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This publication includes lecture notes of papers presented at the 2001 New Jersey Turfgrass Expo. Publication of these lectures provides a readily available source of information covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann Brooks Gould, Editor
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WHAT'S NEW IN TURF WEED CONTROL: PROTOX INHIBITING HERBICIDES

Stephen E. Hart and Darren W. Lycan[1]

Synthetic auxin herbicides such as 2,4-D, MCPP, and dicamba are widely used alone or in combination to control broadleaf weeds in many different turfgrass species. These herbicides are applied to the foliage of broadleaf weeds and are translocated throughout the entire plant, including the vegetative reproductive structures of perennial weeds. Symptoms of herbicidal activity are evident within a few days after application in the form of twisting and abnormal growth. However, it may take several weeks or more for these herbicides to completely control broadleaf weeds.

One method to increase the speed of herbicide activity on broadleaf weeds is to apply synthetic auxin herbicides in combination with herbicides that have more rapid activity. Herbicides with rapid activity on broadleaf weeds include those in the class of Protox inhibitors. These herbicides inhibit the enzyme Protophorphyinogen Oxidase IX (Protox), which regulates chlorophyll synthesis in plants (Duke et al., 1991). Disruption of this pathway leads to rapid herbicidal activity characterized as chlorosis and desiccation of plant foliage. However, these herbicides do not translocate throughout the plant and will not provide complete control of perennial broadleaf weeds when applied alone.

The first generation of Protox-inhibiting herbicides were developed in the 1970s. Turfgrass professionals are familiar with oxidiazon (marketed as Ronstar herbicide) used preemergence for control of annual grasses and some broadleaf weeds. In the 1990s, a new generation of Protox-inhibiting herbicides were developed by several agricultural chemical companies including FMC Corporation and Sumitomo Japan. These herbicides are used at much lower rates relative to older Protox inhibiting herbicides.

RESEARCH TESTING

Replicated field trials were conducted in 2000 and 2001 throughout the northeastern region of the United States. The objective of the following research was to evaluate perennial broadleaf weed control and turfgrass safety with a combination of 2,4-D, MCPP, and dicamba applied with and without the Protox-inhibiting herbicide, carfentrazone. Herbicide treatments consisted of PBI Gordons Trimec Classic 3.2 SL formulation (contains 2.0 lb active ingredient (a.i.) 2,4-D, 1.0 lb a.i. MCPP, and 0.21 lb a.i. dicamba) and the experimental formulation EH 1381 2.3 SL (contains 1.53 lb a.i. 2,4-D, 0.48 lb a.i. MCPP, 0.14 lb a.i. dicamba, and 0.05 lb a.i. carfentrazone).

Symptoms of injury (chlorosis and desiccation of plant foliage) from carfentrazone were observed within three days of application in all the research studies. Injury developed most quickly on broadleaf plaintain and dandelion; however, quicker injury with carfentrazone was less consistent on white clover. Control of all weed species was excellent (> 85%) with both herbicides at 30 days. In many cases, complete control of individual weed species was observed in both years of the study. EH 1381 or Trimec Classic did not significantly reduce the turf quality of Kentucky bluegrass or creeping bentgrass compared with untreated plots at any evaluation time in any study.

DISCUSSION

The results of these studies demonstrate that carfentrazone, applied in combination with synthetic auxin herbicides, can potentially provide greater levels of control of several weed species, including dandelion and broadleaf plaintain, within 7 days. Increas-

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ing the speed of white clover control with carfentrazone was less consistent and may be influenced by environmental factors or application timing.

To obtain complete control of perennial broadleaf weeds, synthetic auxin herbicides must be absorbed into the foliage and translocated to vegetative reproductive structures. Although carfentrazone causes plant desiccation within a few days, complete control of perennial broadleaf weeds was not reduced. Plant physiological studies with synthetic auxin herbicides such as 2,4-D, MCPP, and dicamba have determined that foliar absorption is rapid, with the majority of the herbicide absorbed into the leaves within 8 hours (Robertson and Kirkwood, 1969; Wanamarta and Penner, 1989). Subsequent translocation of these herbicides to vegetative reproductive structures is generally complete within 3 to 7 days depending on weed species (Devine, 1989; Robertson and Kirkwood, 1970). It appears that carfentrazone does not work rapidly enough to cause a detrimental impact on the absorption and translocation of synthetic auxin herbicides.

The experimental herbicide formulation EH 1381 has just received registration from the Environmental Protection Agency and will be available to turfgrass professionals this spring. Three different formulation will be marketed by PBI Gordon Corporation. Speed Zone (EH 1381 formulation in this article) will be for use on cool season turf and bermudagrass. Speed Zone St. Augustine Formula will be for use on warm season turf. There will also be a formulation available called Power Zone which replaces the 2,4-D in Speed Zone with MCPA. It is also important to note that these three herbicide formulations received fast-track “reduced-risk pesticide” labeling by the EPA for their low use rate, low mammalian toxicity, and low ground water contamination potential.

Herbicide formulations containing carfentrazone have been extensively tested by University researchers for broadleaf weed control and turf safety for the past several years. However, it is not possible to test all turfgrass varieties or simulate all possible cultural and environmental conditions. We strongly suggest that golf course superintendents and other turf professionals work with these new herbicide formulations on a limited basis to obtain their own assessment of turfgrass safety prior to large scale use.

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