Mesotrione: A Multi-Purpose Tool for Weed Control

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Today you have three very different projects: Renovate and seed an area affected by snow mold damage, control the crabgrass population developing in the clubhouse lawn and selectively remove the creeping bentgrass that is infesting the tee surrounds. Could this be possible in one day with one tool? Yes! Over the past decade mesotrione has been determined to be a low-risk and effective chemical for use in the above, and other, scenarios. While many know the uses of mesotrione, this is a good time of the year to revisit its utility. During the 2008 season at the OJ Noer Turfgrass Research Facility, three different trials involved mesotrione: Preemergent and Postemergent Crabgrass Control, Broadleaf Weed Control, and Bentgrass Removal. Today the focus will be bentgrass removal but results from all three trials can be found in the Wisconsin Turfgrass Research Reports and previous issues of *The Grass Roots* (Stier, 2004; 2008). While others across the country have documented the uses of mesotrione, it was beneficial to confirm its utility for turfgrass management in the Wisconsin climate.

How Mesotrione Works

Mesotrione is derived from the bottlebrush plant (*Callistemon citrines*) native to Australia, originally marketed as Callisto™ for non-turf uses. It acts by inhibiting the 4-hydroxyphenylpyruvate dioxygenase (HPPD) enzyme in target species. This disrupts

Table 1. Bentgrass removal with mesotrione, treatments and application dates, Madison, WI, 2008.

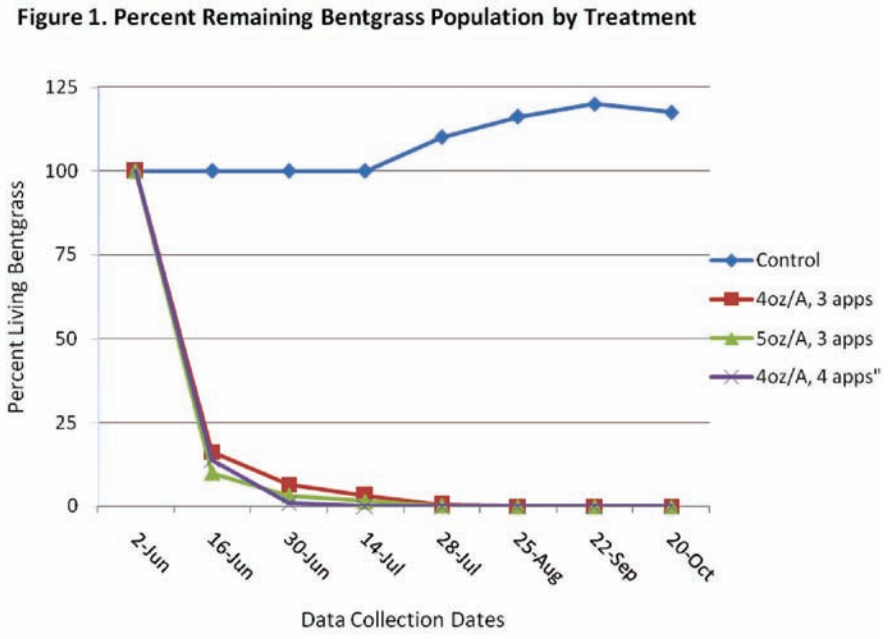
Trt. #	Treatment Product	Rate (fl oz/A)	Application Date(s)
1	Control	----	----
2	Mesotrione (Tenacity)	4.0	June 2, June 23, July 14
3	Mesotrione (Tenacity)	5.0	June 2, June 23, July 14
4	Mesotrione (Tenacity)	4.0	June 2, June 23, July 14, Aug. 4

carotenoid biosynthesis in the chlorophyll molecule, which is manifested visually by the white bleaching of sensitive plants (EPA Pesticide Fact Sheet, 2001). Mesotrione is absorbed through the roots, shoots and leaves of the plant and is translocated by both xylem and phloem. It is presently labeled as Tenacity(tm) for use on sod farms and golf courses for bentgrass removal and broadleaf weed control. Mesotrione is considered a low-risk ("biorational") herbicide due to its low biological risk and rapid degradation rate. It also has low use rates (5oz/A for cool-season turfgrasses), minimal PPE requirements and can be used at, or soon after, seeding.

Mesotrione is based on the same compound as the pharmaceutical drug NTBC, also an HPPD inhibitor, which is used to treat the condition tyrosinemia. Tyrosinemia is the deficiency of the enzyme used to degrade the amino acid tyrosine. When not treated with NTBC, tyrosine builds up in the body's organs, leading to organ failure (Duke, S.O., WSSA Annual Meeting, 2009).

Demonstrating Control of Creeping Bentgrass

In early May 2008, six standard golf course cup cutter-sized plugs of mature creeping bentgrass (*Agrostis stolonifera*) were transplanted into 3' by 5' plots of a mature mix of Kentucky bluegrass (*Poa pratensis*) and perennial ryegrass (*Lolium perenne*), with each herbicide treatment replicated four times. Bentgrass plugs were allowed to acclimate in their new location for about six weeks before herbicide treatment began. During this time, irrigation was supplied four times per week to replace 100% of the moisture loss from evapotranspiration (ET). Irrigation was reduced to twice weekly at 100% ET replacement for the remainder of the trial. Turf was mowed three times weekly at 1.5" using a riding reel mower with clippings returned. The numbers of applications of mesotrione varied by treatment but all applications were at three-week intervals (Table 1). All treatments were applied using a CO_2-powered backpack sprayer operated at 40 psi using TeeJet XR8004VS nozzles at 1 gallon of water per 1000 ft^2. All treatments included a nonionic surfactant at 0.25% volume/volume. Bentgrass removal was rated visually at 2, 4, 6, 8, 12, 16 and 20 weeks after initial treatment (WAIT). Quantification of bentgrass removal was determined as the percent of bentgrass remaining in the six transplanted plugs. Phytotoxicity affecting desirable turfgrass species was rated visually at 2, 4, 8 and 12 WAIT.



What We Found

Both the 4.0 and 5.0 fl oz/A rates of mesotrione provided 100% bentgrass removal by 12WAIT (Figure 1). Prior to the fourth round of applications associated with the second 4.0 fl oz/A treatment, all treatments achieved 100% bentgrass removal. The fourth application was not necessary for this rate but was still applied according to the research protocol. Measurable turfgrass phytotoxicity was only observed at 2 and 4WAIT but it was never above the unacceptable threshold of 3 on a 1-9 scale for either rate of mesotrione. Turfgrass

phytotoxicity was most evident after the first application and less after the second application possibly because of desirable turfgrass species increasing tolerance to mesotrione applications. Any lingering phytotoxicity was essentially mown off. Similar turfgrass phytotoxicity trends were noted by other university researchers (Branham, 2005). It is of interest to note that the bentgrass populations in the untreated plots increased throughout the trial by 10-20%, showing that the bentgrass transplant method was successful.

How You Can Use the Information

Historically only non-selective herbicides like glyphosate (Roundup™) could be used to control creeping bentgrass, but these herbicides also killed all other turfgrasses, usually requiring reseeding or resodding of the affected areas. Mesotrione (Tenacity) provides selective bentgrass removal without unacceptable turfgrass phytotoxicity. For Wisconsin, three applications spaced three weeks apart provided 100% bentgrass removal. Because of this high level of control, applications could be spaced up to four weeks apart to possibly better fit the busy summer golf course schedule. Also, because mesotrione is safe to use at and after seeding, the now voided areas of bentgrass can be slit-seeded with your variety of choice even during the bentgrass removal program. This speeds the recovery of the affected areas, keeping you, your members and guests golfing on (weed-free) green turf.

References:

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