journal is Joe DiTomaso from U-C Davis.
- The 9th Edition of the Herbicide Handbook is now available. You will note the substantial improvements that Scott Senseman has brought to the content and format of the handbook.
- Steve Dewey, Utah State University was appointed as the WSSA/EPA Invasive Terrestrial Weeds Subject Matter Expert. He will provide advice and expertise to this federal agency in matters related to invasive terrestrial plant management.

GRADUATE STUDENT REPRESENTATIVE - Matt Ryan

- A reminder about the Weeds Contest was sent out to graduate students encouraging them to participate and notifying them about the two tours that Shawn Askew has planned for Wednesday, of the Virginia Tech campus, and a hike to Cascade Falls. Students were also surveyed after the contest.
- The Graduate Student Mixer was planned for Monday January 7, with Lewis Ziska as the speaker. He will outline his research on effects of climate change on weed management, as well as discuss what it is like to work to work for the USDA ARS in Beltsville.
- A reminder was sent to the graduate students about the rules and criteria for posters and presentations, along with the judge's worksheet for each.
- Students were reminded they have the opportunity to help at the registration desk, and attend the graduate student mixer on Monday night.
- The graduate student information will be updated at the meeting this year.
- It seems like we should discuss the status of the annual Weeds Contest, as I understand that there is a possibility that it will not occur this year.

LEGISLATIVE COMMITTEE REPORT - Dan Kunkel

None submitted – see Lee VanWychen's report

SUSTAINING MEMBERSHIP - David Spak

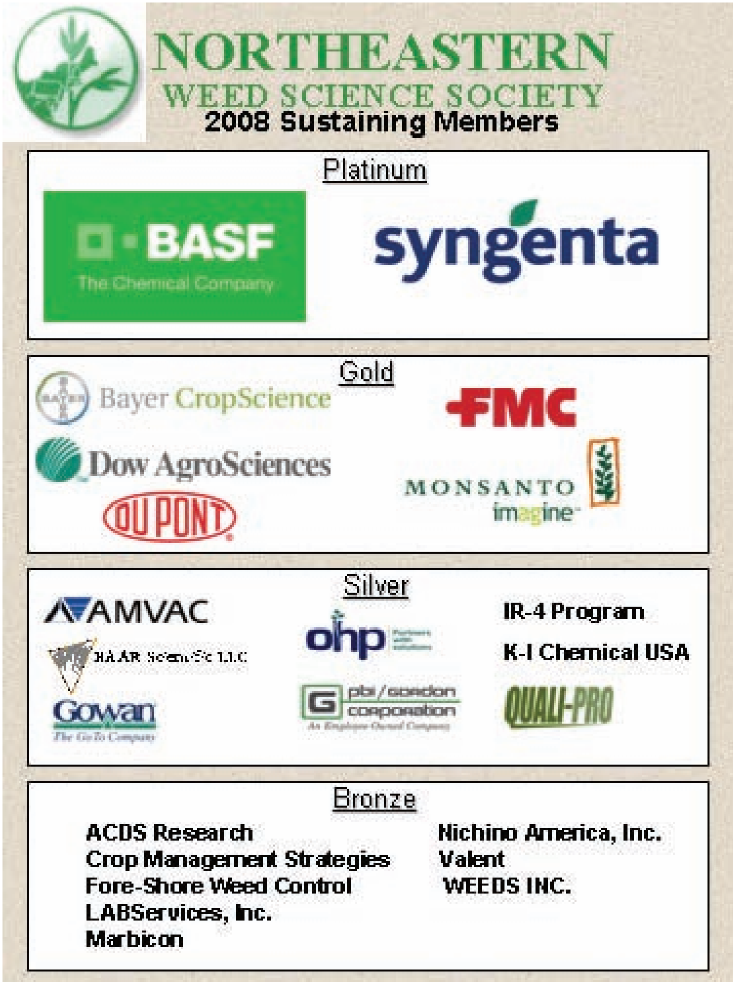
A request for Sustaining Membership fee structure was sent to all current sustaining members and prospective members in October 2007. As of January 4, 2008, we have received commitment from 22 organizations for 2008. This represents a decrease in one member compared to 2007, but one member is still undecided. Two organizations decided not to contribute this year for various reasons, and two new members (Nihon America, Inc, and Quali-Pro) are now on board.

2008 membership breakdown looks like this: 2-Platinum, 5-Gold, 7-Silver, 8-Bronze for a total commitment of $14,000, and potential for $14,500. Therefore, support has remained roughly the same as 2007 ($14,000), but significantly higher than the 2006 income ($5850).

2008 Sustaining Members	2008 Level
ACDS Research	Bronze
AMVAC Chemical Corporation	Silver
BAAR Scientific LLC	Silver
BASF Corporation	Platinum
Bayer Crop Science	Gold
Crop Management Strategies	Bronze
Dow AgroSciences	Gold
Dupont Crop Protection	Gold
Fore-Shore Weed Control	Bronze
FMC Corporation	Gold
Gowan Company	Silver
IR-4 Project	Silver
K-I Chemical USA	Silver?
LABServices, Inc.	Bronze
Marbicon	Bronze
Monsanto	Gold
Nichino America Inc.	Bronze
OHP	Silver
PBI Gordon	Silver
Quali-Pro	Silver
Syngenta	Platinum
Valent	Bronze
Weeds Inc.	Bronze

Two posters are being produced which will be displayed at the annual meeting which will recognize the 2008 Sustaining Members (see below).

Lastly, only two organizations have reserved display tables for the meeting.



CAST REPORT - R.D. Sweet

The past year has been a very good one for CAST in terms of timely, useful publications, but a difficult one regarding finances.

Informative publications on bird flu helped keep the public and regulators calm after a sensational, but inaccurate TV film portrayed the U.S. in a panic because of a bird flu pandemic. More recently several publications have presented facts on biofuels, gene flow from GMO crops and precautions needed before an erotic species is promoted as an ethanol source.

CAST's finances have never recovered from the losses over the past several years from Ag business consolidations. Membership by professional societies is very good, 38. But dues are only a tiny fraction of CAST's budget. It would be great if CAST received the support from business and individuals that NEWSS receives. Any suggestions as to how CAST can achieve this?

SCIENCE POLICY DIRECTOR REPORT - Lee Van Wychen
WASHINGTON UPDATE

WSSA PUBLIC AWARENESS COMMITTEE IS SPREADING THE WORD, NOT THE WEEDS- Committee members include Janis McFarland as chair, Mike Chandler, Carol Mallory-Smith, John Jachetta, Tony White, Carol Somody, Joyce Lancaster and myself.

With 300+ hours of volunteer effort in 2007, we have developed a detailed public awareness strategy, prioritized our main outreach messages, and issued five press releases so far. NEWSS WILL NEED TO NOMINATE A MEMBER FOR THIS COMMITTEE

USDA-NASS PLANS TO DISCONTINUE PESTICIDE USE SURVEYS- The Pesticide Usage Survey Data is critical for identifying and understanding the pest management needs that are mandated duties for the Cooperative State Research Education and Extension Service (CSREES) personnel at the Land Grant University System. If the surveys are cut, government agencies would instead rely on surveys from private companies (Doane's) which would not be publicly available. WSSA President Elect Jeff Derr, VP David Shaw and I met with USDA Under Secretary Gale Buchanan and Rob Hedberg in November to discuss our concerns. After further conversations at the NCWSS meeting in December, I will be drafting a letter to the Secretary of Ag which asks the basic question: "**How are land grant university researchers and extension personnel who rely on Pesticide User Survey data supposed to obtain this data from private sources?"** <u>We will be asking all the regional weed science societies if they want to sign this letter.</u>

IRREFUTABLE EVIDENCE PRESENTED AT EPA SHOWING ATRAZINE WILL NOT FEMINIZE KERMIT THE FROG- In October, the FIFRA-SAP at EPA concluded that **atrazine does not adversely affect amphibian** gonadal development based on a thorough review of 19 laboratory and field studies, including studies submitted by the registrant and others in the public literature. Results showed that exposure to atrazine in concentrations from 0.01 ppb to 100 ppb **had no effect** on the growth, development or sexual differentiation of the test species, *Xenopus laevis*. Over 100,000 frogs were sampled and tested over a period of time that included the sensitive window for sexual differentiation and metamorphosis. Therefore, no mode of action relative to the potential for atrazine to feminize amphibians is suggested by these results.

DAVIS PRESENTS WSSA RESEARCH PRIORITIES AT USDA-CSREES STAKEHOLDERS MEETING IN DC- On November 20, 2007, the USDA CSREES hosted a one day workshop on stakeholder priorities in the area of plant and pest biology. Over 20 different stakeholder groups provided comments and concerns during the workshop. Dr. Adam Davis, Ecologist with the USDA-ARS Invasive Weed Management Unit in Urbana, Illinois presented on behalf of WSSA. A couple of interesting points that came across during the meeting: 1) USDA CSREES is considering lengthening time of awards for some of its programs, possibly up to 10 years; this could open up many exciting opportunities for longer-term research projects; 2) CSREES staff and stakeholders continue to be very excited about the integrated programs (linking research to substantial outreach components within the project) but these grants are undercompeted => there's a good opportunity here for weed scientists who want to link research and extension.

DITAMASO AND BARNEY PRESENT CAST ISSUE PAPER ON BIOFUELS AND INVASIVE WEEDS ON CAPITOL HILL- CAST released a new CAST Commentary titled, **Biofuel Feedstocks: The Risk of Future Invasions**. The paper was written by Dr. Joseph DiTomaso, Dr. Jacob Barney, and Dr. Alison Fox, reviewed by Dr. Steven Dewey and Dr. Jodie Holt and facilitated by Dr. Kassim Al-Khatib, who is the current CAST President and WSWS Past-President. DiTomaso and Barney gave a presentation to 70+ Capitol Hill Staffers on the paper, which described the potential risk of dedicated lignocellulose biofuel species becoming weedy or invasive, and provided a process to quantify and, subsequently, minimize this risk.

WATER RESOURCES DEVELOPMENT ACT BECOMES LAW
If you want to find out which water resources projects are authorized in your state, you can search the 250 + pages of the WRDA at: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h1495enr.txt.pdf. Please keep in mind that "authorized" projects does not necessarily mean that they will be "appropriated" projects.

PESTICIDE REGISTRATION IMPROVEMENT ACT RENEWED- This is great!

NEW AGRICULTURE SECRETARY NOMINATED - In a surprise move on October 31, President Bush nominated former North Dakota Governor Ed Schafer (R) to be Secretary of Agriculture.

FARM BILL- It's basically been a big game of finger pointing and window dressing by both parties and the odds are pretty good that we will see a 1 to 2 year extension of the current law. Bush still has veto threat on table as well. The House passed an extension of the 2002 Farm Bill up to March.

As for the Research Title, the WSSA favors the House's version of the Farm Bill that was passed in July. The House Farm Bill protects the $200 million in mandatory research funding for the Initiative for Future Agriculture and Food Systems (IFAFS) that is scheduled to become available in FY2010. Another reason the WSSA supports the House-passed Farm Bill Research Title is the way the National Institute for Food and Agriculture (NIFA) would be organized within the USDA Research, Extension, and Economic (REE) mission area. The Senate version would basically duplicate responsibilities between the USDA Under Secretary for REE and the NIFA Director, since the NIFA Director would report directly to the Secretary.

USDA CONCLUDES GENETICALLY ENGINEERED CREEPING BENTGRASS INVESTIGATION - On November 26, USDA APHIS concluded its investigation into alleged compliance infractions by The Scotts Company, LLC. The investigation related to regulated genetically engineered glyphosate-tolerant creeping bentgrass. Under the settlement agreement, Scotts has agreed to pay a civil penalty of $500,000 which is the maximum penalty allowed by the Plant Protection Act of 2000. Read more:
http://www.usda.gov/wps/portal/usdahome?contentidonly=true&contentid=2007/11/0350.xml

NEW E-LEARNING WEBSITE ON INVASIVE PLANT MANAGEMENT ISSUES
The U.S. Fish and Wildlife Service and the Center for Invasive Plant Management announced a new e-learning website aimed at engaging volunteers and the public in

invasive plant issues and management.
http://www.fws.gov/invasives/volunteersTrainingModule/index.html

NIWAW 9 IS FEBRUARY 24-29, 2008- The theme for NIWAW 9 is "Weeds won't wait: Don't hesitate". The six invasive weeds that will be featured on this year's poster are: beach vitex, cheatgrass, giant salvinia, Japanese stiltgrass, Russian olive, and yellow starthistle. This year will be the first year we will be setting up easels and 4' X 4' poster boards at the hotel for **participants to display their research**, case studies and other invasive weed related issues.

New Invasive Species Management Bill Introduced in Senate: 100th Meridian Invasive Species State Revolving Loan Fund (S. 1949)- Introduced by Senate Majority Leader Harry Reid (D-NV) along with co-sponsors Wyden (D-OR), Domenici (R-NM) and Craig (R-ID). S. 1949 directs the Secretary of the Interior to provide loans to any combination of public or private stakeholders. Authorizes a federal appropriation of **$410 million, in total, over 5 years** (2008 to 2012).

NEWSS BUSINESS MEETING
62nd meeting
Philadelphia, PA
Jan. 9, 2008

Renee Keese called the Meeting to order at 4:53 PM

Approval of Minutes for 61th Annual Business Meeting, JNeal Motion to Accept, JBaron 2nd; No discussion; Minutes = Accepted as Written

Necrology Report: No members reported as being deceased during previous year.

Committee Reports:
First of all R. Keese provided positive appreciation to A) the weed contest teams, B) Dave Yarborough for a excellent, cutting edge program, and C) the Executive Committee for their commitment to the Society

Meeting Update provided by Chris Becker, Sec/Treasurer:

2008 NEWSS Attendance					
	Preregistered	On-Site	**Total**	INCOME ($$)	
Members	82	37	**119**	19215	(all mem, dist/Ret, Stud)
Distinguished/Retired	10	1	**11**		
Students	21		**21**		
Sustaining Associates	3	19	**22**	14000	(Sus Associate dues)
Symposia	9	5	**14**		
Speakers		5	**5**		
Total	**125**	**67**	**192**	INCOME	

Members w/o attend mtg		5	150	Membership (w/o attend mtg)
`			1975	Proceedings
			235	CD's
			770	(Late fees)
			36345	TOTAL EXPECTED

Financial report showed a $6600 gain in the Nov 06 to Oct 07 Fiscal year; however deposits after the Oct 30 year end were about 3000, yet bills paid after Oct 30, 07 for the previous year resulted in a $1300 loss for the society. However, before these adjustments, the Society had just over $60,000 in the Checking, Savings, and high yielding Certificates of Deposits.
Dave Johnson and Melissa Bravo provided audits of the Financial Report, and found the numbers to match the books.

Archive Committee; Dan Kunkle indicated that ALL previous abstracts from previous Proceedings have been scanned by Andy Senesac, and should be on the NEWSS website prior to the next meeting.
Awards committee; Report provided by Bill Curran (Past President). Reminded the attendees of the 2008 Awardees:
Distinguished Member: Jeff Derr
Award of Merit: Domingo Riego
Outstanding Educator: Mike Fidanza
Outstanding Researcher: Shawn Askew
The Robert Sweet Graduate Student Award: Jacob Barney

Summary of the Summer Weed Competition was provided by Shawn Askew, where he presented an overview of the Video that summarized the event, and which was available FREE to members.

Presentation of Graduate Student Paper Awardees: Financial awards presented by BASF, w/ Caren Judge presenting the awards:
Glenn Evans, Cornell University, 1st = 200
Alex Putnam, University Connecticut, 2nd = $100
Ruth Mick, The Pennsylvania State University Honorable Mention
Angela Post, North Carolina State University, Honorable Mention

Poster Contest: (presented by Dave Johnson)
Matt Ryan, The Pennsylvania State University 1st Place (tie) = $200
Franklin Egan, The Pennsylvania State University, 1st Place (tie) = $200

Photo Contest: (Presented by Toni DiTommaso:
Randy Prostak, Univ of Massachusetts 1st place = $100
Shawn Askew, Virginia Tech, 2ndplace = $50
Nelson DeBarros, The Pennsylvania State University, 3rd Place $25.

Research Committee: Update about states support for credit supplied by Kathie Kalmowitz. (Incoming chair for Research Committee will be Rakesh Chandran ; West Virginia Univ.)

Sustaining Associates: Update on expected $14000 support from various Industries Provided by Dave Spak. (Incoming Sustaining Associates chair will be Caren Judge)

Passing of the Gavel:
Renee Keese passed the Gavel to Jerry Baron.

NEW BUSINESS
First order of Business was to recognize Renee Keese for her excellent leadership during the past 3 years on the Executive Committee… Renee was one of those people who "got the job done"

Art Gover presented a proposed new name for the Conservation and Forestry section… This name will be taken up by the Executive Committed during the next year.

Resolution committee Chaired by Hilary Sandler, presented no new resolutions, and none were offered from the attendees.

Nomination Committee Chaired by Tim Dutt, presented Hilary Sandler and Mark VanGessel as 2 members willing to run for Office on the Executive Committee of the NEWSS.
A planned technology vote using current electronic "clickers" was abandoned after an insufficient number of the voting devices failed to register. Following the filling out of Paper Ballots by members… Hilary Sandler was the choice of the members present at the meeting.

The Nominations Committee was organized for the next year by the President selecting Bill Curran and Dan Loughner, with the Floor recommending Daren Lycan, Dave Johnson, ad Paul Stachowski. This committee will select 2 members to run for NEWSS office (by election of the membership) at the following annual business meeting.

The Resolutions Committee was organized for the upcoming year with selection of Melissa Bravo, Rob Richardson, and Joe Neal; these members agreed to serve on the committee.

Appreciation plaques were presented to Kathie Kalmowitz and Dave Spak for their recent terms as Research and Education Committee Chairperson, and Sustaining Associates Committee Chairperson , respectively.

Weed Contest to be hosted by Mark Issacs and other University of Delaware weed scientists during summer 2008.

The 2009 meeting will be held at the Renaissance Harborplace in Baltimore Jan 6-9, 2009.

Meeting called to close at 6:08 pm. Member vote = Unanimous.

Minutes Respectfully Submitted

Chris Becker
NEWSS Secretary Treasurer

NORTHEASTERN
WEED SCIENCE SOCIETY

NEWSS Financial Statement for 2007
November 1, 2006 to October 31, 2007
Prepared by Chris Becker

Category	Amount
Revenue	
Annual Meeting Registration	$14,325.00
Coffee Break Support	$0.00
Individual Membership	$7,350.00
Interest Income	$870.85
Proceedings	$3,010.00
CD's	$240.00
Sustaining Membership	$10,750.00
Symposium	$1,950.00
Polo shirts	$540.00
Weed Contest	$0.00
Total Revenue	***$39,035.85***
Expenses	
Administration	$392.02
Annual Meeting	$19,089.44
Annual Meeting Awards	$1,171.73
CAST	$603.00
Insurance	$38.14
Newsletter	$0.00
Proceedings	$3,789.61
Programs (Annual Meeting)	$1,911.20
Student Room Reimbursement	$2,835.00
Website	$1,000.00
Weed Contest	$0.00
WSSA Director of Science Policy	$750.00
Polo shirts	$801.60
Total Expenses	***$32,381.74***
Total Revenue - Expenses (Excess or Deficit)	***$6,654.11***
October 31, 2005 Savings Certificate Accounts (IDS - Ameriprise Financial)	$23,274.67
October 31, 2005 Bank of America Savings Account	$27,687.43
October 31, 2005 Bank of America Checking Account	$2,922.19
Total Net Worth October 31, 2006	***$53,884.29***
October 31, 2006 Savings Certificate Accounts (IDS - Ameriprise Financial)	$23,926.93
October 31, 2006 Bank of America Savings Account	$28,015.23
October 31, 2006 Bank of America Checking Account	$8,170.13
Total Net Worth October 31, 2007	***$60,112.29***

The Northeastern Weed Science Society Checking Account, Savings Account and Money Market Accounts were reviewed by the undersigned and are in order.

David Johnson

Melissa Bravo

January 10, 2008

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
Timothy E. Dutt	2005-06
William S. Curran	2006-07
Renee Keese	2007-08

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 University
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
2006	Steve Dennis	Syngenta Crop Protection
2007	None awarded	
2008	Domingo Riego	Monsanto

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

DISTINGUISHED MEMBERS

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 University
2005	David Vitolo	Syngenta Crop Protection
2006	A. Richard Bonnano	University of Massachusetts
	Thomas Vrabel	Eco Soil Systems, Central H.S.
2007	Larry Kuhns	Penn State University
	Brian Olsen	Dow Agrosciences
2008	Jeff Derr	Virginia Tech

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
2006	Grant Jordan	ACDS Research
2007	Peter Dernoeden	University of Maryland
2008	Shawn Askew	Virginia Tech

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
2006	Russell Hahn	Cornell University
2007	Prasanta Bhowmik	University of Massachusetts
2008	Mike Fidanza	Penn State 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
2006	1.	Steven Mirsky	Penn State University
	1.	Robert Shortell	Rutgers University
	2.	Bryan Dillehay	Penn State University
2007	1.	Bryan Dillehay	Penn State University
	2.	John Willis	Virginia Poly Inst. & State Univ.
	3.	Glenn Evans	Cornell University
2008	1.	Glenn Evans	Cornell University
	2.	Alex Putnam	University of Connecticut
	3.	Angela Post	North Carolina 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

2006 – DuPont Crop Protection, Stine Haskell Research Center, Newark, DE

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: Virender Kumar, Cornell University
Undergraduate Individual: Adam Pfeffer, University of Guelph

2007 - Virginia Tech, Blacksburg, Virginia

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: George Place, North Carolina State University
Undergraduate Individual: Craig Reid, University of Guelph

2007 - University of Delaware, Georgetown, Delaware

Graduate Team: Penn State University
Undergraduate Team: University of Guelph
Graduate Individual: Matt Ryan, Penn State University
Undergraduate Individual: Blair Scott, 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, Virginia 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 Univ.

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

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.

2006 1. Mesotrione for preemergence broadleaf weed control in turf. D. Ricker, J. Willis, and S. Askew, Virginia Tech, Blacksburg.

2. Using a wet blade mower for pest control, fertility, and growth retardation in fine turfgrass. J. Willis and S.D. Askew. Virginia Tech, Blacksburg.

2007 1. Effects of emergence periodicity on growth and fecundity of horseweed. J. Dauer, B.A. Scott, M.J. VanGessel, and D.A. Mortensen. Penn State University, College Park.

2. Vascular weed control in container production using selected non-chemical top-dress treatments. A. Burtt. University of Vermont, Burlington.

2008 1. Evaluation of the impact of an adventitious herbivore on an invasive plant, yellow toadflax, in Colorado USA. J.F. Egan and R.E. Irwin. Penn State University, State College.

1. Organic weed management: what the farmers think. M.R. Ryan, D.A. Mortensen, D.O. Wilson, and P.R. Hepperly. Penn State University, University Park.

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 Polytechnic 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	Breakfree;Harness, Surpass, Topnotch, Degree, other	2-chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide
acifluorfen	Blazer, Status Blazer Ultra	5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoic acid
acrolein		2-propenal
alachlor	Intrro, MicroTech, Partner; many	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl) acetamide
allyl alcohol		2-propen-l-ol
alloxydim	Clout	methyl 2,2-dimethyl-4,6-dioxo-5-[1-[(2-propenyloxy)amino]butylidene]cyclohexanecarboxylate
ametryn	Evik	N-ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4- diamine
amicarbazone	Dinamic	4-amino-N-(1,1-dimethylethyl)-4,5-dihydro-3-(1-methylethyl)-5-oxo-1H-1,2,4-triazole-1-carboxamide
amidosulfuron	Hoestar, Gratil, Adret	*N*-[[[[4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sufonyl]-*N*-methylmethanesulfonamide
aminocyclopyrachlor		6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid
aminopyralid	Milestone	2-pyridine carboxylic acid, 4-amino-3,6-dichloro- 2-pyridinecarboxylic acid
amitrole	Amitrol, Amizol, Azolan	1H-1,2,4-triazol-3-amine
asulam	Asulox	methyl[(4-aminophenyl)sulfonyl]carbamate
atraton	Gesatamin	N-ethyl-6-methoxy-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
atrazine	Aatrex, many	6-chloro-N-ethyl-N’-(1-methylethyl)-1,3,5-triazine-2,4-diamine
azafenidin	Milestone	2-[2,4-dichloro-5-(2-propynyloxy)phenyl]-5,6,7,8-tetrahydro-1,2,4-triazolo[4,3-a]pyridin-3(2H)-one

Common Name	Trade Name	Chemical Name
azimsulfuron	Gulliver	N-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-1 -methyl-4-(2-methyl-2H-tetrazol-5-yl)-1H-pyrazole-5-sulfonamide
barban	Carbyne, Neoban, Oatax, many	4-chloro-2-butynyl 3-chlorophenylcarbamate
BCPC		1-methylpropyl 3-chlorophenylcarbamate
beflubutamid		2-[4-fluoro-3-(trifluoromethyl)phenoxy]-*N*-(phenylmethyl)butanamide
benazolin	Galtak, Dasen, Rescate	4-chloro-2-oxo-3(2H)-benzothiazoleacetic acid
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, Betason, Prefar	O,O-bis(1-methylethyl)S-[2-[(phenylsulfonyl)amino] ethyl]phosphorodithioate
bentazon	Basagran, Lescogran, other	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H) -one 2,2-dioxide
benzadox	Topcide	[(benzoylamino)oxy]acetic acid
benzfendizone		methyl 2-[2-[[4-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)pyrimidinyl)phenoxy]methyl]-5-ethylphenoxy]propanoic acid
benzipram		3,5-dimethyl-N-(1-methylethyl)-N-(phenylmethyl)benzamide
benzofenap	Yukawide	2-[4-(2,4-dichloro-m-toluoyl)-1,3-dimethylpyrazol-5-yloxy]-4’-methy-lacetophenone
benzofluor		N-[4-(ethylthio)-2-(trifluoromethyl)phenyl]methanesulfonamide
benzoylprop	Suffix	N-benzoyl-N-(3,4-dichlorophenyl)-DL-alanine
benzthiazuron	Gatnon	N-2-benzothiazolyl-N'-methylurea
bifenox	Fox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate
borax		sodium tetraborate
bispyribac	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
bromofenoxim	Faneron	3,5-dibromo-4-hydroxybenzaldehyde O-(2,4-dinitrophenyl) oxime

Common Name	Trade Name	Chemical Name
bromoxynil	Brominal, Buctril, Moxy, many	3,5-dibromo-4-hydroxybenzonitrile
butachlor	Butanox, Pilarsete, many	N-(butoxymethyl)-2-chloro-N-(2,6-diethylphenyl)acetamide
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
butam		2,2-dimethyl-N-(1-methylethyl)-N-(phenylmethyl) propanamide
butamifos	Cremart	O-ethyl O-(5-methyl-2-nitrophenyl) 1-methylpropylphosphoramidothioate
buthidazole		3-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxy-1-methyl-2-imidazolidinone
butralin	AMEX-820, TAMEX	4-(1,1-dimethylethyl)-N-(1-methylpropyl)-2,6-dinitrobenzenamine
butroxydim	Falcon	2-[1-(ethoxyimino)propyl]-3-hydroxy-5-[2,4,6-trimethyl-3-(1-oxobutyl)phenyl]-2-cyclohexen-1-one
buturon	Butafume, Deccotane, Tutane	N'-(4-chlorophenyl)-N-methyl-N-(1-methyl-2-propynyl)urea
butylate	Sutan+, Genate Plus	S-ethyl bis(2-methylpropyl)carbamothioate
cacodylic acid	Cotton-aide, Montar, Phytar 560	dimethyl arsinic acid
cambendichlor		(phenylimino)di-2,1-ethanediyl bis(3,6-dichloro-2-methoxybenzoate)
carbetamide	Carbetamex, Legurame, Pradone	N-ethyl-2-[[(phenylamino)carbonyl]oxy]propanamide (R)-isomer
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
CDAA	Randox	2-chloro-N,N-di-2-propenylacetamide
CDEA		2-chloro-N,N-diethylacetamide
CDEC	Vegadex	2-chloro-2-propenyl diethylcarbamodithioate
CEPC		2-chloroethyl (3-chlorophenyl)carbamate
chloramben	Amiben, Amilon, Dynoram, Vegiben	3-amino-2,5-dichlorobenzoic acid

Common Name	Trade Name	Chemical Name
chlorazine		6-chloro-N,N,N',N'-tetraethyl-1,3,5-triazine-2,4-diamine
chlorbromuron	Maloran	N'-(4-bromo-3-chlorophenyl)-N-methoxy-N-methylurea
chlorbufam	Alicep, Alipur, Trixabon	1-methyl-2-propynyl (3-chlorophenyl)carbamate
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
chloroxuron	Norex, Tenoran	N'-[4-(4-chlorophenoxy)phenyl]-N,N-dimethylurea
chlorpropham	Gro-stop, Unicrop	1-methylethyl 3-chlorophenylcarbamate
chlorsulfuron	Corsair, Glean, Telar, Lesco TFCr	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) amino]carbonyl] benzenesulfonamide
chlorthiamid		2,6-dichlorobenzenecarbothiamide
chlortoluron	Alert, Culmus, Tolurex, Toluron	N'-(3-chloro-4-methylphenyl)-N,N-dimethylurea
cinmethylin	Cinch	exo-(±)-1-methyl-4-(1-methylethyl)-2-[(2-methylphenyl) methoxy]-7-oxabicyclo[2.2.1]heptane
cisanilide		cis-2,5-dimethyl-N-phenyl-1-pyrrolidinecarboxamide
clethodim	Prism, Select, Envoy	(E,E)-(±)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
clodinafop	Topik	(R)-2-[4-[(5-chloro-3-fluoro-2-pyridinyl)oxy]phenoxy]propanoic acid
clofop	Alopex	2-[4-(4-chlorophenoxy)phenoxy]propanoic acid
clomazone	Command	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone
cloproxydim		(E,E)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
clopyralid	Reclaim, Stinger, Transline, Lontrel	3,6-dichloro-2-pyridinecarboxylic acid
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

Common Name	Trade Name	Chemical Name
4-CPA	Marks 4-CPA, Poltomat, Tomadorane	(4-chlorophenoxy)acetic acid
4-CPB		4-(4-chlorophenoxy)butyric acid
CPMF		1-chloro-N'-(3,4-dichlorophenyl)-N-N-dimethylformamidine
4-CPP		2-(4-chlorophenoxy)propionic acid
CPPC		2-chloro-1-methylethyl (3-chlorophenyl)carbamate
cyanazine	Bladex	2-[[4-chloro-6-(ethylamino)-1,3,5-triazin-2-yl]amino]-2-methylpropanenitrile
cycloate	Ro-Neet	S-ethyl cyclohexylethylcarbamothioate
cyclosulfamuron	Ichiyonmaru, Nebiros Double-Up	N-[[[2-(cyclopropylcarbonyl)phenyl]amino]sulfonyl]-N'-(4,6-dimethoxy-2- pyrimidinyl)urea
cycluron		
cyhalofop	Clincher	(R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propa noic acid
cyperquat		1-methyl-4-phenylpyridinium
cyprazine	Prefox, Outfox	6-chloro-N-cyclopropyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
cyprazole		N-[5-(2-chloro-1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl] cyclopropanecarboxamide
cypromid	Clobber	N-(3,4-dichlorophenyl)cyclopropanecarboxamide
2,4-D	many	(2,4-dichlorophenoxy)acetic acid
3,4-DA		(3,4-dichlorophenoxy)acetic acid
dalapon	Dalapon, Devipon, Dalacide, Depoxim, many	2,2-dichloropropanoic acid
dazomet	Basamid	tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thio ne
2,4-DB	Butoxone, Butyrac	4-(2,4-dichlorophenoxy)butanoic acid
3,4-DB		4-(3,4-dichlorophenoxy)butanoic acid
DCB		1,2-dichlorobenzene
DCPA	Dacthal	dimethyl 2,3,5,6-tetrachloro-1,4-benzenedicarboxylate
DCU	Crag 2	N,N'-bis(2,2,2-trichloro-1-hydroxyethyl)urea
2,4-DEB		2-(2,4-dichlorophenoxy)ethyl benzoate

Common Name	Trade Name	Chemical Name
delachlor		2-chloro-N-(2,6-dimethylphenyl)-N-[(2-methylpropoxy)methyl] acetamide
2,4-DEP		tris[2-(2,4-dichlorophenoxy)ethyl]phosphite
desmedipham	Betanex	ethyl[3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate
desmetryn	Semeron	N-methyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine
diallate	Avadex, Botrizel, Pyardex, many	S-(2,3-dichloro-2-propenyl) bis(1-methylethyl)carbamothioate
dicamba	Banvel, Clarity, Vanquish	3,6-dichloro-2-methoxybenzoic acid
dichlobenil	Barrier, Casoron, Dyclomec, Norosac	2,6-dichlorobenzonitrile
dichlormate	Rowmate	3,4-dichloro benzenemethanol methylcarbamate
dichlorprop	Weedone 2,4-DP	(±)-2-(2,4-dichlorophenoxy)propanoic acid
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
dicryl		N-(3,4-dichlorophenyl)-2-methyl-2-propenamide
diethatyl	Antor	N-(chloroacetyl)-N-(2,6-diethylphenyl)glycine
difenopenten		(E)-(±)-4-[4-[4-(trifluoromethyl)phenoxy]phenoxy]-2-pentenoic acid
difenoxuron	Lironion, Pinoran	N'-[4-(4-methoxyphenoxy)phenyl]-N,N-dimethylurea
difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium
diflufenican	Cougar	N-(2,4-difluorophenyl)-2-[3-(trifluoromethyl)phenoxy]-3-pyridinecarboxamide
diflufenzopyr		2-[1-[[[(3,5-difluorophenyl)amino]carbonyl]hydrazono]ethyl]-3-pyridinecarboxylic acid
dimefuron	Ranger, Scorpio, Pradone	N'-[3-chloro-4-[5-(1,1-dimethylethyl)-2-oxo-1,3,4-oxadiazol-3(2H)-yl]phenyl]-N,N-dimethylurea
dimethachlor	Ohric	2-chloro-N-(2,6-dimethylphenyl)-N-(2-methoxyethyl) acetamide
dimethametryn	Dimepax	N-(1,2-dimethylpropyl)-N'-ethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine
dimethenamid	Frontier	2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide

Common Name	Trade Name	Chemical Name
dimethenamid-P	Outlook	(S)-2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
dinitramine	Cobexo	N^3,N^3-diethyl-2,4-dinitro-6-(trifluoromethyl)-1,3-benzenediamine
dinosam	Sinox general	2-(1-methylbutyl)-4,6-dinitrophenol
dinoseb	Basanite, Dynamyte, Dyanap, many	2-(1-methylpropyl)-4,6-dinitrophenol
dinoterb	Herbogil	2-(1,1-dimethylethyl)-4,6-dinitrophenol
diphenamid	Enide	N,N-dimethyl-a-phenyl benzeneacetamide
dipropetryn	Cotofor, Sancap	6-(ethylthio)-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
diquat	Diquat, Reglone, Reward	6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediiumion
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
DNOC	Trifocide, Trifinox, Trifrina	2-methyl-4,6-dinitrophenol
3,4-DP		2-(3,4-dichlorophenoxy) propanoic acid
DSMA	Ansar, many	disodium salt of MAA
EBEP		ethyl bis (2-ethylhexyl)phosphinate
eglinazine		N-(4-chloro-6-ethylamino-1,3,5-triazin-2-yl)glycine
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
erbon	Baron, Novege	2-(2,4,5-trichlorophenoxy)ethyl-2,2-dichloropropanoate
esprocarb	Fuji-grass	S-(phenylmethyl)(1,2-dimethylpropyl)ethylcarbamothioate
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
ethidimuron	Ustilon	N-(5-ethylsulfonyl-1,3,4-thiadiazol-2-yl)-N,N'-dimethylurea

Common Name	Trade Name	Chemical Name
ethiolate	Outfox, Prefox	S-ethyl diethylcarbamothioate
ethofumesate	Nortron	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
ethoxysulfuron	Sunrice	2-ethoxyphenyl [[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]sulfamate
EXD		diethyl thioperoxydicarbonate
fenac	Fenatrol, Rack, Trifene	2,3,6-trichlorobenzeneacetic acid
fenoxaprop	Acclaim, Horizon, Puma, Whip	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propanoic acid
fentrazamide	Innova, Lecspro	4-(2-chlorophenyl)-N-cyclohexyl-N-ethyl-4,5-dihydro-5-oxo-1H-tetrazole-1-carboxamide
fenuron	Dozer, Urab	N,N-dimethyl-N'-phenylurea
flamprop	Barnon, Suffix BW, Mataven L	N-benzoyl-N-(3-chloro-4-fluorophenyl)-DL-alanine
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
fluazifop-p	Fusilade II, Venture	(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
flucetosulfuron		1-[3-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-2-pyridinyl]-2-fluoropropyl methoxyacetate
fluchloralin	Basalin, Flusol	N-(2-chloroethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl) benzenamine
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, Flumizin, 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
fluorochloridone	Racer, Talis	3-chloro-4-(chloromethyl)-1-[3-(trifluoromethyl)phenyl]-2-pyrrolidinone
fluorodifen	Preforan	2-nitro-1-(4-nitrophenoxy)-4-trifluoromethylbenzene
fluoroglycofen	Compete	carboxymethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate
flupoxam	Quatatim	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	Lexus	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
flurtamone	Bacara, Carat, Cline, Nikeyl, Ingot, Benchmark	(±)-5-(methylamino)-2-phenyl-4-[3-(trifluoromethyl)phenyl]-3 (2H)-furanone
fluthiacet	Action, Appeal	[[2-chloro-4-fluoro-5-[(tetrahydro-3-oxo-1H,3H-[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, Ignite	2-amino-4-(hydroxymethylphosphinyl)butanoic acid

Common Name	Trade Name	Chemical Name
glyphosate	Glyphomax, Glyphos, Roundup, Touchdown; many	N-(phosphonomethyl)glycine
halosafen		5-[2-chloro-6-fluoro-4-(trifluoromethyl)phenoxy]-N-(ethylsulfonyl)-2-nitrobenzamide
halosulfuron	Manage, Permit, Sandea, Sempra, Sedgehammer	3-chloro-5-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-1-methyl-1H-pyrazole-4-carboxylic acid
haloxyfop	Vulkan, Verdict	(±)-2-[4-[[3-chloro-5-(trifluoromethyl)-2-pyridinyl]oxy] phenoxy]propanoic acid
hexaflurate		potassium hexafluoroarsenate
hexazinone	Pronone, Velpar	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-tria zine-2,4(1H,3H)-dione
imazamethabenz	Assert	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo -1H- imidazol-2-yl]-4(and 5)-methylbenzoic acid (3:2)
imazamox	ClearCast, Raptor, Odessey	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	Image, Scepter	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imidazol-2-yl]-3-quinolinecarboxylic acid
imazethapyr	NewPath, Pursuit	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid
iodosulfuron	Autumn, Husar	4-iodo-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoic acid
ioxynil	Actil, Axall, Brittox, Bentrol, Oxytril, many	4-hydroxy-3,5-diiodobenzonitrile
ipazine	Gesabal	6-chloro-N,N-diethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
IPX	Goodrite n.i.x	O-(1-methylethyl)carbonodithioate
isocarbamid	Merpelan AZ	N-(2-methylpropyl)-2-oxo-1-imidazolidinecarboxamide

Common Name	Trade Name	Chemical Name
isocil		5-bromo-6-methyl-3-(1-methylethyl)-2,4(1H,3H)-pyrimidinedione
isomethiozin	Tantizon	6-(1,1-dimethylethyl)-4-[(2-methylpropylidene)amino]-3-(methylthio)-1,2,4-triazin-5-(4H)-one
isopropalin	Paarlan	4-(1-methylethyl)-2,6-dinitro-N,N-dipropylbenzenamine
isoproturon	Zodiac, Crip, Ingot	N,N-dimethyl-N'-[4-(1-methylethyl)phenyl]urea
isouron	Isoxyl	N'-[5-(1,1-dimethylethyl)-3-isoxazolyl]-N,N-dimethylurea
isoxaben	Gallery	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dim eth- oxybenzamide
isoxaflutole	Balance, Balance Pro, Merlin	(5-cyclopropyl-4-isoxazolyl)[2-(methylsulfonyl)-4-(trifluoromethyl)-phenyl]methanone
karbutilate	Backup, Tandex, Tanzene	3-[[(dimethylamino)carbonyl]amino]phenyl (1,1-dimethylethyl)carbamate
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-)
KOCN		potassium cyanate
lactofen	Cobra	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenz oate
lenacil	Lenazar, Venar, Lanslide, Pyaracur, many	3-cyclohexyl-6,7-dihydro-1H-cyclopentapyrimidine-2,4 (3H,5H)-dione
linuron	Lorox, Linex, Afolan	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea
MAA		methylarsonic acid
MAMA		monoammonium salt of MAA
maleic hydrazide	Royal MH30, Royal Slo-Gro	1,2-dihydro-3,6-pyridazinedione
MCPA	Rhonox, other	(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
mefenacet	Rancho, Hinochloa	2-(2-benzothiazolyloxy)-N-methyl-N-phenylacetamide

Common Name	Trade Name	Chemical Name
mefluidide	Embark, Vistar	N-[2,4-dimethyl-5-[[(trifluoromethyl)sulfonyl]amino] phenyl]acetamide
mesosulfuron	Atlantis, MesoMaxx	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-4-[[methylsulfonyl)amino]methyl]benzoic acid
mesotrione	Callisto, Tenacity	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
metamitron	Seismic, Tornado, Danagan, many	4-amino-3-methyl-6-phenyl-1,2,4-triazin-5(4H)-one
metazachlor	Butisan	2-chloro-N-(2,6-dimethylphenyl)-N-(1H-pyrazol-1-ylmethyl)acetamide
methalpropalin		N-(2-methyl-2-propenyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamine
metham	Vapam	methylcarbamodithioic acid
methazole	Probe	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione
methibenzuron	Tribull, Tribunil, Trilixon	N-(2-benzothiazolyl-N,N'-dimethylurea
methoprotryn	Gesaran	N-(3-methoxypropyl)-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine
methyl bromide	Rotox, Metabrom, Pestmaster, many	bromomethane
metobromuron	Patoran, Pattonex	N'-(4-bromophenyl)-N-methoxy-N-methylurea
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
metoxuron	Dosaflo, Deftor, many	N'-(3-chloro-4-methoxyphenyl)-N,N-dimethyl urea
metribuzin	Sencor	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one

Common Name	Trade Name	Chemical Name
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
monalide	Potablan	N-(4-chlorophenyl)-2,2-dimethylpentanamide
monolinuron	Aresin, Afesin, Monamex, Premalin	N'-(4-chlorophenyl)-N-methoxy-N-methylurea
monuron	Borea, Monurex, Telvar	N'-(4-chlorophenyl)-N,N-dimethylurea
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
neburon	Granurex, Propuron, Neburex, many	N-butyl-N'-(3,4-dichlorophenyl)-N-methylurea
nicosulfuron	Accent	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino] sulfonyl]-N,N-dimethyl-3-pyridinecarboxamide
nitralin	Planavin	4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylbenzenamine
nitrofen	Trizilin	2,4-dichloro-1-(4-nitrophenoxy)benzene
nitrofluorfen		2-chloro-1-(4-nitrophenoxy)-4-(trifluoromethyl)benzene
norea	Herban	N,N-dimethyl-N'-(octahydro-4,7-methano-1H-inden-5-yl)urea 3aα,4α,5α,7α,7aα-isomer
norflurazon	Evital, Solicam, Predict, Zorial	4-chloro-5-(methylamino)-2-(3-(trifluoromethyl)phenyl)-3 (2H)-pyridazinone
OCH		2,3,4,4,5,5,6,6-octachloro-2-cyclohexen-1-one
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(3H)-one
oxadiazon	Ronstar	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2-(3H)-one
oxaziclomefone	Homerun, Samurai, Thoroughbred	3-[1-(3,5-dichlorophenyl)-1-methylethyl]-2,3-dihydro-6-methyl-5-phenyl-4H-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, other	1,1'-dimethyl-4,4'-bipyridiniumion
PBA		chlorinated benzoic acid
PCP	Dowicide, Penta, Permatox, Santophen, many	pentachlorophenol
pebulate	Tillam	S-propyl butylethylcarbamothioate
pelargonic acid	Scythe	nonanoic acid
pendimethalin	Pentagon, PendiMax, Pendulum, Prowl, 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
perfluidone	Destun	1,1,1-trifluoro-N-[2-methyl-4-(phenylsulfonyl)phenyl] methanesulfonamide
phenisopham	Diconal, Verdinal	3-[[(1-methylethoxy)carbonyl]amino]phenyl ethylphenylcarbamate
phenmedipham	Spin-Aid	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl)carbamate
picloram	Tordon, Grazon	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid
pinoxaden	Axial	8-(2,6-diethyl-4-methylphenyl)-1,2,4,5-tetrahydro-7-oxo-7H-pyrazolo[1,2-d][1,4,5]oxadiazepin-9-yl 2,2-dimethylpropanoate
piperophos	Rilof, Avirosan	S-[2-(2-methyl-1-piperidinyl)-2-oxoethyl]O,O-dipropyl phosphorodithioate
PMA	Seedtox, Mersolite, many	(acetato-O)phenylmercury
potassium azide		potassium azide
pretilachlor	Rifit, Solnet, Sofit, Sparkstar, Gorbo	2-chloro-N-(2,6-diethylphenyl)-N-(2-propoxyethyl) acetamide
primisulfuron	Beacon, Rifle	2-[[[[[4,6-bis(difluoromethoxy)-2-pyrimidinyl]amino] carbonyl]amino]sulfonyl]benzoic acid
procyazine		2-[[4-chloro-6-(cyclopropylamino)-1,3,5-triazine-2-yl]amino]-2 -methylpropanenitrile

Common Name	Trade Name	Chemical Name
prodiamine	Barricade, Factor, RegalKade	2,4 dinitro-N3,N3-dipropyl-6-(trifluoromethyl)-1,3-benzenediamine
profluralin	Tolban	N-(cyclopropylmethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamine
proglinazine		N-[4-chloro-6-(1-methylethylamino)-1,3,5-triazine-2-yl]glycine
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
propaquizafop	Falcon, Shogun, Prilan	(R)-2-[[(1-methylethylidene)amino]oxy]ethyl 2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy]propanoate
propazine	Milogard, Milocep, Milo-Pro, Gesamil	6-chloro-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
propham	Beet-Kleen, Quintex, Premalox, many	1-methylethyl phenylcarbamate
propoxy-carbazone	Attribute, Olympus	methyl 2-[[[(4,5-dihydro-4-methyl-5-oxo-3-propoxy-1H-1,2,4-triazol-1-yl)carbonyl]amino]sulfonyl]benzoate
prosulfalin	Sward	N-[[4-(dipropylamino)-3,5-dinitrophenyl]sulfonyl]-S,S-dimethylsulfilimine
prosulfocarb	Boxer, Defi	S-(phenylmethyl) dipropylcarbamothioate
prosulfuron	Peak	*N*-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]-2-(3,3,3-trifluoropropyl)benzenesulfonamide
prynachlor	Basamaize	2-chloro-N-(1-methyl-2-propynyl)-N-phenylacetamide
pyraflufen	ET	[2-chloro-5-[4-chloro-5-(difluoromethoxy)-1-methyl-1*H*-pyrazol-3-yl]-4-fluorophenoxy]acetic acid
pyrasulfatole		(5-hydroxyl-1,3-dimethyl-1H-pyrazol-4-yl)[2-(methylsulfonyl)-4-(trifluoromethyl)phenyl]methanone

Common Name	Trade Name	Chemical Name
pyrazolynate	Kusakarin	4-(2,4-dichlorobenzoyl)-1,3-dimethylpyrazol-5-ylp-toluenesulfonate(2,4-dichloropheyl)[1,3-dimethyl-5-[[4-methylphenyl)sulfonyl]oxy]-1H-pyrazol-4-yl]methanone
pyrazon	Pyramin	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone
pyrazosulfuron	Agreen, Sirius, many	5-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-1-methyl-1H-pyrazole-4-carboxylic acid
pyrazoxyfen	Paicer	2-[[4-(2,4-dichlorobenzoyl)-1,3-dimethyl-1H-pyrazol-5-yl]oxy]-1-phenylethanone
pyribenzoxium	Pyanchlor	diphenylmethanone O-[2,6-bis[(4,6-dimethoxy-2-pyrimidinyl)oxy]benzoyl]oxime
pyriclor	Daxtron	2,3,5-trichloro-4-pyridinol
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
pyroxsulam	Admitt, Powerflex, Simplicity, Merit Gold	N-(5,7-dimethoxy[1,2,4]triazolo[1,5-a]pyrimidin-2-yl)-2-methoxy-4-(trifluoromethyl)-3-pyridinesulfonamide
quinclorac	Drive, Facet	3,7-dichloro-8-quinolinecarboxylic acid
quinmerac	Rebell, Fiesta, Largo, many	7-chloro-3-methyl-8-quinolinecarboxylic acid
quinonamid		2,2-dichloro-N-(3-chloro-1,4-dihydro-1,4-dioxo-2-naphthalenyl)acetamide
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
saflufenacil	Kixor, Sharpen	2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)-pyrimidinyl[-4-fluoro-N-[[methyl(1-methylethyl)amino]sulfonyl] benzamide
secbumeton	Etazine, Sumitol	N-ethyl-6-methoxy-N'-(1-methylpropyl)-1,3,5-triazine-2,4-diamine
sethoxydim	Poast	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
sesone	Crag I	2-(2,4-dichlorophenoxy)ethyl hydrogen sulfate
siduron	Tupersan	N-(2-methylcyclohexyl)-N'-phenylurea

Common Name	Trade Name	Chemical Name
silvex	AquaVex, Kuron, many	2-(2,4,5-trichlorophenoxy)propanoic acid
simazine	Aquazine, Princep; many	6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine
simeton	Gesadural	N,N'-diethyl-6-methoxy-1,3,5-triazine-2,4-diamine
simetryn	Gy-bon	N,N'-diethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine
sodium arsenite	Kill-all, Penite, many	sodium aresenite
sodium azide	Sodium azide	sodium azide
sodium chlorate	Defol	sodium chlorate
solan (pentanochlor)	Solan	N-(3-chloro-4-methylphenyl)-2-methylpentanamide
sulcotrione	Galleon	2-[2-chloro-4-(methylsulfonyl)benzoyl]-1,3-cyclohexanedione
sulfentrazone	Authority, Spartan, Dismiss	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]amino] sulfonyl]benzoic acid
sulfosulfuron	Maverick, Outrider, Certainty	N-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-2-(ethylsulfonyl)imidazo[1,2-a]pyridine-3-sulfonamide
swep		methyl(3,4-dichlorophenyl)carbamate
2,4,5-T	Brush Killer, Super D Weedone, many	(2,4,5-trichlorophenoxy)acetic acid
2,4,5-TB		4-(2,4,5-trichlorophenoxy)butanoic acid
2,3,6-TBA	Benzac, Trysben, many	2,3,6-trichlorobenzoic acid
TCA	Revenge, Varitox, many	trichloroacetic acid
tebuthiuron	Spike	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea
tembotrione	Laudis	2-[2-chloro-4-(methylsulfonyl)-3-[(2,2,2-(trifluoroethoxy)methyl]benzoyl]-1,3-cyclohexanedione
tepraloxydim	Aramo, Equinox, Honest	2-[1-[[[(2E)-3-chloro-2-propenyl]oxy]imino]propyl]-3-hydroxy-5-(tetrahydro-2H-pyran-4-yl)-2-cyclohexen-1-one

Common Name	Trade Name	Chemical Name
terbacil	Sinbar	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H) - pyrimidinedione
terbuchlor		N-(butoxymethyl)-2-chloro-N-[2-(1,1-dimethylethyl)-6-methylphenyl]acetamide
terbumeton	Caragard	N-(1,1-dimethylethyl)-N'-ethyl-6-methoxy-1,3,5-triazine-2,4-diamine
terbuthylazine	Gardoprim, Click, Azimut, many	6-chloro-N-(1,1-dimethylethyl)-N'-ethyl-1,3,5-triazine-2,4-diamine
terbutol	Azac, Azak, Azar	2,6-bis(1,1-dimethylethyl)-4-methylphenyl methylcarbamate
terbutryn	Ternit, Terbutrex, Sunter, Short-stop, many	N-(1,1-dimethylethyl)-N'-ethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine
tetrafluron	Tomilon	N,N-dimethyl-N'-[3-(1,1,2,2-tetrafluoroethoxy)phenyl]urea
thenylchlor	Alherb	2-chloro-N-(2,6-dimethylphenyl)-N-[3-methoxy-2-thienyl)methyl]acetamide
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
thidiazuron	Dropp, other	N-phenyl-N'-1,2,3-thiadiazol-5-ylurea
thiencarbazone		4-[[[(4,5-dihyrdo-3-methoxy-4-methyl-5-oxo-1H-1,2,4-triazol-1-yl)carbonyl]amino]sulfonyl]-5-methyl-3-thiophenecarboxylic acid
thifensulfuron	Harmony GT	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid
thiobencarb	Bolero	S-[(4-chlorophenyl)methyl]diethylcarbamothioate
2,2,3-TPA		2,2,3-trichloropropionic acid
topramezone	Impact	[3-(4,5-dihydro-3-isoxazolyl)-2-methyl-4-(methylsulfonyl)phenyl](5-hydroxy-1-methyl-1*H*-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

Common Name	Trade Name	Chemical Name
tribenuron	Express	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)methylamino] carbonyl]amino]sulfonyl]benzoic acid
tricamba		2,3,5-trichloro-6-methoxy benzoic acid
triclopyr	Garlon, Grandstand, Pathfinder, Remedy, Turflon, Renovate, other	[(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid
tridiphane	Tandem	2-(3,5-dichlorophenyl)-2-(2,2,2-trichloroethyl)oxirane
trietazine	Bronox, Gesafloc, Pre-empt	6-chloro-N,N,N'-triethyl-1,3,5-triazine-2,4-diamine
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)benzenamine
triflusulfuron	UpBeet	2-[[[[[4-(dimethylamino)-6-(2,2,2-trifluoroethoxy)-1,3,5- triazin-2-yl]amino]carbonyl]amino]sulfonyl]-3-methylbenzoic acid
trimeturon		methyl N'-(4-chlorophenyl)-N,N-dimethylcarbamidate
tritac		1-[(2,3,6-trichlorophenyl)methoxy]-2-propanol
topramezone	Impact	[3-(4,5-dihydo-3-isoxazolyl)-2-methyl-4-(methylsulfonyl) phenyl](5-hydoxy-1-methyl-1H-pyrazol-4-yl)methanone
vernolate	Vernam	S-propyl dipropylcarbamothioate
xylachlor		2-chloro-N-(2,3-dimethylphenyl)-N-(1-methylethyl)acetamide

COMMON PRE-PACKAGED HERBICIDES

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

Trade Name	Common Name of Individual Herbicides [percent ai (liquid or dry) or lbs ai/gal (liquid) or lb ai/ lb product (dry) represented in parentheses]
875 BrushKiller	2,4-D (1.81 lbs or 19.49%) + mecoprop-p (0.96 lb or 10.37%) + dicamba (0.32 lb or 3.52%)
ACE Dilutable Concentrate Lawn Weed Killer	2,4-D (0.54 lb) + mecoprop-p (0.13 lb) + dicamba (0.06 lb)
Accent Gold	clopyralid (51.4%) + flumetsulam (15.9%) + nicosulfuron (5.4%) + rimsulfuron (5.4%)
Affinity Broadspec	tribenuron (25%) + thifensulfuron (25%)
Affinity Tank Mix	tribenuron (10%) + thifensulfuron (40%)
Agility SG	tribenuron (2.4%) + thifensulfuron (4.7%) + metsulfuron (1.9%) + dicamba (57.8%)
All-In-One Lawn Weed & Crabgrass Killer Ready-to-spray	2,4-D (4.03%) + quinclorac (1.61%)+ dicamba (0.37%)
All-In-One Weed Killer for Lawns Concentrate	MSMA (9.81%) + 2,4-D (2.64%) + mecoprop-p (1.32%) + dicamba (0.66%)
All-In-One Weed Killer for Lawns Ready-to-use	MSMA (0.36%) + 2,4-D (0.1%) + mecoprop-p (0.05%) + dicamba (0.02%)
AllPro BK32 Brush Killer	2,4-D (0.92 lbs or 10.6%) + dichlorprop-p (0.94 lb or 10.9%)
All-Season Brush-No-More	2,4-D (0.49 lb or 6.46%) + dichlorprop-p (0.24 lb or 3.23%) + dicamba (0.12 or 1.65%)
Ally Extra	tribenuron (18.75%) + thifensulfuron (37.5%) + metsulfuron (15%)
Arrosolo 3.3E	molinate (33.1%) + propanil (33.1%)
Atra-bute	atrazine (14.2%) + butylate (56.8%)
Authority First	sulfentrazone (62.1%) + cloransulam-methyl (7.9%)
Authority MTZ	sulfentrazone (18%) + metribuzin (27%)
Axiom	flufenacet (54.4%) + metribuzin (13.6%)
Axiom AT	flufenacet (19.6%) + metribuzin (4.9%) + atrazine (50.5%)
Backdraft	glyphosate (14.1% as its isopropylamine salt) + imazaquin (2.8%)
Banvel + 2,4-D	dicamba (1 lb or 10.3%) + 2,4-D (2.87 lb or 29.6%)
Banvel 720	dicamba (1 lb) + 2,4-D (1.9 lbs)
Banvel-K + Atrazine	dicamba (1.1 lbs or 11.45%) + atrazine (2.1 lbs or 22.23%)
Barespot Monobor-chlorate	sodium chlorate (30%) + sodium metaborate (48.5%)
Basic Solutions Lawn Weed Killer	2,4-D (0.26 lb) + dichlorprop-p (0.13 lb) + mecoprop-p (0.13 lb)
Basis	rimsulfuron (50%) + thifensulfuron (25%)

Trade Name	Common Name of Individual Herbicides [percent ai (liquid or dry) or lbs ai/gal (liquid) or lb ai/ lb product (dry) represented in parentheses]
Basis Gold	atrazine (82.4%) + nicosulfuron (1.34%) + rimsulfuron (1.34%)
Battleship	triclopyr (0.27 lb) + clopyralid (0.13 lb) + MCPA (3 lbs)
Betamix	desmedipham (8%) + phenmedipham (8%)
Bicep	atrazine (2.67 lbs or 28.9%- atrazine + related triazines) + metolachlor (3.28 lbs or 35.6%%)
Bicep Lite	atrazine (1.67 lbs or 18.3%- atrazine + related triazines) + metolachlor (3.35 lbs or 36.6%)
Bicep II	atrazine (2.67 lbs or 28.8%- atrazine + related triazines) + metolachlor (3.18 lbs or 34.8%)
Bicep Lite II	atrazine (1.67 lbs or 18.3%- atrazine + related triazines) + metolachlor (3.23 lbs or 35.3%)
Bicep II Magnum	atrazine (3.1 lbs or 33.7%- atrazine + related triazines) + s-metolachlor (2.4 lbs or 26.1%)
Bicep II Magnum FC	atrazine (3.1 lbs or 33.7%- atrazine + related triazines) + s-metolachlor (2.4 lbs or 26.1%)
Bicep Lite II Magnum	atrazine (2.67 lbs or 28.7%- atrazine + related triazines) + s-metolachlor (3.33 lbs or 35.8%)
Bison	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Bison Advanced	bromoxynil (2.5 lbs) + MCPA (2.5 lbs)
BnB Plus	phenmedipham (0.6 lb or 7%) + desmedipham (0.6 lb or 7%) + ethofumesate (0.6 lb or 7%)
Boundary 6.5EC	s-metolachlor (5.25 lbs or 58.2%) + metribuzin (1.25 lbs or 13.8%)
Brash	dicamba (1 lb or 10.3%) + 2,4-D (2.87 lbs or 29.6%)
Brawl II ATZ	atrazine (3.1 lbs or 33.7%- atrazine + related triazines) + s-metolachlor (2.4 lbs or 26.1%)
Brawn	atrazine (3.1 lbs or 33.7%- atrazine + related triazines) + s-metolachlor (2.4 lbs or 26.1%)
Breakfree ATZ	acetochlor (3 lbs or 32.6%) + atrazine (2.25 lbs or 24.4%- atrazine + related triazines)
Breakfree ATZ Lite	acetochlor (4 lbs or 43.4%) + atrazine (1.5 lbs or 16.3%- atrazine + related triazines)
Broadstrike + Dual	flumetsulam (0.2 lb) + metolachlor (7.47 lb)
Broadstrike SF + Dual	flumetsulam (0.25 lb) + metolachlor (7.47 lb)
Broadstrike + Treflan	flumetsulam (0.25 lb) + trifluralin (3.4 lb)
Bromac	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Bromac Advanced	bromoxynil (2.5 lbs) + MCPA (2.5 lbs)
Bromacil/Diuron 40/40	bromacil (40%) + diuron (40%)
Bromox/MCPA	bromoxynil (2 lbs) + MCPA (2 lbs)
Bronate	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Bronate Advanced	bromoxynil (2.5 lbs) + MCPA (2.5 lbs)
Bronco	alachlor (2.6 lbs) + glyphosate (1.04 lbs acid)
Brox-M	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Brox-M Ultra	bromoxynil (2.5 lbs) + MCPA (2.5 lbs)
Brozine	bromoxynil (1 lb or 10.81%) + atrazine (2 lbs or 21.62%)

Trade Name	Common Name of Individual Herbicides [percent ai (liquid or dry) or lbs ai/gal (liquid) or lb ai/ lb product (dry) represented in parentheses]
Brushbuster	2,4-D (1.9 lbs) + dicamba (1 lb)
Brush Buster Woody Plant	2,4-D (0.78 lb or 10.6%) + dichlorprop-p (0.4 lb or 5.4%)
Brush Killer	2,4-D (1.98 lbs or 21.54%) + mecoprop-p (0.53 lb or 5.73%) + dicamba (0.21 lb or 2.29%)
Brush killer 2-2	2,4-D (34.7% of its 2-ethylhexyl ester) + 2,4,5-T (33.1% of its 2-ethylhexyl ester)
Brush Killer Concentrate	2,4-D (0.51 lb or 6.46%) + dichlorprop-p (0.24 lb or 3.23%) + dicamba (0.13 lb or 1.65%)
Brushmaster	dicamba (0.24 lb or 3.01%) + 2,4-D (1.02 lbs or 12.5%) + dichlorprop-p (0.51 lb or 6.25%)
Brush-no-more	2,4-D (0.51 lb) + dicamba (0.13 lb) + dichlorprop (0.51 lb)
Brush-Rhap	dicamba (1.8 lbs or 18.28%) + 2,4-D (2.4 lbs or 24.62%)
Buckle	triallate (10%) + trifluralin (3%)
Buctril + Atrazine	bromoxynil (1 lb) + atrazine (2 lb)
Bullet	alachlor (2.5 lbs or 25.4%) + atrazine (1.5 lbs or 15.3%- atrazine + related triazines)
Cadence ATZ	acetochlor (3 lbs or 32.6%) + atrazine (2.25 lbs or 24.4%- atrazine + related triazines)
Cadence ATZ Lite	acetochlor (4 lbs or 43.4%) + atrazine (1.5 lbs or 16.3%- atrazine + related triazines)
Camix	s-metolachlor (3.34 lbs or 36.8%) + mesotrione (0.33 lb or 3.68%)
Campaign	glyphosate (1.2 lbs or 12.9% as its isopropylamine salt) + 2,4-D (1.9 lbs or 20.6%)
Cannon	alachlor (2.5 lbs) + trifluralin (0.5 lb)
Canon broadleaf weed killer	2,4-D (3.4% as its dimethylamine salt) + MCPP (4.3% as its diethanolamine salt)
Canopy	chlorimuron (10.7%) + metribuzin (64.3%)
Canopy XL	chlorimuron (9.4%) + sulfentrazone (46.9%)
Canopy EX	chlorimuron (22.7%) + tribenuron (6.8%)
Canvas	metsulfuron (15%) + thifensulfuron (37.5%) + tribenuron (18.75%)
Celebrity	dicamba (69.3% as its sodium salt) + nicosulfuron (7.5%)
Celebrity Plus	dicamba (42.4%) + nicosulfuron (10.6%) + diflufenzopyr (17%)
Charger MAX ATZ	atrazine (3.1 lbs or 33.7%- atrazine + related triazines) + s-metolachlor (2.4 lbs or 26.1%)
Charger MAX ATZ Lite	atrazine (2.67 lbs or 28.7%- atrazine + related triazines) + s-metolachlor (3.33 lbs or 35.8%)
Chaser	triclopyr (1 lb or 16.5% as its butoxyethyl ester)+ 2,4-D (2 lbs or 34.4% as its butoxyethyl ester)
Chaser 2	triclopyr (1.07 lbs) 2,4-D (2.78 lbs)
Chaser Ultra	MCPA (3.2 lbs) + dicamba (0.18 lb) + dichlorprop-p (0.64 lb)
Chaser Ultra 2	MCPA (3.2 lbs 33.97%) + fluroxypyr (0.32 lb or 3.4%) + dichlorprop-p (0.64 lb or 6.79%)
Cheyenne	fenoxaprop (0.79 lb) + MCPA (4 lbs)

Trade Name	Common Name of Individual Herbicides [percent ai (liquid or dry) or lbs ai/gal (liquid) or lb ai/ lb product (dry) represented in parentheses]
Cimarron Max	**Part A:** metsulfuron (60%) **Part B:** dicamba (1 lb or 10.3%) + 2,4-D (2.87 lbs or 29.6%)
Cimarron Plus	metsulfuron (48%) + chlorsulfuron (15%)
Cimarron X-tra	metsulfuron (30%) + chlorsulfuron (37.5%)
Cinch ATZ	atrazine (3.1 lbs or 33.7%- atrazine + related triazines) + s-metolachlor (2.4 lbs or 26.1%)
Cinch ATZ Lite	atrazine (2.67 lbs or 28.7%- atrazine + related triazines) + s-metolachlor (3.33 lbs or 35.8%)
Clarion	nicosulfuron (37.5%) + rimsulfuron (37.5%)
Cleanout Brush & Stump Spray	2,4-D (0.49 lb or 6.46%) + mecoprop-p (0.24 lb or 3.23%) + dicamba (0.12 lb or 1.65%)
CleanWave	aminopyralid (0.085 lbs or 1%) + fluroxypyr (1.2 lbs or 14.03%)
Clearmax	**Part A:** imazamox (1 lb) + **Part B:** MCPA (3.7 lbs)
Clearpath	imazethapyr (13.02%) + quinclorac (61.98%)
Colt	clopyralid (0.75 lb or 8.6%) + fluroxypyr (0.75 lb or 8.6%)
Colt AS	clopyralid (0.75 lb or 8.6%) + fluroxypyr (0.75 lb or 8.6%)
Conclude Ultra	bentazon (1.69 lbs) + acifluorfen (0.84 lb) + sethoxydim (1.29 lbs)
Conclude Xact	bentazon (2.67 lbs) + acifluorfen (1.33 lbs) + sethoxydim (2 lbs)
Conclude Xtra B	bentazon (2.67 lbs) + acifluorfen (1.33 lbs)
Confidence Xtra	acetochlor (4.3 lbs or 46.3%) + atrazine (1.7 lbs or 18.3%- atrazine + related triazines)
Confidence Xtra 5.6L	acetochlor (3.1 lbs or 33.4%) + atrazine (2.5 lbs or 26.9%- atrazine + related triazines)
Confront	clopyralid (0.75 lb or 7.9%) + triclopyr (2.25 lbs or 23.7%)
Contour	imazethapyr (0.38 lb) + atrazine (3 lbs- atrazine + related triazines)
Cool Power	dicamba (0.3 lb and 3.6%) + MCPA (3 lbs or 36%) + triclopyr (0.3 lb and 3.6%)
Commando	clopyralid (0.38 lb or 3.9%) + 2,4-D (2 lbs or 20.9%)
Commando M	clopyralid (0.42 lb or 5%) + MCPA (2.35 lbs or 27.8%)
Contour	imazethapyr (0.38 lb) + atrazine (3 lbs)
CoStarr	glyphosate (1.1 lbs) + dicamba (0.5 lb)
Crabgrass Preventer with Team	benefin (1.33%) + trifluralin (0.67%)
Crossbow	triclopyr (1 lb or 11.9%) + 2,4-D (2 lbs or 23.7%)
Crossbow L	triclopyr (1 lb or 11.9%) + 2,4-D (2 lbs or 23.7%)
Crossroad	triclopyr (1 lb or 11.9%) + 2,4-D (2 lbs or 23.7%)
Curtail	clopyralid (0.38 lb or 3.9%) + 2,4-D (2 lbs or 20.9%)
Curtail M	clopyralid (0.42 lb or 5%) + MCPA (2.35 lbs or 27.8%)
Cutback	clopyralid (0.38 lb or 3.9%) + 2,4-D (2 lbs or 20.9%)
Cutback M	clopyralid (0.42 lb or 5%) + MCPA (2.35 lbs or 27.8%)
Dakota	fenoxaprop (0.234 lb) + MCPA (2.8 lbs)
Degree Xtra	acetochlor (2.70 lbs or 29%) + atrazine (1.34 lbs or 14.5%- atrazine + related triazines)

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Derby	metolachlor (4%) + simazine (1%)
DiBro 2 + 2	diuron (2%) + bromacil (2%)
DiBro 4 + 2	diuron (4%) + bromacil (2%)
Dilgent	rimsulfuron + chlorimuron-ethyl + flumioxazin
Dissolve premium granular weed killer	MCPP (0.73% as its dimethylamine salt) + 2,4-D (1.4% as its dimethylamine salt) + 2,4-DP (0.71% as its dimethylamine salt)
Distinct	dicamba (50%) + diflufenzopyr (20%)
Domain	flufenacet (24%) + metribuzin (36%)
Double O E-Pro	oxyfluorfen (2%) + oryzalin (1%)
DoublePlay	acetochlor (1.4 lbs or 16.9%) + EPTC (5.6 lbs or 67.8%)
Double Team	acetochlor (3.5 lbs or 38.2%) + atrazine (1.78 lbs or 19.42%- atrazine + related triazines)
Double Up B+D	bromoxynil (2 lbs and 20.69%) + 2,4-D (1.9 lbs and 20.69%)
Duet 60DF	propanil (0.6 lb or 60%) + bensulfuron (2.1 grams or 0.46%)
Duet CA	propanil (4 lbs or 41.2%) + bensulfuron (14 grams or 0.32%)
EndRun	2,4-D (2.38 lbs or 25.38%) + mecoprop-P (0.63 lb or 6.75%) + dicamba (0.21 lb or 2.3%)
Enlite	chlorimuron (2.85%) + thifensulfuron (8.8%) + flumioxazin (36.21%)
Envert 171	2,4-D (0.95 lb) + dichlorprop-p (1.125 lbs)
Envive	chlorimuron (9.2%) + thifensulfuron (2.9%) + flumioxazin (29.2%)
Epic	flufenacet (48%) + isoxaflutole (10%)
Equip	foramsulfuron (30%) + iodosulfuron (2%)
Escalade	2,4-D (3.2 lbs or 32.83%) + fluroxypyr (0.8 lb or 8.1%) + dicamba (0.4 lb or 4.1%)
Escalade 2	2,4-D (3.2 lbs or 32.83%) + fluroxypyr (0.4 lb or 4.1%) + dicamba (0.4 lb or 4.1%)
Escalade Low Odor	2,4-D (3.2 lbs or 27.12%) + fluroxypyr (0.8 lb or 5.09%) + dicamba (0.4 lb or 3.39%)
Escalade Weed and Feed MC	2,4-D (69.75% as its 2-methylhexyl ester) + fluroxypyr (16.64% as its 1-methylheptyl ester) + dicamba (5.78% acid)
Establish ATZ	dimethenamid-P (1.7 lbs or 18.2%) + atrazine (3.3 lbs or 35.3%)
Establish Lite	dimethenamid-P (2.25 lbs or 24.1%) + atrazine (2.75 lbs or 29.5%)
Event	imazapyr (0.64%) + imazethapyr (17.26%)
Exceed	primisulfuron (28.5%) + prosulfuron (28.5%)
Expert	s-metolachlor (1.74 lbs or 18.6%) + atrazine (2.14 or 22.9%- atrazine + related triazines + glyphosate (1 lb or 10.8% as its isopropylamine salt)
Extreme	glyphosate (2 lbs or 22% as its isopropylamine salt) +

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	imazethapyr (0.17 lbs or 1.8%)
Fallow Master	glyphosate (1.6 lbs) + dicamba (0.4 lb or 4.1%)
Fallow Star	glyphosate (1.1 lbs) + dicamba (0.5 lb)
Field Master	acetochlor (2 lbs or 21.6%) + atrazine (1.5 lbs or 16.2%-atrazine + related triazines) + glyphosate (0.56 lbs acid or 0.75 lbs or 8.2% of its isopropylamine salt)
Finesse	chlorsulfuron (62.5%) + metsulfuron (12.5%)
Finesse Grass and Broadleaf	chlorsulfuron (25%) + flucarbazone (44%)
Fire Power	glyphosate (40% as its isopropylamine salt) + oxyfluorfen (2.5%)
FirstShot SG	thifensulfuron (25%) + tribenuron (25%)
ForeFront R&P	aminopyralid (0.33 lb or 3.4%) + 2,4-D (2.67 lbs or 27.2%)
Four Power Plus	2,4-D (4 lbs or 40%) + dicamba (0.5 lb or 5%)
Freedom	alachlor (2.67 lbs or 31.7%) + trifluralin (0.33 lb or 3.9%)
Freehand	dimethenamid-P (0.75%) + pendimethalin (1%)
Freestyle	thifensulfuron + tribenuron + chlorimuron-ethyl
Frontrow	**Part A:** cloransulam-methyl (0.84 lb or 84%) + **Part B:** flumetsulam (0.8 lb or 80%)
Fuego	**Part A:** dicamba (4 lbs) + **Part B:** triasulfuron (75%)
FulTime	acetochlor (2.4 lbs or 24.8%) + atrazine (1.6 lbs or 16.6%-atrazine + related triazines)
Fusion	fenoxaprop-P-ethyl (0.56 lb or 6.76%) + fluazifop-P-butyl (2 lbs or 24.15%)
Galaxy	bentazon (3 lbs or 33.4%) + acifluorfen (0.67 lb or 6.8%)
Galigan Slapshot	glyphosate (1 lb acid or 1.33 lbs or 14.2% as its isopropylamine salt) + oxyfluorfen (2 lbs or 21.1%)
Gangster	**Part V:** flumioxazin (51%) + **Part FR:** cloransulam-methyl (84%)
GlyKamba	glyphosate (1.6 lbs acid or 2.2 lbs or 23.3% as its isopropylamine salt) + dicamba (0.4 lb or 4.1%)
GlyMix MT	glyphosate (3 lbs) + 2,4-D (0.32 lb)
G-Max Lite	dimethenamid-P (2.25 lbs or 24.1%) + atrazine (2.75 lbs or 29.5%)
Grazon P+D	picloram (0.54 lb or 5.7%) + 2,4-D (2 lbs or 21.2%)
GroundClear Complete Vegetation Killer Concentrate	glyphosate (5%) + imazapyr (0.08%)
GroundClear Complete Vegetation Killer Ready-to-use	glyphosate (1%) + imazapyr (0.016%)
Guardsman	dimethenamid (2.33 lbs or 24.8%) + atrazine (2.67 lbs or 28.4%)
Guardsman Max	dimethenamid-P (1.7 lbs or 18.2%) + atrazine (3.3 lbs or 35.3%)
Gunslinger	picloram (0.54 lb or 5.7%) + 2,4-D (2 lbs or 21.2%)
Gunslinger IVM	picloram (0.54 lb or 5.7%) + 2,4-D (2 lbs or 21.2%)
Halex GT	s-metolachlor (2.09 lbs or 20.5%) + glyphosate (2.09 lbs or 20.5%) + mesotrione (0.209 lb or 2.05%)

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Harmony Extra	thifensulfuron (50%) + tribenuron (25%)
Harness Xtra	acetochlor (4.3 lbs or 46.3%) + atrazine (1.7 lbs or 18.3%- atrazine + related triazines)
Harness Xtra 5.6L	acetochlor (3.1 lbs or 33.4%) + atrazine (2.5 lbs or 26.9%- atrazine + related triazines)
HiredHand P+D	picloram (0.54 lb or 5.7%) + 2,4-D (2 lbs or 21.2%)
Horizon 2000	fenoxaprop-P-ethyl (0.56 lb or 6.76%) + fluazifop-P-butyl (2 lbs or 24.15%)
Hornet	clopyralid (62,5%) + flumetsulam (23.1%)
Horsepower	MCPA (3.8 lbs or 40%) + triclopyr (0.38 lb or 4%) + dicamba (0.38 lb or 4%)
Huskie	pyrasulfatole + bromoxynil
Imperium	acetochlor (1.4 lbs or 16.9%) + EPTC (5.6 lbs or 67.8%)
Instigate	rimsulfuron + chlorimuron-ethyl + mesotrione
Journey	glyphosate (1.5 lbs) + imazapic (0.75 lb or 8.13%)
KambaMaster	dicamba (1 lb) + 2,4-D (2.87 lbs)
Kansel Plus	oxadiazon (2%) + pendimethalin (1.25%)
Keystone	acetochlor (3 lbs or 32.6%) + atrazine (2.25 lbs or 24.4%- atrazine + related triazines)
Keystone LA	acetochlor (4 lbs or 43.4%) + atrazine (1.5 lbs or 16.3%- atrazine + related triazines)
Krovar I DF	bromacil (40%) + diuron (40%)
Laddok S-12	bentazon (2.5 lbs or 27%) + atrazine (2.5 lbs or 25%- atrazine + related triazines)
Landmark MP or XP	chlorsulfuron (25%) + sulfometuron (50%)
Landmark II MP	chlorsulfuron (18.75%) + sulfometuron (56.25%)
Landmaster	glyphosate (0.9 lbs acid / 1.2 lbs or 12.9% as its isopropylamine salt) + 2,4-D (1.5 lbs acid / 1.9 lbs or 20.6% as its isopropylamine salt)
Landmaster II	glyphosate (0.9 lbs acid/ 1.2 lbs or 13.3% as its isopropylamine salt) + 2,4-D (0.8 lb acid / 1 lb or 11.1% as its isopropylamine salt)
Landmaster BW	glyphosate (0.9 lbs acid / 1.2 lbs or 12.9% as its isopropylamine salt) + 2,4-D (1.5 lbs acid / 1.9 lbs or 20.6% as its isopropylamine salt)
Lariat	alachlor (2.5 lbs or 27.2%) + atrazine (1.5 lbs or 16.3%- atrazine + related triazines)
Layby Pro	linuron (2 lbs or 20.3%) + diuron (2 lbs or 20%)
Leadoff	dimethenamid (2.33 lbs or 24.8%) + atrazine (2.67 lbs or 28.4%- atrazine + related triazines)
Lexar	s-metolachlor (1.74 lbs or 19%) + atrazine (1.74 lbs or 19%- atrazine + related triazines) + mesotrione (0.224 lbs or 2.44%)
Liberator 600	bromacil (0.98%) + 2,4-D (1.09%)
Liberty ATZ	atrazine (3.3 lbs- atrazine + related triazines) + glufosinate (1 lb)
Lightning	imazapyr (17.5%) + imazethapyr (52.5%)

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Lumax	s-metolachlor (2.68 lbs or 29.4%) + atrazine (1 lb or 11%-atrazine + related triazines) + mesotrione (0.268 lbs or 2.94%)
Maestro D	bromoxynil (2 lbs or 20.69%) + 2,4-D (1.9 lbs or 20.69%)
Maestro MA	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Marksman	atrazine (2.1 lbs or 22.23%) + dicamba (1.1 lbs or 11.45%)
Mec Amine-D Turf Herbicide	2,4-D (2.44 lbs or 25.38%) + mecoprop-p (0.65 lb or 6.75%) + dicamba (0.22 lb or 2.3%)
Medal II AT	s-metolachlor (2.4 lbs or 26.1%) + atrazine (3.1 lbs or 33.7%)
Milestone VM Plus	aminopyralid (0.1 lb or 1.15%) + triclopyr (1 lb or 11.63%)
Millennium Ultra 2	clopyralid (0.183 lb or 1.93%) + dicamba (0.375 lb or 3.86%) + 2,4-D (3 lbs or 31%)
Misty 2 Plus 2	bromacil (2%) + diuron (2%)
Momentum Premium	triclopyr (0.27 lb) + clopyralid (0.13 lb) r + 2,4-D (2.67 lbs)
Momentum FX	triclopyr (0.229 lb) + fluroxypyr (0.571 lb) + 2,4-D (2.286 lbs)
Momentum FX2	triclopyr (0.263 lb or 2.77%) + fluroxypyr (0.278 lb or 2.92%) + 2,4-D (2.254 lbs or 23.7%)
Momentum Force Weed and Feed	2,4-D (0.955%) + mecoprop-P (0.319%) + dicamba (0.08%)
Moxy+Atrazine	bromoxynil (1 lb) + atrazine (2 lbs)
NorthStar	dicamba (39.9%) + primisulfuron (7.5%)
Oasis	2,4-D (58.2% as its 2-ethylhexyl ester) + imazapic (19.4%)
OH2 (Ornamental Herbicide)	oxyfluorfen (2%) + pendimethalin (1%)
Olympus Flex	propoxycarbazone-sodium (6.75%) + mesosulfuron-methyl (4.5%)
OneStep	imazapyr (0.637 lb or 6.82%) + glyphosate (1.531 lbs or 16.4%)
One-Step Non-Selective Weed Killer	bromacil (0.98%) + 2,4-D (1.09%)
OpTill	dicamba (1 lb) + dimethenamid (5 lbs)
Ornamental Herbicide II	oxyfluorfen (2%) + pendimethalin (1%)
Oustar	hexazinone (63.2%) + sulfometuron (11.8%)
Oust Extra	metsulfuron (15%) + sulfometuron (56.25%)
Outlaw	dicamba (1.09 lbs or 12.18%) + 2,4-D (1.45 lbs or 16.1%)
Overdrive	dicamba (0.5 lb or 50%) + diflufenzopyr (0.2 lb or 20%)
Overtime ATZ	acetochlor (32.6%) + atrazine (24.4%)
Overtime ATZ Lite	acetochlor (43.4%) + atrazine (16.3%)
Parallel Plus	metolachlor (2.7 lbs or 28.9%) + atrazine (2.8 lbs or 30.5%- atrazine + related triazines)
PastureGard	triclopyr (1.5 lbs or 17.97%) + fluroxypyr (0.5 lb or 5.99%)
PastureMaster	2,4-D (1.9 lbs) + dicamba (1 lb)
Pasture MD	2,4-D (17.9% as its diethylamine salt) + dicamba (6.2% as its dimethylamine salt) + metsulfuron (30%)
Patron 170	2,4-D (1.71 lbs or 21.3%) + dichlorprop-p (0.87 lb or

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	10.9%)
Pathway	picloram (3%) + 2,4-D (11.2%)
PD 2	picloram (0.5 lb or 5.7%) + 2,4-D (2 lbs or 21.2%) + dicamba (0.5 lb or 5.7%)
Perdition Granular	bromacil (4%) + diuron (2%)
Phenaban 801	2,4-D (3.06 lbs) + dicamba (0.4 lb)
Phenomec	2,4-D (1 lb) + mecoprop (2 lb)
Phos Free Weed & Feed 5M	2,4-D (0.64%) + mecoprop-p (0.16%) + dicamba (0.03%)
Power Zone	carfentrazone (0.04 lb or 0.48%) + dicamba (0.22 lb or 2.69%) + mecoprop-p (0.44 lb or 5.39%) + MCPA (2.21 lbs or 26.92%)
Pramitol 5 PS	prometon (5%) + simazine (0.76%) + sodium chlorate (39.8%) + sodium metaborate (40%)
PrePair	napropamide (4%) + oxadiazon (2%)
Preen Brush Weed Killer Concentrate	2,4-D (0.87 lb or 10.05%) + mecoprop-p (0.21 lb or 2.42%) + dicamba (0.1 lb or 1.11%)
Preen Brush Weed Killer Ready-to-use	2,4-D (0.03 lb or 0.33%) + mecoprop-p (0.02 lb or 0.18%) + dicamba (0.1 lb or 0.06%)
Prefix	s-metolachlor (4.34 lb or 46.4%) + fomesafen (0.95 lb or 9.7%)
Preview	chlorimuron (6.5%)+ metribuzin (68.5%)
Priority	carfentrazone-ethyl (50%)+ halosulfuron-methyl (12.5%)
Prompt	atrazine (17.5%) + bentazon (19.1% as its sodium salt)
Prompt 5L	atrazine (2.5 lbs or 25%) + bentazon (2.5 lbs or 27% as its sodium salt)
Progress	phenmedipham (0.6 lb or 7% + desmedipham (0.6 lb or 7%) + ethofumesate (0.6 lb or 7%)
Prosecutor Swift-Acting Herbicide	glyphosate (0.66 lb acid) + dicamba (0.03 lb)
Pursuit Plus	imazethapyr (0.2 lb or 2.24%) + pendimethalin (2.7 lbs or 30.24%)
Q4	quinclorac (0.5 lb or 5.69%) + sulfentrazone (0.06 lb or 0.69%) + 2,4-D (0.88 lb or 9.98%) + dicamba (0.1 lb or 1.15%)
QuikPro	diquat (0.03 lb or 2.9% as it dibromide salt) + glyphosate (1 lb or 73.3% as its ammonium salt)
Radius	flufenacet (3.57 lbs or 35.7%) + isoxaflutole (0.43 lbs or 4.29%)
Rage D-Tech	carfentrazone (0.13 lb or 1.44%) + 2,4-D (3.93 lbs)
Ramrod/Atrazine	propachlor (3 lbs) + atrazine (1 lb)
Range Star	dicamba (1 lb or 10.3%) + 2,4-D (2.87 lbs or 29.6%)
Rave	triasulfuron (8.8%) + dicamba (55%)
Razor Burn	diquat (0.11 lb active diquat or 0.21 lb or 2.1% as its dibromide salt) + glyphosate (3 lbs or 30.4% acid or 4 lbs or 41% as its isopropylamine salt)
Ready Master ATZ	atrazine (2 lbs or 20.9%) + glyphosate (1.5 lbs acid or 2 lbs or 20.9% as its isopropylamine salt)
Recoil	glyphosate (1.58 lbs acid or 2.13 lbs or 23.03% as its

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	isopropylamine salt) + 2,4-D (1.07 lbs or 11.38%)
Redeem R&P	clopyralid (0.75 lb or 7.9%) + triclopyr (2.25 lbs or 23.7%)
Refute	clopyralid (0.75 lb or 7.9%) + triclopyr (2.25 lbs or 23.7%)
Regal O-O	oxadiazon (1%) + oxyfluorfen (2%)
RegalStar G or II	oxadiazon (1%) + prodiamine (0.2%)
Resolve SG	dicamba (56.25% or 61.9% as its sodium salt) + imazethapyr (18.7%)
Rezult	Part B: bentazon (5 lbs or 53%) Part G: sethoxydim (1 lb or 13%)
Rhino	bromoxynil (2.5 lbs) + MCPA (1.9 lbs)
Rifle D	2,4-D (2.87 lbs or 29.6%) + dicamba (1 lb or 10.3%)
Rifle Plus	atrazine (2.1 lbs or 22.23%) + dicamba (1.1 lbs or 11.45%)
Rimfire	propoxycarbazone-sodium (8.14%) + mesosulfuron-methyl (2.03%)
Roundup Poison Ivy and Tough Brush Killer Plus Concentrate	glyphosate (18%) + triclopyr (2%)
Rout	oryzalin (1%) + oxyfluorfen (2%)
RT Master	glyphosate (3 lbs) + 2,4-D (0.32 lb)
Sahara DG	diuron (62.22%) + imazapyr (7.78%)
Salute	metribuzin (14%) + trifluralin (28%)
Schultz Lawn Weed Killer Concentrate	2,4-D (0.54 lb or 6.3%) + mecoprop-p (0.129 lb or 1.51%) + dicamba (0.059 lb or 0.69%)
Schultz Lawn Weed Killer Ready-to-use	2,4-D (0.493%) + mecoprop-p (0.119%) + dicamba (0.055%)
Scorpion III	2,4-D (50%) + clopyralid (25%) + flumetsulam (9.3%)
Season-Long MAX Weed and Grass Killer plus Preventer Concentrate	oxyfluorfen (1.5%) + glyphosate (8%) + diquat (0.1%)
Season-Long MAX Weed and Grass Killer plus Preventer Ready-to-use	oxyfluorfen (0.25%) + glyphosate (0.25%)
Sequence	s-metolachlor (3 lbs or 29%) + glyphosate (2.25 lbs or 21.8%)
SFM + MSM E-Pro	sulfometuron (56.25%) + metsulfuron (15%)
Shotgun	atrazine (2.25 lbs or 24.74%- atrazine + related triazines) + 2,4-D (1 lb of 2,4-D or 16.58% as its 2-ethylhexyl ester)
Showcase	trifluralin (2%) + isoxaben (0.25%) + oxyfluorfen (0.25%)
Simazat 4L	atrazine (2 lbs or 21.42%- atrazine + related triazines) + simazine (2 lbs or 21.41%)
Simazat 90DF	atrazine (45.01%- atrazine + related triazines) + simazine (45%)
Snapshot 80DF	isoxaben (20%) + oryzalin (60%)
Snapshot 2.5TG	isoxaben (0.5%) + trifluralin (2%)
Sonic	cloransulam (7.9%) + sulfentrazone (62.1%)
Southern Weed Killer for Lawns Concentrate or Ready-to-spray	2,4-D (0.311% as its dimethylamine salt) + mecoprop-p (0.075% as its dimethylamine salt) + dicamba (0.034% as

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	its dimethylamine salt)
Southern Weed Killer for Lawns Concentrate or Ready-to-use	2,4-D (6.3%) + mecoprop-p (1.51%) + dicamba (0.69%)
Speed Zone	carfentrazone (0.05 lb or 0.62%) + dicamba (0.14 lb or 1.71%) + mecoprop (0.48 lb or 5.88%) + 2,4-D (1.53 lbs or 18.95%)
Speed Zone Southern	carfentrazone (0.04 lb or 0.54%) + dicamba (0.05 lb or 0.67%) + mecoprop (0.2 lb or 2.66%) + 2,4-D (0.52 lbs or 6.96%)
Spike Treflan 6G	tebuthiuron (2%) + trifluralin (4%)
Sprakil SK-13 Granular Weed Killer	tebuthiuron (1%) + diuron (3%)
Sprakil SK-26 Granular Weed Killer	tebuthiuron (2%) + diuron (6%)
Spirit	primisulfuron (42.8%) + prosulfuron (14.2%)
Squadron	imazaquin (0.33 lb or 3.84% as its monoammonium salt) + pendimethalin (2 lbs or 21.85%))
Stalwart Xtra	metolachlor (2.4 lbs or 26.1%) + atrazine (3.1 lbs or 33.7%- atrazine + related triazines)
Stampede CM	MCPA (0.85 lbs acid or 1.4 lbs or 15% as its isooctyl ester) + propanil (3 lbs or 33%)
Staple Plus	pyrithiobac (1.7%) + glyphosate (40.2% as its isopropylamine salt)
Starane NXT	fluroxypyr (0.583 lb or 6.4%) + bromoxynil octanoate (2.33 lbs or 25.62%)
Starane NXTcp	Part A: fluroxypyr (1.5 lbs or 18.2%) + Part B: bromoxynil octanoate (2 lbs or 22.9%)
Starane + Esteron	fluroxypyr (0.75 lb) + 2,4-D (3 lbs)
Starane + MCPA	fluroxypyr (0.71 lb) + MCPA (2.84 lbs)
Starane + Saber	fluroxypyr (0.5 lb or 5.5%) + 2,4-D (2 lbs or 22%)
Starane + Salvo	fluroxypyr (0.75 lb or 8.4%) + 2,4-D (3 lbs or 33.6%)
Starane + Sword	fluroxypyr (0.71 lb or 8.3%) + MCPA (2.84 lbs or 33.3%)
Status	dicamba (40%) + diflufenzopyr (16%) + plus isoxadifen-ethyl safener
Steadfast	nicosulfuron (50%) + rimsulfuron (25%)
Steadfast ATZ	atrazine (85.3%) + nicosulfuron (2.7%) + rimsulfuron (1.3%)
Steel	imazaquin (1.9%) + imazethapyr (1.9%) + pendimethalin (25.4%)
Stellar	flumiclorac (7.6%) + lactofen (26.6%)
Sterling Plus	atrazine (2.1 lbs or 22.23%) + dicamba (1.1 lbs or 11.45%)
Stout	nicosulfuron (67.5%) + thifensulfuron (5%)
Strategy	clomazone (0.5 lb or 5.6%) + ethalfluralin (1.6 lbs or 18.2%)
Strike 3	2,4-D (2.44 lbs or 25.38%)+ dicamba (0.22 lb or 2.3%) + mecoprop-p (0.63 lb or 6.75%)
Strike 3 Ultra	2,4-D (2.9 lbs or 30%) + clopyralid (0.15 lb or 1.5%) + dichlorprop-p (0.75 or 7.8%)
Strike 3 Ultra 2	2,4-D (3.2 lbs or 32.64%) + fluroxypyr (0.4 lb or 4.08%) +

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	dichlorprop-p (0.8 lb or 8.16%)
Stronghold	imazapyr (0.01 lb or 0.14%) + imazethapyr (0.35 lb or 3.86%) + mefluidide (1.46 lbs or 16.02%)
SuperBrush Killer	2,4-D (1.89 lbs or 21.54%) + dichlorprop-p (0.94 lb or 10.77%) + dicamba (0.47 lb or 5.38%)
Super Trimec	2,4-D (1.89 lbs or 21.54%) + dicamba (0.47 lb or 5.38%) + 2,4-DP-p (0.94 lbs or 10.77%)
Suprend	prometryn (79.3%) + trifloxysulfuron (0.7%)
Surefire	paraquat (2 lbs) + diuron (1 lb)
SureStart	acetochlor (3.75 lbs or 41.67%) + flumetsulam (0.12 lb or 1.3%) + clopyralid (0.29 lb or 3.24%)
Surge	2,4-D (1.4 lbs or 15.66%), mecoprop-p (0.5 lb or 5.62%), dicamba (0.22 lb or 2.52%), sulfentrazone (0.06 lb or 0.67%)
Surmount	picloram (0.67 lb acid or 1.19 lb or 13.24% as its triisopropanolamine salt) + fluroxypyr (0.67 lb acid or 0.96 lb or 10.64% as its 1-methylheptyl ester)
Synchrony STS DF	chlorimuron (18.7%) + thifensulfuron (6.3%)
Synchrony XP	chlorimuron (21.5%) + thifensulfuron (6.9%)
STS Broadleaf	chlorimuron (10%) + thifensulfuron (30%)
Storm	bentazon (2.67 lb or 29.2% as its sodium salt) + acifluorfen (1.33 lbs or 13.4% as its sodium salt)
Tailspin	fluroxypyr (0.33 lb or 3.87%) + triclopyr (1 lb or 11.62%)
Team 2G	benefin (1.33%) + trifluralin (0.67%)
Team Pro	benefin (0.43%) + trifluralin (0.43%) + fertilizer
Telone C-15	chloropicrin (14.8%) + 1,3-dichloropropene (82.9%)
Telone C-17	chloropicrin (1.75 lbs or 16.5%) + 1,3-dichloropropene (8.6 lbs or 81.2%)
Telone C-35	chloropicrin (3.89 lbs or 34.7%) + 1,3-dichloropropene (7.1 lbs or 63.4%)
Thunder Master	glyphosate (2 lbs or 22% as its isopropylamine salt) + imazethapyr (0.17 lb or 1.8%)
Tiller	fenoxaprop (0.44 lb) + MCPA (1.75 lb) + 2,4-D (0.58 lb)
Top gun	2,4-D (71.2%) + metribuzin (18.8%)
Topsite 2G	diuron (2%) + imazapyr (0.5%)
Tordon 101 Mixture	picloram (0.54 lb or 5.7%) + 2,4-D (2 lbs or 21.2%)
Tordon RTU	picloram (3%) + 2,4-D (11.2%)
Total	bromacil (2%) + diuron (2%) + sodium chlorate (40%) + sodium metaborate (40%)
Three-way Ester II Selective	MCPA (3 lbs) + triclopyr (0.3 lb) + dicamba (0.3 lb)
Throttle XP	chlorsulfuron (9%) + sulfometuron (18%) + sulfentrazone (48%)
Traverse	rimsulfuron + chlorimuron-ethyl
Triamine	mecoprop-p (0.62 lb or 6.8%) + 2,4-D (1.24 lbs or 13.6%) + dichlorprop-p (0.62 lb or 6.8%)
Triamine Jet Spray Spot Weed	mecoprop-p (0.011 lb or 0.135%) + 2,4-D (0.023 lbs or

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Killer	0.27%) + dichlorprop-p (0.011 lb or 0.135%)
Triamine II	mecoprop-p (0.63 lb or 7%) + MCPA (1.27 lbs or 14%) + dichlorprop-p (0.63 lb or 7%)
Triangle	metolachlor (3.2 lbs or 34.5%) + atrazine (2.7 lbs or 29.1%- atrazine + related triazines)
Tri-Ester	MCPP (24.4% as its isooctyl ester) + 2,4-D (24% as its 2-ethylhexyl ester) + 2,4-DP (33.5% as its isooctyl ester)
Tri-Ester TM II	MCPP (25% as its 2-ethylhexyl ester) + MCPA (25.6% as its 2-ethylhexyl ester) + 2,4-DP (24.2% as its 2-ethylhexyll ester)
Trimec 899	dicamba (0.21 lb) + mecoprop-p (0.63 lb) + 2,4-D (2.38 lbs)
Trimec 959	dicamba (0.29 lb) + mecoprop-p (0.63 lb) + 2,4-D (2.97 lbs)
Trimec 992 or Trimec Turf Herbicide (891)	dicamba (0.21 lb or 2.3%) + mecoprop-p (0.63 lbs or 6.75%) + 2,4-D (2.38 lbs or 25.38%)
Trimec Bentgrass Formula	dicamba (0.18 lb or 2.1%) + mecoprop-p (0.71 lbs or 8.2%) + 2,4-D (0.44 lbs or 5.08%)
Trimec Classic	dicamba (0.21 lb or 2.29%) + mecoprop-p (0.53 lb or 5.73%) + 2,4-D (1.98 lbs or 21.54%)
Trimec DMB 32 S.I.	dicamba (4.3%) + mecoprop-p (10.2%) + 2,4-D (45.6%)
Trimec Encore Broadleaf	MCPA (2.97 lb or 31.59%) + mecoprop-p (0.63 lb or 6.74%) + dicamba (0.29 lbs or 3.16%)
Trimec LAF-637	dicamba (0.093 lb) + mecoprop-p (0.22 lb) + 2,4-D (0.75 lb)
Trimec Lawn Weed Killer	dicamba (0.13 lb or 1.39%) + mecoprop-p (0.55 lbs or 5.75%) + 2,4-D (3.28 lbs or 34.12%)
Trimec Plus	dicamba (0.12 lb or 1.21%) + mecoprop-p (0.24 lb or 2.42%) + 2,4-D (0.48 lb or 4.84%) + MSMA (1.8 lbs or 18%)
Trimec Southern Broadleaf Weed Killer	dicamba (0.3 lb or 3.2%) + mecoprop-p (1.32 lbs or 14.35%) + 2,4-D (1.44 lbs or 15.57%)
Trimec (Super)	2,4-D (1.89 lbs or 21.54%)+ dicamba (0.47 lb or 5.38%) + 2,4-DP-p (0.94 lb or 10.77%)
Trimec Turf	dicamba (0.22 lb or 2.33%) + mecoprop (1.3 lbs or 13.5%) + 2,4-D (2.44 lbs or 25.38%)
Triple Strike Grass Weed Root Killer2	diquat (2.3% as its dibromide salt) + fluazifop-p-butyl (0.75%) + dicamba (0.51% as its dimethylamine salt)
Triple Threat Selective Herbicide	2,4-D (0.33 lb or 3.8%) + mecoprop (0.33 lb or 3.8%) + dichlorprop (0.33 lb or 3.8%)
Triplet Hi-D	2,4-D (3.3 lb or 34.12%) + mecoprop-p (0.56 lbs or 5.75%) + dicamba (0.13 lb or 1.39%)
Triplet Low Odor	2,4-D (2.38 lb or 25.38%) + mecoprop-p (0.63 lbs or 6.75%) + dicamba (0.22 lb or 2.30%)
Triplet Selective	2,4-D (2.38 lb or 25.38%) + mecoprop-p (0.63 lbs or 6.75%) + dicamba (0.22 lb or 2.3%)
Triplet Sensitive	2,4-D (0.82 lb or 9.02%) + mecoprop-p (1.43 lbs or

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	15.63%) + dicamba (0.35 lb or 3.84%)
Triplet SF	2,4-D (2.38 lb or 25.38%) + mecoprop-p (0.63 lbs or 6.75%) + dicamba (0.22 lb or 2.30%)
Tri-Scept	Imazaquin (4.72% as its monoammonium salt) + trifluralin (28.6%)
Trizmet II	metolachlor (2.4 lbs or 26.1%) + atrazine (3.1 lbs or 33.7%- atrazine + related triazines)
TruPower	clopyralid (0.37 or 3.93%) + dicamba (0.37 lb or 3.93%) + MCPA (3.75 lbs or 39.3%)
TruPower II	2,4-D (2.45 lbs or 26%) + dicamba (0.31 lb or 3.24%) + mecoprop-p (0.61 lb or 6.5%)
Turbo	metolachlor (6.55 lbs or 70%) + metribuzin (1.45 lbs or 15%)
Turf Weed & Brush	2,4-D (1.71 lbs or 21.3%) + dichlorprop-p (0.87lb or 10.9%)
Turflon D	2,4-D (2 lbs) + triclopyr (1 lb)
Turflon II Amine	2,4-D (2.78 lbs or 28.4%) + triclopyr (1.07 lbs or 10.9%)
Typhoon	fluazifop-p-butyl (5.3%) + fomesafen (11% as its sodium salt)
Ureabor	sodium metaborate (66.5%) + sodium chlorate (30%) + bromacil (1.5%)
Vegemac	2,4-D (1%) + premeton (3.6%)
Valor XLT	flumioxazin (30%) + chlorimuron (10.3%)
Velpar Alfamax	hexazinone (35.3%) + diuron (42.4%)
Velpar Alfamax Gold	hexazinone (23.1%) + diuron (55.4%)
Velpar K-4 Max	hexazinone (17.3%) + diuron (61.5%)
Vendetta	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Vengeance	2,4-D (2.5 lbs) + dicamba (1.25 lbs)
Vengeance Plus	MCPA (3.72 lbs or 38.27%) + triclopyr (0.75 lb or 7.65%) + dichlorprop-p (0.75 lb or 7.65%)
Vessel	dicamba (0.21 lb) + mecoprop-p (0.63 lb) + 2,4-D (2.38 lbs)
Vigoro Ultra Turf Lawn Weed Control	2,4-D (1.37%) + mecoprop-p (0.31%) + dicamba (0.13%)
Vigoro Ultra Turf Weed and Feed	2,4-D (0.26 lb or 2.7%) + mecoprop-p (0.13 lb or 1.35%) + dichlorprop-p (0.13 lb or 1.35%)
Volley ATZ	acetochlor (3 lbs or 32.6%) + atrazine (2.25 lbs or 24.4%- atrazine + related triazines)
Volley ATZ Lite	acetochlor (4 lbs or 43.4%) + atrazine (1.5 lbs or 16.3%- atrazine + related triazines)
Weed and Grass Killer	diquat (0.18% as its dibromide salt) + fluazifop-p-butyl (0.06%) + dicamba (0.04% as its dimethylamine salt)
Weed-B-Gon MAX plus Crabgrass Control Ready-to-use	2,4-D (0.12%) + quinclorac (10%) + MCPP (0.22%) + dicamba (0.05%)
Weed-B-Gon MAX Weed Killer for Lawns Ready-to-use	2,4-D (0.12%) + MCPP (0.22%) + dicamba (0.05%)

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Weed-B-Gon MAX Weed Killer for Lawns Ready-spray or Concentrate	triclopyr (1.56%) + MCPA (13.72%) + dicamba (1.35%)
Weed-B-Gon for Southern Lawns Ready-spray or Concentrate	2,4-D (3.05%) + MCPP (5.3%) + dicamba (1.3%)
Weed Blast	bromacil (4%) + diuron (4%)
Weed Blast 4G	bromacil (2%) + diuron (2%)
Weed & Feed 5M	2,4-D (0.64%) + mecoprop-p (0.16%) + dicamba (0.03%)
Weed & Feed 15M	2,4-D (1.108% as its ethylhexyl ester) + mecoprop-p (0.167%) + dicamba (0.71%)
Weed Free 75	trifluralin (3%) + oxyfluorfen (2%)
Weedking	2,4-D (2.87 lbs) + dicamba (1 lb)
Weedmaster	dicamba (1 lb or 10.3%) + 2,4-D (2.87 lbs or 29.6%)
Weed Out	2,4-D (1.09%) + bromacil (0.98%)
Weed Stop 2X Weed Killer for Lawns Concentrate	2,4-D (0.54 lb or 6.31%) + mecoprop-p (0.19 lb or 2.25%) + dicamba (0.05 lb or 0.59%) + sulfentrazone (0.02 lb or 0.18%)
Weed Stop 2X Weed Killer for Lawns Ready-to-use	2,4-D (0.285%) + mecoprop-p (0.102%) + dicamba (0.027%) + sulfentrazone (0.008%)
Westar	hexazinone (68.6%) + sulfometuron (6.5%)
WideMatch	clopyralid (0.75 lb or 8.6%) + fluroxypyr (0.75 lb or 8.6%)
WideMatch M	Part S: fluroxypyr (1.5 lbs or 18.2%) + Part CM: clopyralid (0.42 lb or 5%) + MCPA (2.35 lbs or 27.8%)
Wildcard Xtra	bromoxynil (2 lbs or 21.8%) + MCPA (2 lbs or 21.8%)
Wil-Power	MCPA (3.72 lbs or 38.27%)+ triclopyr (0.75 lb or 7.65%) + dichlorprop-p (0.75 lb or 7.65%)
XL 2G	benefin (1%) + oryzalin (1%)
Yukon	dicamba (55% as its sodium salt) + halosulfuron (12.5%)

EXPERIMENTAL HERBICIDES

Experimental Number	Common Name (Proposed), Trade Name, Company Name
AC-900001	picolinafen/Pico, BASF
BK-800	Uniroyal
CGA-277476	oxasulfuron/Dynam, Syngenta
DPX-KJM44	aminocyclopyrachlor-methyl; DuPont
DPX-MAT28	aminocyclopyrachlor; DuPont
DPX-QKC88	DuPont
F4113	carfentrazone + glyphosate, FMC
F6875	sulfentrazone + prodiamine, FMC
KIH-485	pyroxasulfone, Kumiai
V-3153	flufenapyr, Valent

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

<u>*Disclaimer*</u>

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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