2006 Turf Weed Research

In 2006, 42 experiments and ongoing projects were conducted. Funding for specific studies was provided by 12 companies. The following is a summary of each study or project and broad conclusions drawn form 2006 research.

Research in 2006 was conducted in two places. Investigation of preemergence and postemergence crabgrass control is often conducted at the Evergreen Cemetery in Lansing, MI because it has consistently high crabgrass pressure. Most broadleaf weed, turfgrass safety, and research on closely managed turf is conducted, however, at the Hancock Turfgrass Research Center (HTRC) at Michigan State University in East Lansing, MI. Unless otherwise noted, all liquid treatments were applied with a CO_2 powered backpack sprayer at 62.5 gallons per acre (gpa) and all granular treatments were hand applied with a shaker bottle in two directions. Injury evaluations for applicable studies are made on a 1-9 scale, where 1= no injury and 9= dead turf. Quality evaluations for applicable studies are made on a 9-1 scale, where 9= highest relative quality and 1= lowest relative quality. Quality evaluations are based on turf color, uprightness, density, and overall surface uniformity. All statistical analysis was performed with ARM 7.0 (Gylling Data Management, Inc., Brookings, SD).

Postemergence Crabgrass Control

Nine postemergence crabgrass trials were conducted in 2006. Herbicide applications were made when the majority of crabgrass was in the 1-3 leaf growth stage. Adequate rainfall in June facilitated excellent germination of crabgrass. Above average summer temperatures ensured the development of these plants and their

persistence within the turfgrass. Percent control was determined for each species in each trial using the Henderson-Tilton pre-count/post-count method.

Seven trials were conducted at Evergreen Cemetery to evaluate mesotrione, with and without other compounds, as a granular postemergence crabgrass herbicide. Both smooth and large crabgrass were present throughout the study. Initial crabgrass populations were measured in plots of each trial prior to herbicide applications. Three studies were applied to dry and wet turf to total six studies: Mesotrione Only, Mesotrione + Dithiopyr, and Mesotrione + Carfentrazone. The seventh study evaluated Mesotrione Only and Mesotrione + Prodiamine.

The Postemergence Crabgrass Control with Mesotrione Trial (Wet Turf) was treated on 29 June. Percent control was assessed on 19 July and 21 August, 20 and 53 days after treatment (DAT), respectively. Results from this trial are shown in Table 1. Callisto 4SC at 0.25 lbs ai/A provided the best control of crabgrass on both rating dates. Fifty-three DAT, AND6064, AND6070, AND6076, AND6063, AND6069, AND6117, AND6127, and Callisto 4SC at 0.15 lbs ai/A, provided good control of crabgrass. On the same date, AND6075, AND6111, AND6126, AND6130, provided moderate crabgrass control, while all other treatments did not differ from untreated.

The Postemergence Crabgrass Control with Mesotrione Trial (Dry Turf) was treated on 28 June. Percent control was assessed on 19 July and 21 August, 21 and 54 DAT, respectively. Results from this trial are shown in Table 2. Fifty-four DAT, AND6064, AND6117, AND6126, AND6127, and Callisto 4SC at 0.25 lbs ai/A, provided good to excellent control of crabgrass. On the same date, AND6070, AND6076, AND6111, AND6110, AND6129, AND6130, AND6131, and Callisto 4SC at 0.15 lbs ai/A

provided moderate crabgrass control, while all other treatments did not differ from untreated.

The Postemergence Crabgrass Control with Mesotrione + Dithiopyr Trial (Wet Turf) was treated on 29 June. Percent control was assessed on 18 July and 21 August, 19 and 53 DAT, respectively. Results from this trial are shown in Table 3. Fifty-three DAT, AND6068, AND6074, AND6114, and the two higher rates of Callisto 4SC + Dimension Ultra 40 WP provided good control of crabgrass. On the same rating date, AND6159, AND6161, AND6115, and AND6120 provided moderate control of crabgrass, while all other treatments provided poor crabgrass control.

The Postemergence Crabgrass Control with Mesotrione + Dithiopyr Trial (Dry Turf) was treated on 29 June. Percent control was assessed on 19 July and 22 August, 20 and 54 DAT, respectively. Results from this trial are shown in Table 4. Fifty-four DAT, all liquid (sprayed) treatments provided good-excellent control of crabgrass. On the same rating date, AND6159, AND6074, AND6067, AND6073, AND6115, AND6121, and AND6120 provided good control of crabgrass, while AND6160, AND6161, AND6079, AND6114, AND6108, and Dimension 0.25G provided moderate crabgrass control. All other treatments provided poor or no control of crabgrass.

The Postemergence Crabgrass Control with Mesotrione + Carfentrazone Trial (Wet Turf) was treated on 29 June. Percent control was assessed on 18 July and 21 August, 19 and 53 DAT, respectively. Results from this trial are shown in Table 5. The treatment factor for the last rating date (21 August) was significant at the LSD (p=0.10) level only and is so presented in Table 5. Fifty-three DAT, all of the treatments, granular and sprayable, provided moderate crabgrass control; however, they did not significantly differ from each other.

The Postemergence Crabgrass Control with Mesotrione + Carfentrazone Trial (Dry Turf) was treated on 28 June. Percent control was assessed on 18 July and 21 August, 20 and 54 DAT, respectively. Results from this trial are shown in Table 6. Fifty-four DAT, AND6119, AND6106, and both sprayable treatments provided excellent crabgrass control. All other treatments on this date provided moderate to good crabgrass control. These treatments performed much better on dry turf than wet turf; perhaps, because the dry turf trial (mesotrione + carfentrazone), unlike any of the other five trials, was laid out in an area with a much thicker and healthier stand of Kentucky bluegrass. This turfgrass stand may have added to the herbicides' effectiveness by competing with crabgrass for light, nutrients, and water.

Although the wet turf trials seemed to show injury sooner than the dry trials, the treatments in the dry trials proved to provide better crabgrass control in the long run. The sprayable treatments definitely outperformed the granular products; however, there were a few granular products, such as AND6106, AND6068, and AND6064, that compared to these sprayable treatments in their respective trials. There were also granular products that performed well in their respective wet turf trials, but did not perform well in the counterpart dry turf trials, such as AND6068, and vice-versa, such as AND6067 and AND6073.

The Postemergence Crabgrass Control with Mesotrione Only and Mesotrione + Prodiamine Trial was treated on June 29 and July 31, 2006. Results from this trial are shown in Table 7. A key is provided in Table 8 breaking down the components of the following compounds. Plots treated with EXC934, EXC924+EXC878 (21 DAT-A), EXC924, and EXC925 did not differ from untreated plots on either rating date. Plots treated with EXC925+EXC934 (21 DAT-A) did not differ from untreated plots

on the first rating date, but exhibited some, albeit poor, control of crabgrass on the second rating date. EXC878, EXC881+EXC878 (21 DAT-A), EXC878+EXC878 (21 DAT-A), and EXC 881 provided good to very good control of crabgrass on both rating dates. EXC923+EXC934 (21 DAT-A) provided mediocre control of crabgrass early and good control after the second application. EXC923 provided mediocre control of crabgrass on both rating dates.

The Mesotrione Turf Safety Trial was conducted at the HTRC. The mesotrione treatments were applied on July 6, 2006 and July 29, 2006. A nonionic surfactant was included with each application of mesotrione at 0.25 % v/v. Turf phytotoxicity was evaluated for Rhino Select turf mixture including 20% 'Viva,' 20% 'Blue Chip,' and 20% 'Baron' Kentucky bluegrasses, 20% 'K-2' chewings fescue, and 20% 'Stellar' perennial ryegrass. Injury was evaluated for each turf species and mixture. Mesotrione proved to be very safe on this turf mixture (Table 9). Injury reached its maximum 8 DAT-B (days after treatment B) of 3.0, exhibited by the repeat application of 0.5 + 0.5 lb ai/A mesotrione rate. Plots treated with a single application of mesotrione at any rate never significantly differed from the untreated plots. Turfgrass injury from repeat application treatments disappeared by 15 DAT-B. Overall response to the repeat applications increased injury after the second application, but followed a similar recovery timetable. The Rhino Select turf mixture seemed adequately tolerant to all mesotrione applications, regardless of rate. The chewings fescue within the mixture seemed to be the only turf species that displayed noticeable injury during the trial period.

The QP Quin and QP Tric Postemergence Crabgrass Control Trial was treated on 29 June and the two repeat treatments were applied on 31 July. This trial tested Quali Pro's version of triclopyr (QP Tric) and quinclorac (QP Quin) for

postemergence control of crabgrass at Evergreen Cemetery. Percent control was determined for crabgrass using the Henderson-Tilton pre-count/post-count method. All Drive and QP Quin treatments were tank-mixed with an adjuvant (Microyl), unless it was paired with QP triclopyr in a treatment. Results from this trial are shown in Table 10. Thirteen and twenty-five DAT-A, all Drive and QP Quin provided excellent crabgrass control. By 53 DAT-A the repeat application treatments and the high rate, single application of QP Quin provided the best control of crabgrass.

Preemergence Crabgrass Control

Preemergence crabgrass control trials are established in areas with histories of heavy crabgrass pressure and rotated yearly to ensure strong crabgrass seed-bank populations. In 2006, one general preemergence crabgrass control trial and two preemergence crabgrass/broadleaf control studies were conducted. As aforementioned, crabgrass pressure was strong in 2006 and included smooth and large crabgrass.

The 2006 General Preemergence Crabgrass Control Trial was conducted at the HTRC and included various formulations of Dimension and Pendulum. Treatments were applied on April 18, 2006. Results from this trial are shown in Table 12. While Dimension 1EC, Ultra 2EW, and Ultra 40WSP were compared in this trial at 0.5 lb ai/A, Pendulum 3.3EC and 3.8CS were also included as a single application at 2 lb ai/A and each as split applications of 1+1 lb ai/A. Crabgrass populations were measured June 7, July 13, and August 1, 2006. All Dimension formulations included in this trial provided excellent crabgrass control at all three evaluation dates. Pendulum 3.3EC and 3.8CS also provided excellent crabgrass control regardless of application timings. Dithiopyr and pendimethalin, regardless of formulation type, continue to be very consistent performers in our preemergence crabgrass trials.

A preemergence crabgrass/broadleaf trial was conducted to evaluate carfentrazone (Quicksilver) in combination with prodiamine (Barricade) and a confidential numbered compound, EF-1343, in combination with liquid dithiopyr (Dimension). **The Preemergence Crabgrass and Broadleaf Weed Control Trial #1** treatments were applied at Evergreen Cemetery on April 21, 2006. The treatment list and results for this trial are shown in Table 13. Crabgrass populations were measured June 9 and July 12, 2006. Yellow woodsorrel (*Oxalis stricta*) populations were measured June 23 and July 12, 2006. All treatments including Barricade 4FL and Dimension Ultra 2EW provided excellent crabgrass control at both evaluation dates. Neither EF-1343 alone nor Quicksilver T&O alone provided any crabgrass control. There were no differences noticed between any of the treatments for preemergence yellow woodsorrel control (data not presented).

The Preemergence Crabgrass and Broadleaf Weed Control Trial #2 was conducted to assess sulfentrazone and sulfentrazone + prodiamine. Treatments were applied at Evergreen Cemetery on April 21, 2006. Table 14 contains the complete treatment list and results for this trial. The crabgrass population in each plot was assessed on June 9, June 20, and June 12, 2006. The active ingredient in Dismiss is sulfentrazone and the numbered compound, F6875, is a granular form of sulfentrazone + prodiamine. During the trial period, Dimension 1EC, F6875 Gran, and all treatments including Barricade 4 FL provided excellent crabgrass control. Both rates of F6285 Gran Fert provided good control of crabgrass. All treatments including only Dismiss 4F did not differ from untreated by the end of the trial period. Yellow woodsorrel populations were measured June 23 and July 12, 2006. There were no differences noticed between any of the treatments for preemergence yellow woodsorrel control (data not presented).

Postemergence Broadleaf Weed Control

Nine postemergence broadleaf weed control trials were conducted at the HTRC in 2006. Dandelion (*Taraxacum officinale*), white clover (*Trifolium repens*), and broadleaf plantain (*Plantago major*) were all well represented in each of the trial areas. Percent control was determined for each species using the Henderson-Tilton pre-count/post-count method.

The Wilbur-Ellis/Precision Labs Broadleaf Weed Control Trial was treated on 8 June. Weed population assessments were made on 30 June (22 DAT), 7 July (29 DAT), and 1 August (54 DAT). Three Wilbur-Ellis compounds were assessed as well as three Precision Labs adjuvants, Microyl, Delux, and an Experimental Adjuvant. Trimec Classic (amine), Super Trimec (ester), and Escalade were included in this trial as comparison treatments. Tables presenting the adjuvants' comparisons are shown in Tables 15-17 and Table 18 shows the coded Wilbur Ellis products' comparison separately.

Dandelion: Fifty four DAT, WECO WPHA + Bronc Plus Dry and Super Trimec +Delux provided poor dandelion control, while WECO WPE + Bronc Plus and Super Trimec + Experimental Adjuvant provided moderate dandelion control. Trimec Classic stood out, providing excellent dandelion control 54 DAT. All other treatments on this date provided good dandelion control and did not statistically differ from each other.

White Clover: All treated plots exhibited good to excellent control of white clover on every rating date. Fifty four DAT, WECO WPHA +Bronc Plus Dry was the only treatment that provided less white clover control than any other treatment.

Broadleaf Plantain: Twenty nine DAT, all treatments, except WECO WPE + Bronc Plus Dry and Super Trimec + Experimental Adjuvant, provided good to excellent control of broadleaf plantain. Fifty four DAT, enough broadleaf plantain had either recovered or newly germinated to show no statistical differences between treatments.

An identical trial was initiated on 27 July, 2006 to investigate the safety of the same treatments from the broadleaf trial on a typical turfgrass mixture. **The Wilbur Ellis/Precision Labs Turf Safety Trial** was conducted on the Rhino Select turf mixture, which is comprised of 20% 'Viva,' 20% 'Blue Chip,' and 20% 'Baron' Kentucky bluegrasses, 20% 'K-2' chewings fescue, and 20% 'Stellar' perennial ryegrass. There was no turfgrass injury noticed on the entire trial area at any time (data not presented).

The Broadleaf Weed Control with EF-1343 Trial was treated on June 16, 2006. EF-1343 is a numbered compound provided by Dow AgroSciences. Dandelion and white clover were well represented in the trial area, while broadleaf plantain was sparse. The complete treatment list and results from this trial are shown in Table 19. Dandelion, white clover, and broadleaf plantain populations were evaluated on August 22.

Dandelion: Confront, Trimec Classic, and the high rate of EF-1343 (0.013 lb ai/A)+Spotlight+2,4-D provided the best control of dandelion. Plots treated with the low rate of EF-1343 (0.009 lb ai/A), the low rate of EF-1343+2,4-D, the high rate of EF-1343+2,4-D, and the low rate of EF-1343+Banvel+2,4-D did not differ from untreated plots in dandelion control.

White Clover: Confront, Trimec Classic, high rate EF-1343+Spotlight+2,4-D, high rate EF-1343+Banvel+2,4-D, low rate EF-1343+Banvel+2,4-D, and high rate EF-1343 provided excellent control of white clover. Plots treated with low rate EF-1343 did not

differ from untreated plots, while all other treated plots exhibited good white clover control.

Broadleaf Plantain: There were no differences in broadleaf plantain control among treatments, which may be due to the lack of an adequate or even population within the trial area.

Liquid and granular formulations of F6875 (sulfentrazone + prodiamine) and Dismiss 4F (sulfentrazone) were evaluated for FMC at the HTRC in 2006. **The Postemergence Broadleaf Weed Control with F6875 Trial** was treated on 16 June, 2006. Percent control was determined 1 August (46 DAT). Table 20 contains the complete treatment list and results for this trial.

Dandelion: Trimec Classic provided good control of dandelion. All Dismiss 4F treatments and F6875 Gran at 0.125 lb ai/A provided moderate control of dandelion, while all other treatments did not significantly differ from the untreated.

White Clover and Broadleaf Plantain: No treatments significantly differed from the untreated. Trimec Classic provided good control of white clover, but it was only significant at the p=0.10 LSD level.

The Broadleaf Weed Control with V-10142 Trial was treated on 16 June for Valent USA. Population assessments were made on 30 June (14 DAT), 7 July (21 DAT), 13 July (27 DAT), and 1 August (46 DAT). V-10142 is an unknown numbered compound provided by Valent USA. Speedzone and Turflon were included in this trial as comparison treatments. Tables 21-23 contain the complete treatment list and results for this trial.

Dandelion: Twenty-seven DAT, Turflon provided good control of dandelion, while all other treatments provided excellent dandelion control. However, 46 DAT, all treatments

including V-10142 + Turflon were still providing good to excellent dandelion control, but the dandelion control by all other treatments had markedly declined.

White Clover: V-10142 + Resource and V-10142 + NIS provided poor control of white clover. All other treatments, though, provided good to excellent control of white clover on all rating dates.

Broadleaf Plantain: It was apparent that activity on broadleaf plantain happened slowly with all treatments. Again, V-10142 + Resource and V-10142 + NIS provided poor control of broadleaf plantain, while all other treatments provided moderate control.

V-10142 did not perform well alone or with Resource on any of the three aforementioned weeds. The addition of V-10142 to Turflon was only beneficial for control of dandelion 46 DAT. Turflon did not differ from V-10142 + Turflon at any rate for control of white clover or broadleaf plantain.

The 2006 Granular Mesotrione Broadleaf Weed Control Trial was conducted at the HTRC. Granular mesotrione treatments were applied on June 7 and June 30, 2006. Dandelion and broadleaf plantain were well represented in the trial area, while white clover was sparse. Weed populations were measured on August 1, 2006. Mesotrione activity in the weeds was very slow, so injury ratings were often taken between the first application and the population rating on August 1; however, they are not shown in this report. Table 24 contains the complete treatment list and results for this trial. The corresponding active ingredients to the coded compounds can be found in Table 8.

Dandelion: EXC878 (21 DAT-A), EXC878 (21 DAT-A), EXC923+EXC934 (21 DAT-A), EXC925+EXC934 (21 DAT-A), EXC924+EXC878 (21 DAT-A), EXC881+EXC878 (21 DAT-

A), EXC878+EXC878 (21 DAT-A) provided moderate control of dandelion. EXC924 provided no dandelion control, while all other treatments provided poor control of dandelion.

Broadleaf Plantain: EXC878 (21 DAT-A), EXC878, EXC934, EXC923+EXC934 (21 DAT-A), EXC925+EXC934 (21 DAT-A), and EXC924 provided moderate to good control of broadleaf plantain. All other treated plots did not significantly differ in broadleaf plantain control from untreated plots.

White Clover: Because white clover was not well represented in the whole trial area, it was difficult to get a true read on the differences between treatments for control. Because of this, the LSD (p=0.05) was very high and showed no differences among treatments for white clover control.

QualiPro's version of triclopyr (QP Tric) and quinclorac (QP Quin) were also tested in a postemergence broadleaf weed control trial at the HTRC. **The QP Quin and QP Tric Broadleaf Weed Control Trial** was treated on 6 July and the two repeat treatments were applied on 7 August. Results from this trial are shown in Table 25.

Dandelion: Twenty-two DAT-A (days after treatment A) the three treatments that included QP Tric provided excellent control of dandelion; however, 63 DAT-A, the repeat application treatments, both Drive and QP Quin, provided the best control of dandelion.

White Clover: All treatments, except QP Tric at 1 pt/A, provided excellent control of white clover by 63 DAT-A, while QP Tric at 1 pt/A provided relatively good control of white clover.

Broadleaf Plantain: All treatments that included QP Tric provided good control of broadleaf plantain, while all other treatments provided no control of broadleaf plantain.

Three other postemergence broadleaf weed control trials in 2006 were conducted under confidentiality agreements. Therefore, the neither the treatment lists nor the results are shown.

Yellow Nutsedge Control

An experiment was conducted to explore herbicide differences on yellow nutsedge control (*Cyperus esculentus*). **The Postemergence Yellow Nutsedge (*Cyperus esculentus*) Control Trial** was treated on 6 July and all sequential applications were made again on 7 August, 32 days after treatment A (DAT-A). Yellow nutsedge pressure as percent plot coverage was determined prior to treatment application for each plot. Percent control was determined 28 July (22 DAT-A) and 15 August (40 DAT-A) using the Henderson-Tilton pre-count/post-count method. Table 26 contains the complete treatment list and results for this trial. F6011 is a confidential compound provided by FMC.

Twenty-two DAT-A, Certainty, which was included as a comparison, all treatments that included Dismiss 4F at any rate, and the higher rate of Dismiss Granular provided good to excellent control of yellow nutsedge. Forty DAT-A (8 DAT-B), repeat applications of Dismiss 4F, the single high rate of Dismiss 4F, the repeat application of Dismiss Granular, and Certainty provided excellent control of yellow nutsedge. Throughout the trial period the low rate, single application of Dismiss Granular and all rates of F6011 alone provided poor control of yellow nutsedge.

Certainty Turf Herbicide (sulfosulfuron)

Three trials were conducted to evaluate the safety of Certainty Turf Herbicide on Kentucky bluegrass and creeping bentgrass and its ability to control tall fescue. Each

study was first treated 27 July and repeat applications were made on 17 August at the HTRC. A nonionic surfactant was included with each treatment in all three studies summarized hereafter. Turf injury was evaluated in each study using the 1-9 scale, where 1= no injury and 9= dead turf.

The Tall Fescue Control with Certainty Trial was conducted on a 100% 'Arid' tall fescue turf stand mowed at 3.5 inches. On 7 and 12 September, percent control of tall fescue was evaluated. Results for this trial are shown in Table 27. Although Certainty seemed to act slowly, it displayed excellent control of tall fescue 42 days after the first treatment (DAT-A). Even with a lack of competition from other turfgrass species, the tall fescue showed little ability to recover from the high rate Certainty treatment. A repeat application of Certainty at either rate was necessary to adequately control tall fescue.

The Certainty Safety on Kentucky Bluegrass Trial was conducted on a 100% stand of 'Limousine' Kentucky bluegrass maintained at fairway height. Injury was evaluated throughout the trial period and is presented in Table 28. Injury on Kentucky bluegrass never exceeded a rating of 3.3 at any application rate, which can definitely be tolerated. All signs of injury disappeared by 15 DAT-A and 21 DAT-B regardless of application rate. Certainty proved to be moderately safe on fairway height 'Limousine' Kentucky bluegrass.

The Certainty Safety on Creeping Bentgrass Trial was conducted on a 100% stand of 'Penncross' creeping bentgrass maintained at fairway height. The first treatments were applied 27 July and the repeat treatments were applied three weeks later on 17 August. Injury was evaluated throughout the trial period and is presented in Table 29. Injury on creeping bentgrass never exceeded a rating of 3 at any application

rate, which can definitely be tolerated. All signs of injury disappeared by 15 DAT-A and 11 DAT-B regardless of application rate. Certainty proved to be moderately safe on fairway height 'Penncross' creeping bentgrass.

Annual Bluegrass Control

Four studies related to control of annual bluegrass were conducted in 2006. Two new chemistries were evaluated and Velocity, a newly labeled herbicide, was further explored.

The Annual Bluegrass Control with F6908 Trial was conducted at the HTRC to evaluate F6908, a numbered compound provided by FMC as an annual bluegrass herbicide. This herbicide showed no activity on annual bluegrass whatsoever and, therefore, neither the treatment list nor the results are presented. The same trial was also conducted on creeping bentgrass to evaluate the safety of F6908 on creeping bentgrass (data not presented). Similarly, there was no activity noticed on creeping bentgrass either.

HM9930 is a confidential numbered compound that has performed well when applied to remove annual bluegrass from creeping bentgrass fairways in previous research at the HTRC. HM9930 is also said to have phenomenal safety on most turfgrass species other than annual bluegrass. In 2006, HM9930 was used in two real world situations to observationally evaluate its ability to remove annual bluegrass from other turfgrasses. In October and November, HM9930 was applied to a creeping bentgrass fairway at Kalamazoo Country Club and to the Kentucky bluegrass infield of Osmobile Park in Lansing, MI. In spring and summer of 2007, these treated areas will be visually

compared to the untreated surrounding areas to help us to understand the capabilities of this herbicide and lead us into extended research in 2007.

The Multi-age Annual Bluegrass Control with Velocity Trial was conducted on a fairway made up of 85% annual bluegrass and 15% creeping bentgrass to evaluate the activity of Velocity on mature stands of annual bluegrass as opposed to new stands. Plots were sprayed with RoundUp on four dates: 25 April, 22 May, 6 June, and 29 June. Treated plots were sprayed on 27 July with Velocity at 20 g ai/A (3x) at two week intervals and Velocity at 10 g ai/A (6x) at one week intervals. All treated plots received a total of 60 g ai/A of Velocity. Because the RoundUp applications were staggered, annual bluegrass germinated and began to fill in plots on four different starting dates resulting in four ages of annual bluegrass. Percent annual bluegrass cover was evaluated on 22 and 30 August, and 8 September, which represented annual bluegrass that was 119, 127, and 136 DAR-A (days after RoundUp application A), respectively, 92, 100, and 109 DAR-B, respectively, 77, 85, and 94 DAR-C, respectively, and 54, 62, and 71 DAR-D, respectively. Plots not treated with RoundUp contained annual bluegrass 10 years old. The treatment list and results are presented in Table 30.

The only significant difference in the amount of annual bluegrass present among treatments occurred on 22 August: plots not treated with RoundUp and treated with Velocity at 10 g ai/A twice per week still had an average of 44% annual bluegrass cover, although only two-thirds of the Velocity treatments had been made at that point. Although Velocity exhibited less control of annual bluegrass that was 10 years old relative to that which was months of age, the difference was not statistically significant on the last two rating dates. It was evident that Velocity at 20 g ai/A once per week

performed slightly better than 10 g ai/A twice per week, which is counterintuitive from previous data.

Trinexapac-ethyl

The QP Trinexapac-ethyl and Primo Maxx Comparison Trials were conducted at the HTRC. The trials were conducted to compare Quali Pro's version of trinexapac-ethyl (QP Trin) to Primo Maxx. Three total trials were conducted on creeping bentgrass (cv. Penncross)/annual bluegrass fairway height, Rhino Select turf mixture at lawn height, and creeping bentgrass (cv. Penncross) greens height. The Rhino Select turf mixture was comprised of 20% 'Viva,' 20% 'Blue Chip,' and 20% 'Baron' Kentucky bluegrasses, 20% 'K-2' chewings fescue, and 20% 'Stellar' perennial ryegrass. Injury was evaluated for each plot throughout each trial period on a scale of 1 to 9, where 1 represents no injury and 9 represents dead turf. Quality was also evaluated for each plot throughout each trial period on a scale of 9 to 1, where 9 represents highest relative quality and 1 represents lowest relative quality. Color was evaluated for the fairway and green trials on few occasions using the same rating system as quality. Clippings were collected, dried, and weighed to understand the growth differences for each treatment for the fairway and lawn trials. Treatment lists and results from these trials are presented in Tables 31-35.

The **fairway trial** compared Primo Maxx and QP Trin at 0.125 fl oz/1000 ft^2 applied weekly and Primo Maxx and QP Trin at 0.25 fl oz/1000 ft^2 applied bi-weekly (Table 31). Clippings were collected on 24 July, 21 July, 7 August, and 15 August. All treatments produced fewer clippings than untreated on the first three clipping dates (Table 32). By 15 August, differences in clipping weights among treatments disappeared. On the last three clipping dates, the Primo Maxx and QP Trin treatments were statistically identical

for clipping weights. No injury was seen throughout the trial period. Quality did not differ among treatments throughout the trial period except on 4 August when all treated plots exhibited higher quality than the untreated plots. All treated plots exhibited darker green color than untreated plots on 4, 22, and 28 August.

The **green trial** compared Primo Maxx and QP Trin at 0.125 fl oz/1000 ft^2 applied weekly. Treatments were applied on 12, 21, and 27 August, and 4, 10, 17, 30 September. No treated plots exhibited injury throughout the trial period. At the beginning of the trial, 19 July, the treated plots exhibited lower quality than the untreated; however, by the end of the trial, 7 September, the treated plots exhibited higher quality than the untreated (Table 33). On 4 and 30 August and 7 September, both treated plots exhibited a darker green color than the untreated plots (Table 33).

The **rough or lawn trial** compared Primo Maxx and QP Trin at 0.75 fl oz/1000 ft^2 and Proxy at 5 fl oz/1000 ft^2. These treatments were only applied once on 12 July. Clippings were collected on 19 July, 28 July, 3 August, 10 August, and 19 August. Plots treated with Primo Maxx and QP Trin had the lowest clipping weights on each date and never differed from each other (Table 34). Plots treated with Primo Maxx and QP Trin also exhibited injury on 25 July (13 DAT) through 1 August (20 DAT), which resulted in significantly less quality than plots treated with Proxy and untreated plots on the same dates (Table 35).

Annual Bluegrass Seedhead Suppression

Ongoing seedhead suppression research is in its sixth year at the HTRC. Treatments have been amended from year to year, featuring Embark T&O and a tank-mix of Proxy and Primo Maxx. The primary objective of the research is to refine the

timing of plant growth regulator application in the spring and to develop a range of growing degree days (GDD) based on the results within which to make these applications. Applications of Embark and Proxy/Primo Maxx are staggered throughout the spring season and subsequent measurements of seedheads are periodically made. For six years, a relationship between maximum annual bluegrass seedhead suppression and soil temperature has been scrutinized and a range of GDDs have been identified. With each year of new data, this range is refined and the data is distributed to golf course superintendents and others to use in the real world.

In contrast to Proxy + Primo Maxx as a seedhead suppressing treatment on an annual bluegrass fairway, Embark can cause much turf injury soon after application and last a few weeks depending on the growing conditions. Embark is commonly applied at a rate of 0.2 oz/1000 ft_2, so was initiated in the spring of 2006 to explore the use of Embark at a lower rate and with addition of a biostimulant, Macro-Sorb, said to minimize injurious effects of Embark on annual bluegrass. Embark was applied three times at a rate of 2 fl. oz./Acre bi-weekly with four different start dates. These treatments were compared to one application of Embark applied within the optimum range of 400-500 GDD_{32}. The treatment schedule is shown in Table 36 and the results are shown in Tables 37-38.

The best Embark application timings (treatment(s)) are those that exhibited the least turf injury throughout the season and, also, exhibited the least seedhead coverage, especially during the seedhead flush period. Macro-Sorb did not affect Embark and it's ability to suppress seedheads and, if anything, plots treated with Embark + Macro-Sorb exhibited more injury than those treated only with Embark (data not presented). The first application timing (A) and the optimum timing (E) of Embark and Embark + Macro-

Sorb provided the best seedhead suppression throughout the season and, especially, during the seedhead flush (10-18 May) (Table 37). Table 38 shows the average of eleven injury ratings and eight seedhead population (percent) measurements during the study. The second application timing provided the least turf injury, but poor seedhead suppression during the flush (Table 38). Overall, timings A and E provided the best mixture of low turf injury and high seedhead suppression (Table 38). However, timing E plot received only one application of Embark and Embark + Macro-Sorb at 2 fl. oz./Acre, relative to three applications for every other timing, making it the most effective and efficient treatment.

The 2005/2006 Fall/Spring Primo/Proxy Trial was conducted at the HTRC. The trial was conducted on an approximately 95% annual bluegrass fairway. The study was set up as a demonstration plot with two replications per request to explore the benefits, if any, of fall and spring applied plant growth regulators for annual bluegrass seedhead suppression in a fairway. Proxy was applied November 2, 2005 at 5 oz/M followed by Proxy (5 oz/M) + Primo (0.125 oz/M) on April 13, 2006 (318 growing degree days [base 32]) and reapplied on May 3, 2006. Treated and untreated plots measured 52 ft by 13 ft. At the HTRC in 2006, seedheads first emerged on the fairway around May 1 and peaked around May 16. Results are shown in Table 39.

Treated plots provided excellent suppression of seedheads relative to untreated plots. Between May 3 and May 23 untreated plots were covered with an average of 29% seedheads, while treated plots averaged 5.5% seedhead coverage; an average of suppression of 81% seedheads. Treated plots also displayed higher quality throughout May and displayed very minimal injury (lighter green color) on May 5 and May 8 (injury rating never exceeded 2 on a scale of 1 (no injury) to 9 (dead turf)).

A similar fall/spring primo/proxy study was initiated in fall of 2006 to be evaluated for turf quality and seedhead suppression in spring of 2007. However, this study included the addition of specific turf fungicides in each treatment.

PGRs and Putting Green Speed

As increased green speed becomes a more and more coveted golf course attribute, new ways to achieve these increased speeds are conjured. Decreasing mowing heights, double mowing, rolling, and use of PGRs are often implemented by golf courses to increase green speeds. Often, golf course greens receive monthly or weekly applications of certain plant growth regulators, namely Primo Maxx (trinexapac-ethyl), with the intention that green speeds will be increased. As the efficacy of the use of Primo Maxx to increase green speed is not entirely known, treatments of Primo Maxx at various rates and intervals on a creeping bentgrass green began in mid-May of 2005. Green speed or ball roll distance was measured with a Stimpmeter six days per week and dry clipping weights were measured 2 days per week for a four month span. Quality and density were also measured throughout the study.

In 2005, no differences were found among treatments for greenspeed in over 70 dates or in dry clipping weights in over 20 dates. Differences were not visually noticed for quality or density either.

This study was repeated in 2006, but included Trimmit (paclobutrazol) in addition to Primo Maxx treatments. The management and evaluation of the turf remained similar to those in 2005 as did the results. For the second year, the addition of PGRs to putting green turf, regardless of rate of application regime, had no effect on green speed or dry clipping weights.

Best Management Practices

Research investigating the effects of cultural practices, such as mowing height, fertility, and strategic broadleaf herbicide applications has been ongoing at the HTRC. Initiated in 1997, this study examined these effects on plots mowed at 4 and 2 inches. In 2003, a similar study was initiated to examine the same cultural practices at what we decided were more common mowing heights—3 and 1.5 inches. In 2005, the first study, BMP I, was put to rest and concentration began on BMP II, which has proven to behave differently than BMP I. While plots were invaded almost exclusively with broadleaf weeds, such as white clover, dandelion, and broadleaf plantain in plots mowed at 4 and 2 inches, there has much more grassy weed pressure, specifically crabgrass, in BMP II plots at 3 and 1.5 inches.

Observing BMP I, it was found that sound cultural practices like regular nitrogen fertility, occasional broadleaf herbicide applications, and an action as simple as raising a mower deck will dramatically decrease a broadleaf's vegetative ability to compete with the turfgrass. Now, with BMP II, observations reveal that the same cultural practices benefit the turf's ability to compete with germination and seedling survival of annual plants like crabgrass.

In 2005 and 2006, the BMP II research is being collaborated with research conducted by Alec Kowalewski from his masters thesis research dealing with the preemergence dandelion activity of senesced tree leaves. These fallen leaves have been applied to the BMP II plots, replacing the herbicides previously applied for BMP I. We are excited to see the effects of the leaves in conjunction with the cultural practices as well as the practicality of the study to homeowners.

The Weed Garden

The weed garden, established in 1998, flourished again in 2006. It proved very useful weed identification tool in MSU classes, as extension agents and lawncare operators that stop by the turf center with a weed question, and for the Weed I.D. workshop at field day.

Table 1: Postemergence Crabgrass Control with Mesotrione Trial (Wet Turf)

Treatment	Rate	19 July 20 DAT	21 August 53 DAT
		percent control	
AND6064	4 lb/M	78 abc†	69 ab
AND6070	4 lb/M	75 abc	59 abc
AND6076	4 lb/M	72 bcd	63 ab
AND6063	4 lb/M	72 bcd	61 abc
AND6069	4 lb/M	67 cd	58 abc
AND6075	4 lb/M	60 cde	53 bcd
AND6111	4 lb/M	72 bcd	44 b-e
AND6110	4 lb/M	59 cde	17 def
AND6117	4 lb/M	77 abc	56 abc
AND6116	4 lb/M	40 e	33 b-f
AND6126	4 lb/M	65 cd	52 bcd
AND6127	4 lb/M	80 abc	70 ab
AND6128	4 lb/M	50 de	38 b-f
AND6129	4 lb/M	67 cd	37 b-f
AND6130	4 lb/M	66 cd	55 bcd
AND6131	4 lb/M	37 e	24 c-f
CALLISTO 4SC	0.15 lb ai/A	94 ab	65 ab
CALLISTO 4SC	0.25 lb ai/A	99 a	93 a
UNTREATED		10 f	0 f
UNTREATED		0 f	12 ef
LSD (p=0.05)		24	38

†Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 2: The Postemergence Crabgrass Control with Mesotrione Trial (Dry Turf)

Treatment	Rate		19 July 21 DAT		21 August 54 DAT	
			percent control			
AND6064	4	lb/M	79	abc[†]	82	a
AND6070	4	lb/M	80	ab	56	a-d
AND6076	4	lb/M	67	b-e	56	a-d
AND6063	4	lb/M	36	fg	22	def
AND6069	4	lb/M	41	fg	42	cde
AND6075	4	lb/M	41	fg	34	c-f
AND6111	4	lb/M	56	c-f	56	a-d
AND6110	4	lb/M	45	efg	56	a-d
AND6117	4	lb/M	76	abc	78	ab
AND6116	4	lb/M	37	fg	44	bcd
AND6126	4	lb/M	75	abc	81	a
AND6127	4	lb/M	73	a-d	83	a
AND6128	4	lb/M	27	gh	33	c-f
AND6129	4	lb/M	57	c-f	65	abc
AND6130	4	lb/M	51	def	49	a-d
AND6131	4	lb/M	47	efg	50	a-d
CALLISTO 4SC	0.15	lb ai/A	94	a	67	abc
CALLISTO 4SC	0.25	lb ai/A	91	a	81	a
UNTREATED			8	h	7	ef
UNTREATED			6	h	3	f
LSD (p=0.05)			23		36	

†Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 3: Postemergence Crabgrass Control with Mesotrione + Dithiopyr Trial (Wet Turf)

Treatment	Rate		18 July 19 DAT		21 August 53 DAT	
			percent control			
AND6068	4	lb/M	56	a-d[†]	72	ab
AND6159	4	lb/M	41	c-g	54	a-e
AND6074	4	lb/M	44	c-f	70	abc
AND6160	4	lb/M	33	d-h	46	b-f
AND6080	4	lb/M	35	c-h	40	b-f
AND6161	4	lb/M	60	a-d	49	a-f
AND6067	4	lb/M	38	c-g	23	efg
AND6073	4	lb/M	16	f-i	39	b-f
AND6079	4	lb/M	15	f-i	37	c-f
AND6115	4	lb/M	33	d-h	61	a-d
AND6114	4	lb/M	52	b-e	67	abc
AND6121	4	lb/M	56	a-d	44	b-f
AND6108	4	lb/M	21	e-i	18	fg
AND6120	4	lb/M	66	abc	54	a-e
AND6107	4	lb/M	21	e-i	29	d-g
AND6109	4	lb/M	11	ghi	28	d-g
CALLISTO 4SC DIMENSION ULTRA	0.15 0.25	lb ai/A	80	ab	47	b-f
CALLISTO 4SC DIMENSION ULTRA	0.25 0.375	lb ai/A	88	a	82	a
CALLISTO 4SC DIMENSION ULTRA	0.25 0.50	lb ai/A	85	a	71	ab
DIMENSION GRAN	4.6	lb/M	0	hi	24	efg
UNTREATED				i	0	g
LSD (p=0.05)			32		34	

†Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 4: Postemergence Crabgrass Control with Mesotrione + Dithiopyr Trial (Dry Turf)

Treatment	Rate		19 July 20 DAT		22 August 54 DAT	
			percent control			
AND6068	4	lb/M	11	def[†]	37	e-h
AND6159	4	lb/M	26	cde	74	a-d
AND6074	4	lb/M	34	bcd	75	a-d
AND6160	4	lb/M	24	cde	51	cde
AND6080	4	lb/M	16	def	20	f-i
AND6161	4	lb/M	3	ef	47	def
AND6067	4	lb/M	15	def	70	a-d
AND6073	4	lb/M	16	def	67	a-d
AND6079	4	lb/M	13	def	47	d-g
AND6115	4	lb/M	15	def	76	a-d
AND6114	4	lb/M	21	c-f	58	b-e
AND6121	4	lb/M	15	def	62	a-e
AND6108	4	lb/M	4	ef	55	b-e
AND6120	4	lb/M	12	def	61	a-e
AND6107	4	lb/M	11	ef	18	ghi
AND6109	4	lb/M	0	f	10	hi
CALLISTO 4SC DIMENSION ULTRA	0.15 0.25	lb ai/A	70	a	83	ab
CALLISTO 4SC DIMENSION ULTRA	0.25 0.375	lb ai/A	50	ab	89	a
CALLISTO 4SC DIMENSION ULTRA	0.25 0.50	lb ai/A	71	a	78	abc
DIMENSION GRAN	4.6	lb/M	43	bc	52	cde
UNTREATED			0	f	0	i
LSD (p=0.05)			24		29	

†Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 5: Postemergence Crabgrass Control with Mesotrione + Carfentrazone Trial (Wet Turf)

Treatment	Rate		18 July 19 DAT	21 August 53 DAT
			percent control	
AND6066	4	lb/M	49 ab[†]	38 a[‡]
AND6072	4	lb/M	39 ab	50 a
AND6078	4	lb/M	34 ab	44 a
AND6113	4	lb/M	35 ab	59 a
AND6119	4	lb/M	35 ab	40 a
AND6102	4	lb/M	34 ab	41 a
AND6104	4	lb/M	33 b	44 a
AND6106	4	lb/M	61 a	51 a
CALLISTO 4SC QUICKSILVER	0.15 0.031	lb ai/A	56 ab	63 a
CALLISTO 4SC QUICKSILVER	0.25 0.031	lb ai/A	53 ab	55 a
UNTREATED			0 c	0 b
LSD			28[†]	27[‡]

†Means followed by same letter do not significantly differ (P=0.05, LSD).
‡Means followed by same letter do not significantly differ (P=0.10, LSD).

Table 6: Postemergence Crabgrass Control with Mesotrione + Carfentrazone Trial (Dry Turf)

Treatment	Rate		18 July 20 DAT		21 August 54 DAT	
			percent control			
AND6066	4	lb/M	65	abc†	69	ab
AND6072	4	lb/M	66	abc	71	ab
AND6078	4	lb/M	64	abc	76	ab
AND6113	4	lb/M	44	c	76	ab
AND6119	4	lb/M	67	abc	88	ab
AND6102	4	lb/M	35	cd	60	b
AND6104	4	lb/M	48	bc	73	ab
AND6106	4	lb/M	81	ab	94	a
CALLISTO 4SC QUICKSILVER	0.15 0.031	lb ai/A	93	a	95	a
CALLISTO 4SC QUICKSILVER	0.25 0.031	lb ai/A	96	a	100	a
UNTREATED			0	d	0	c
LSD (p=0.05)			37		31	

†Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 7: Granular Mesotrione Postemergence Crabgrass Control – 2006
Evergreen Cemetery, Lansing, MI

Treatment	Rate		Crabgrass July 18 19 DAT-A		Crabgrass August 22 54 DAT-A	
			percent control			
EXC878	173	lb/A	53	cd	34	cde
EXC925	100	lb/A	3	e	29	def
EXC881	173	lb/A	76	ab	60	abc
EXC924	104	lb/A	9	e	29	def
EXC923	129	lb/A	50	d	56	a-d
EXC878 EXC878 (21 DAT)	173 173	lb/A	73	abc	75	a
EXC881 EXC878 (21 DAT)	173 173	lb/A	77	a	83	a
EXC924 EXC878 (21 DAT)	104 173	lb/A	7	e	15	ef
EXC925 EXC934 (21 DAT)	100 150	lb/A	19	e	36	b-e
EXC923 EXC934 (21 DAT)	129 150	lb/A	56	bcd	71	a
EXC878	173	lb/A	74	ab	65	ab
EXC934	150	lb/A	9	e	9	ef
UNTREATED			0	e	0	f
LSD (p=0.5)			20		30	

Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 8: Chemical Components of Coded Compounds

EXC878	mesotrione
EXC925	pendimethalin
EXC881	mesotrione + prodiamine
EXC924	prodiamine
EXC923	dithiopyr
EXC934	2,4-D + dicamba + mecoprop

Table 9: The Mesotrione Turf Safety Trial - Injury
HTRC, East Lansing, MI, Michigan State University

	Treatment	Rate	13 July 7 DA-A	19 July 13 DA-A	25 July 19 DA-A	28 July 1 DA-B	1 August 5 DA-B	4 August 8 DA-B	11 August 15 DA-B
1	MESOTRIONE NIS	0.15 lb ai/a	1.0 a	1.0 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
2	MESOTRIONE NIS	0.19 lb ai/a	1.0 a	1.0 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
3	MESOTRIONE NIS	0.25 lb ai/a	1.3 a	1.0 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
4	MESOTRIONE NIS	0.5 lb ai/a	1.7 a	1.7 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
5	MESOTRIONE NIS MESOTRIONE NIS	0.15 lb ai/a 0.15 lb ai/a	1.0 a	1.0 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
6	MESOTRIONE NIS MESOTRIONE NIS	0.19 lb ai/a 0.19 lb ai/a	1.0 a	1.0 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
7	MESOTRIONE NIS MESOTRIONE NIS	0.25 lb ai/a 0.25 lb ai/a	1.0 a	1.0 a	1.0 a	1.0 a	1.0 b	2.0 b	1.0 a
8	MESOTRIONE NIS MESOTRIONE NIS	0.5 lb ai/a 0.5 lb ai/a	1.7 a	1.7 a	1.0 a	1.0 a	2.0 a	3.0 a	1.0 a
9	UNTREATED		1.0 a	1.0 a	1.0 a	1.0 a	1.0 b	1.0 c	1.0 a
LSD (P=.05)			0.60	0.78	0.00	0.00	0.00	0.00	0.00

Means followed by same letter do not significantly differ (P=0.05, LSD).

Table 10: The QP Quin and QP Tric Postemergence Crabgrass Control Trial
HTRC, East Lansing, MI, Michigan State University

Treatment	Rate	12 July	24 July	21 August
		13 DAT-A	25 DAT-A	53 DAT-A
		percent control		
QP TRIC	1 pt/A	23 b†	51 c	5 c
QP TRIC	2 pt/A	40 b	70 bc	16 c
QP QUIN MICROYL	5.33 oz/A 0.5 % v/v	92 a	98 a	67 b
QP QUIN MICROYL	16 oz/A 0.5 % v/v	98 a	98 a	91 a
QP QUIN (x2) ‡ MICROYL	16 oz/A 0.5 % v/v	100 a	100 a	100 a
DRIVE (x2) MICROYL	16 oz/A 0.5 % v/v	98 a	99 a	99 a
QP QUIN QP TRIC	5.33 oz/A 1 pt/A	89 a	91 ab	67 b
UNTREATED		0 c	0 d	0 c
LSD (p=.05)		19.6	22.5	19.0

†Means followed by same letter do not significantly differ (P=0.05, LSD).
‡Repeat applications were made about 30 days after the first application.

Table 12: The General Preemergence Crabgrass Control Trial
HTRC, Michigan State University, East Lansing, MI

Treatment	Form	Rate	June 7 50 DA-A	July 13 86 DA-A	August 1 105 DA-A
			crabgrass centers		
DIMENSION	2EW	0.5 lb ai/a	0.0	0.3	5.0
DIMENSION	1EC	0.5 lb ai/a	0.0	0.0	0.3
DIMENSION	40WSP	0.5 lb ai/a	0.0	0.3	0.7
PENDULUM	3.3 EC	2 lb ai/a	0.0	1.0	2.0
PENDULUM	3.3 EC	1+1 lb ai/a	0.0	0.7	0.7
PENDULUM	3.8 CS	2 lb ai/a	0.0	1.0	0.7
PENDULUM	3.8 CS	1+1 lb ai/a	0.0	0.0	0.0
UNTREATED			7.3	40.7	60.0
LSD (P=.05)			NS	25.2	21.2

[1] Treatments were applied on 18 April 2006. Split applications were applied on 18 April 2006 and 30 May 2006. Treatments were applied using a CO_2-pressurized backpack sprayer with 8002VS nozzles calibrated to deliver 62.5 gpa.

Table 13: The Preemergence Crabgrass and Broadleaf Weed Control Trial 1
Evergreen Cemetery, Lansing, MI

Treatment	Form	Rate		June 9 49 DAT	July 12 82 DAT
				crabgrass centers	
QUICKSILVER T&O	1.9SC	0.031	lb ai/a	21.7	38.3
BARRICADE	4FL	0.5	lb ai/a	0.0	2.7
QUICKSILVER T&O BARRICADE	1.9SC 4FL	0.031 0.5	lb ai/a	1.3	4.3
QUICKSILVER BARRICADE	12%ME 4FL	0.031 0.5	lb ai/a	0.0	1.7
DIMENSION ULTRA	2EW	0.5	lb ai/a	0.3	0.3
EF-1343	0.417SC	0.5	lb ai/a	42.3	58.3
DIMENSION ULTRA EF-1343	2EW 0.417SC	2	lb ai/a	0.0	0.0
UNTREATED				27.7	45.3
LSD (P=.05)				12.1	10.0

[1]Treatments were applied on April 21, 2006 using a CO_2-pressurized backpack sprayer with 8002VS nozzles calibrated to deliver 62.5 gpa.

Table 14: The Preemergence Crabgrass and Broadleaf Weed Control Trial 2
Evergreen Cemetery, Lansing, MI, Michigan State University

Treatment	Rate (lb ai/A)	9 June 49 DAT	20 June 60 DAT	12 July 82 DAT
		crabgrass centers		
DISMISS 4F	0.125	4.3 bc†	8.3 bc	18.0 bc
DISMISS 4F	0.190	10.7 b	9.0 bc	23.7 ab
DISMISS 4F	0.250	5.7 bc	16.3 ab	34.3 a
DISMISS 4F BARRICADE 4FL	0.125 0.250	0.0 c	0.7 c	2.0 d
DISMISS 4F BARRICADE 4FL	0.190 0.380	0.0 c	0.3 c	1.0 d
DISMISS 4F BARRICADE 4FL	0.250 0.500	0.0 c	0.0 c	0.3 d
F6875 GRAN	0.125	0.0 c	1.0 c	1.7 d
F6875 GRAN	0.190	0.3 c	1.0 c	4.7 cd
F6875 GRAN	0.250	0.0 c	1.0 c	2.7 d
F6285 GRAN FERT	0.125	1.0 bc	2.0 c	8.7 cd
F6285 GRAN FERT	0.190	3.0 bc	4.0 c	10.3 bcd
BARRICADE 4FL	0.500	0.0 c	0.7 c	0.7 d
DIMENSION 1EC	0.500	0.0 c	0.0 c	0.3 d
UNTREATED		22.3 a	21.7 a	23.7 ab
LSD (p=0.05)		10.0	10.1	13.6

†Means in a column followed by the same letter do not significantly differ (P=0.05, LSD).

Table 15: The Precision Labs Adjuvants Broadleaf Weed Control Trial - Dandelion

Treatment	Rate		Dandelion 30 June 22 DAT		Dandelion 7 July 29 DAT		Dandelion 1 August 54 DAT	
			percent control					
TRIMEC AM*	4	pt/A	81	cd†	91	cd	96	a
TRIMEC AM MICROYL	4 0.5	pt/A %v/v	87	bcd	93	bcd	83	ab
TRIMEC AM DELUX	4 1.25	pt/A %v/v	80	d	88	d	81	ab
TRIMEC AM EXPER.	4 0.5	pt/A %v/v	82	cd	93	bcd	81	ab
TRIMEC ES**	5	pt/A	94	ab	97	abc	80	ab
TRIMEC ES MICROYL	5 0.5	pt/A %v/v	91	abc	98	ab	80	ab
TRIMEC ES DELUX	5 1.25	pt/A %v/v	96	ab	100	a	70	b
TRIMEC ES EXPER.	5 0.5	pt/A %v/v	88	bcd	93	bcd	76	ab
ESCALADE	3	pt/A	94	ab	97	abc	84	ab
ESCALADE MICROYL	3 0.5	pt/A %v/v	96	ab	94	a-d	82	ab
ESCALADE DELUX	3 1.25	pt/A %v/v	96	ab	96	abc	83	ab
ESCALADE EXPER.	3 0.5	pt/A %v/v	98	a	99	a	91	ab
UNTREATED			0	e	0	e	0	c
LSD (p=.05)			10		6		22	

† Means followed by same letter do not significantly differ (P=0.05, LSD).
*Trimec Classic (Amine)
**Super Trimec (Ester)

Table 16: The Precision Labs Adjuvants Broadleaf Weed Control Trial – White Clover

Treatment	Rate		White Clover 30 June 22 DAT		White Clover 7 July 29 DAT		White Clover 1 August 54 DAT	
			percent control					
TRIMEC AM*	4	pt/A	78	b†	94	c	99	ab
TRIMEC AM MICROYL	4 0.5	pt/A %v/v	77	b	94	bc	96	b
TRIMEC AM DELUX	4 1.25	pt/A %v/v	88	ab	98	abc	98	ab
TRIMEC AM EXPER.	4 0.5	pt/A %v/v	97	a	100	a	98	ab
TRIMEC ES**	5	pt/A	94	a	100	a	100	a
TRIMEC ES MICROYL	5 0.5	pt/A %v/v	98	a	100	a	100	a
TRIMEC ES DELUX	5 1.25	pt/A %v/v	96	a	99	ab	100	a
TRIMEC ES EXPER.	5 0.5	pt/A %v/v	95	a	98	abc	100	a
ESCALADE	3	pt/A	95	a	99	abc	100	a
ESCALADE MICROYL	3 0.5	pt/A %v/v	94	a	99	ab	100	a
ESCALADE DELUX	3 1.25	pt/A %v/v	96	a	99	abc	100	a
ESCALADE EXPER.	3 0.5	pt/A %v/v	94	a	99	ab	98	ab
UNTREATED			0	c	0	d	0	c
LSD (p=.05)			16		5		4	

† Means followed by same letter do not significantly differ (P=0.05, LSD).
*Trimec Classic (Amine)
**Super Trimec (Ester)

Table 17: The Precision Labs Adjuvants Broadleaf Weed Control Trial – Broadleaf Plantain

Treatment	Rate		Broadleaf Plantain		
			30 June 22 DAT	7 July 29 DAT	1 August 54 DAT
			percent control		
TRIMEC AM*	4	pt/A	78 ab†	94 ab	83
TRIMEC AM MICROYL	4 0.5	pt/A %v/v	89 ab	94 ab	67
TRIMEC AM DELUX	4 1.25	pt/A %v/v	67 abc	98 a	39
TRIMEC AM EXPER.	4 0.5	pt/A %v/v	35 cd	100 a	67
TRIMEC ES**	5	pt/A	88 ab	100 a	41
TRIMEC ES MICROYL	5 0.5	pt/A %v/v	85 ab	100 a	94
TRIMEC ES DELUX	5 1.25	pt/A %v/v	73 ab	99 a	100
TRIMEC ES EXPER.	5 0.5	pt/A %v/v	54 bc	98 b	67
ESCALADE	3	pt/A	88 ab	99 a	67
ESCALADE MICROYL	3 0.5	pt/A %v/v	81 ab	99 a	89
ESCALADE DELUX	3 1.25	pt/A %v/v	61 abc	99 a	75
ESCALADE EXPER.	3 0.5	pt/A %v/v	96 a	99 a	81
UNTREATED			0 d	0 c	0
LSD (p=.05)			38	30	NS

† Means followed by same letter do not significantly differ (P=0.05, LSD).
*Trimec Classic (Amine)
**Super Trimec (Ester)