Preemergence Herbicide Effects on
Four Kentucky Bluegrass Cultivars

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Abstract. Three preemergence herbicides [S-(0, 0-Diisopropyl phosphorodithioate) ester of N-(2-mercaptoethyl) benzenesulfonamide (bensulide) at 8.4 and 15.7 kg/ha, Dimethyl tetrachloroterephthalate (DCPA) at 11.8 and 16.8 kg/ha, and 2-tert-butyl-4-(2,4 dichloro-5-isopropoxyphenyl)-5(1,3,4-oxadiazolin-5-one (oxadiazon) at 2.2, 4.5, and 9 kg/ha] were applied to plugs of Kentucky bluegrass (Poa pratensis L. cvs. Baron, Enmundi, Newport, and Park) in the greenhouse. Bensulide and oxadiazon reduced root weight, but there were no cultivar differences. Cultivar differences in response to oxadiazon were observed for rhizome weight, rhizome length, and turfgrass quality, with 'Newport' and 'Baron' damaged more by oxadiazon than 'Park' and 'Enmundi'. There were no cultivar differences in rhizome weight, rhizome length, and quality in response to bensulide or DCPA.

Bensulide, DCPA, and oxadiazon are preemergence herbicides commonly used for control of annual lawn weeds. The effectiveness of these materials in the control of annual weeds in Kentucky bluegrass turf has been well-established (2); however, less is known about the secondary effects of these herbicides on the growth and development of this species and of possible differences in cultivar response.

DCPA reduced the number and length of rhizomes and the number of tillers of Kentucky bluegrass and was more severe on dwarf cultivars than 'Merion' (3). Bensulide severely reduced root growth of 'Merion' and the verdure of 'Kenblue' Kentucky bluegrass, whereas DCPA had no effect (1, 7).

Long-term studies with several preemergence herbicides on 'Kenblue' and 'Merion' suggest that rooting and thatch development vary with herbicides and cultivars (6). Hurto and Turgeon (4) demonstrated that the degree of thatch development in Kentucky bluegrass is an important factor in determining the amount of damage that occurs from the use of preemergence herbicides. They also speculate that differences in the inherent susceptibility of turfgrass to injury by the preemergence herbicides must exist.

Shearman et al. (5) studied the effects of preemergence herbicides on the sod transplant rooting of 3 Kentucky bluegrass cultivars. Their results indicate that intraspecific differences likely exist in the response to preemergence herbicide application. The sod transplant rooting of 'Baron' was reduced by siduron, oxadiazon, prosulfalin, and benefin, whereas 'Park' and 'Merion' were unaffected by these herbicides. Bensulide reduced rooting in all 3 cultivars.

I have observed Kentucky bluegrass cultivar variation in response to preemergence herbicides in field trials. The objectives of this study were to investigate the effects of bensulide, DCPA, and oxadiazon on Kentucky bluegrass and to determine if herbicide response varies with cultivar.

Twenty-four circular plugs each of 'Baron', 'Enmundi', 'Newport', and 'Park' Kentucky bluegrass were removed from field plots on Nov. 25, 1980, and placed in the greenhouse under a temperature regime of 18° night/21° to 23°C day. Each plug measured 10.3 cm in diameter and 10.3 cm in depth. The field plots from which the samples were taken had been established in September 1979 on a Aquic Hapludoll fine-loamy mixed mesic 'Nicoller' soil. Each of the cultivar plantings had received a total of 146 kg N/ha during 1980. Uniform cultural practices had been maintained on all 4 areas during the first season. The plugs were placed in the center of 16 × 18-cm pots and additional soil was added to fill the space between the plugs and the pot wall. The cultivars were maintained at a 5-cm mowing height for 6 weeks preceding the initiation of treatments. No thatch layers were present in the samples at the time of treatment. The organic matter content of the soil was 2.3%.

The study was arranged in a split-plot design with cultivars as main plots and preemergence herbicide treatments as subplots. Herbicide treatments (expressed as active ingredient) included bensulide at 8.4 and 15.7 kg/ha from a 46% emulsifiable concentrate formulation; DCPA at 11.8 and 16.8 kg/ha from a 75% wettable powder; and oxadiazon at 2.2, 4.5, and 9.0 kg/ha from a 2 G formulation. The rates of bensulide and DCPA are the recommended rates for control of crabgrass [Digitaria sanguinalis (L.) Scop.] and annual bluegrass (Poa annua L.), respectively. The rates of oxadiazon correspond to the low, high, and a double application of the high rate. Each treatment, plus an untreated control, was replicated 3 times. The pots were maintained at a 5-cm mowing height and were fertilized at a rate of 25 kg N/ha-month with a 20 N–8.8 P–16.6K fertilizer. The grasses were irrigated twice weekly with 350 ml of distilled water per pot throughout the study.

Data collected on a weekly basis included

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (kg a.i./ha)</th>
<th>Root wt* (g/pot)</th>
<th>Clipping wt (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Newport</td>
<td>Park</td>
</tr>
<tr>
<td>Control</td>
<td>11.8</td>
<td>1.2</td>
<td>310</td>
</tr>
<tr>
<td>DCPA</td>
<td>16.8</td>
<td>1.5</td>
<td>320</td>
</tr>
<tr>
<td>Oxadiazon</td>
<td>2.2</td>
<td>1.2</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>1.0</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>9.0</td>
<td>0.8</td>
<td>230</td>
</tr>
<tr>
<td>Bensulide</td>
<td>8.4</td>
<td>0.6</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>15.7</td>
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<td>250</td>
</tr>
<tr>
<td>LSD 1%</td>
<td>0.3</td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

*Values are the mean root weight of the 4 cultivars.
Cultivar × oxadiazon rate interactions were found for rhizome weight (Fig. 1), rhizome length (Fig. 2), and quality ratings (Fig. 3). In contrast, each of the cultivars responded consistently to DCPA and bensulide. The variation in cultivar response of rhizome weight and length to oxadiazon was pronounced. In both instances (Fig. 1 and 2), ‘Newport’ and ‘Baron’ were affected in a detrimental way, whereas ‘Park’ and ‘Enmundi’ were either slightly affected or unaffected by the increasing rates of oxadiazon. Quality ratings of all 4 cultivars decreased with increasing rates of oxadiazon (Fig. 3). The quality ratings for ‘Park’ and ‘Enmundi’ were higher than for ‘Newport’ and ‘Baron’ at all rates.

Oxadiazon is considered to be quite damaging to Kentucky bluegrass under some conditions (7); however, it has the advantage of providing excellent control of goosegrass (Eleusine indica L.), whereas the other chemicals are less effective against this species (2). I have also observed that it has a longer residual than the other preemergence herbicides. The phytotoxicity of oxadiazon varies with cultivar and this study suggests that where goosegrass is a serious problem, oxadiazon could be a useful preemergence herbicide if tolerant Kentucky bluegrass cultivars are used.

Literature Cited


Anatomical Aspects of Fluoride Foliar Necrosis of Cordyline1

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Abstract. Ten-node terminal cuttings of Cordyline terminalis (L.) Kunth ‘Baby Doll’ were placed in solutions of 0, 1, 2, and 3 mg/liter F (from NH₂FHF) and placed in growth chambers for 6 days at 18, 24, or 29°C. Increasing temperature and F concentration increased leaf damage. Damage ratings at 3 ppm were over 4 times greater at 29° than at 18°. Mesophyll collapse occurred only after severe epidermal collapse and chloroplast degeneration.

‘Baby Doll’ cordyline is a colorful and popular foliage plant. Until roots form, cuttings often develop foliar necrosis as a result of fluoride toxicity even at concentrations as low as 0.25 mg/liter (1, 2, 3, 4, 5). Fluoride contamination may result from irrigation water, propagation medium (particularly German peat and perlite), and soil amendments such as superphosphate (1, 2, 3, 4, 5, 6, 7, 8). Fluoride damage occurs primarily during propagation and diminishes due to a selective ion exclusion mechanism associated with wound healing and root development (1, 2, 4, 5). Toxicity symptoms appear macroscopically as necrotic areas or lesions which develop at leaf tips and progress basipetally along margins and from margins towards the midrib, often eventually involving the entire

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