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Annual Bluegrass and Creeping Bentgrass Germination Response to Flurprimidol

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Abstract. Seed of *Poa annua* var. *reptans* (Hauskins) Timm. (annual bluegrass) and *Agrostis palustris* Huds. 'Pennncross' (creeping bentgrass) were treated at planting with flurprimidol at rates of 0.00, 0.28, 0.56, 0.84, 1.12, 1.68, and 2.24 kg·ha⁻¹. Data were collected on germination of each species. Flurprimidol rates greater than 0.56 decreased germination for both species. Chemical name used: α -(1-methylethyl- α -(4-(trifluoromethoxy)phenyl)-5-pyrimidine methanol (flurprimidol).

Poa annua L. (annual bluegrass) invades close-cut, irrigated, intensively managed cool season turfs and within 3 to 5 years may dominate the stand (11). Annual bluegrass may invade desired species, filling voids left by mismanagement, disease, traffic, cultivation, and other stresses (1). Annual bluegrass may reestablish these areas vegetatively (1) or from seed in the soil (7). Control programs are based on the removal of annual bluegrass over a number of years while managing the turf for the desired species, or reestablishment of the desired species after annual bluegrass eradication (2, 5, 8). One management approach would be to employ a plant growth regulator to inhibit selectively the growth of annual bluegrass and encourage the desired species, allowing a gradual transition from annual bluegrass dominance while maintaining turfgrass aesthetic and functional qualities. Flurprimidol reduced annual bluegrass in perennial ryegrass (*Lolium perenne* L.) (2). Flurprimidol applied to annual bluegrass and creeping bentgrass (*Agrostis palustris* Huds.) polystands exhibits selectivity for annual bluegrass growth suppression, indicating a potential for use in

the conversion process (10). If the annual bluegrass population in a mixed stand is very high, overseeding with creeping bentgrass is sometimes implemented. Haley and Fermanian (6) found that flurprimidol was active on young seedlings of annual bluegrass and creeping bentgrass, but information on germination response was not reported. The objective of this research was to determine if flurprimidol applications influenced germination of annual bluegrass and creeping bentgrass.

Clay pots 100 mm in diameter were seeded in the greenhouse, where temperatures fluctuated between 10° and 24°C. The growth medium was 5 sandy loam : 3 sand : 1 peat-moss, (by volume). Half the pots were seeded to 'Pennncross' creeping bentgrass (lab germination 85%). The remaining pots were seeded to annual bluegrass (lab germination 92%). Both species were seeded at a rate of 25 seeds/pot. Seed of annual bluegrass was obtained by harvesting mature seed heads from a stand of annual bluegrass located at the Hancock Turfgrass Research Center, Michigan State Univ. The harvested seed was assumed to be of the perennial annual bluegrass biotype, due to the high germination (92%) observed immediately after harvest (1).

Immediately following seeding, pots were treated with flurprimidol at rates of 0.00, 0.28, 0.56, 0.84, 1.12, 1.68, and 2.24 kg·ha⁻¹. Treatments were applied with a backpack CO₂ sprayer with an 8002E nozzle calibrated to deliver 384 liters·ha⁻¹. Pots were irrigated three times daily for 4 min with an automatic misting system. The experiment was conducted on two dates (Oct. 1984 and

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Table 1. Flurprimidol effects on annual bluegrass (*Poa annua* var. *repans*) and creeping bentgrass (*Agrostis palustris* 'Penncross') germination. Values presented represent means of both species.

Rate (kg·ha ⁻¹)	Germination (%) ^a	
	Test date	
	1	2
0.00	100	100
0.28	92.0	92.3
0.56	86.7	85.3
0.84	86.7	78.3
1.12	81.0	76.3
1.68	47.7	60.0
2.24	50.3	73.7

^aPercent germination for the controls were normalized and treatment values were adjusted to a percentage of the control. Germination counts taken 21 days after treatment.
LSD ($P = 0.05$) for test date = 6.5%; LSD ($P = 0.05$) for rate = 8.4%.

Jan. 1985). Data were collected on the number of seed germinating per pot. Nongerminating seed were examined for evidence of radicle emergence. Pots were arranged in a randomized complete block. The rate and species factors were split on the date of test factor for a $2 \times 7 \times 2$ factorial treatment design. On each test date, six replications were used. Mean separation was accomplished using the least significant difference (LSD) multiple comparison technique.

Results of the analysis of variance showed that flurprimidol rates and date of test were significant sources of variation. A significant rate \times test date interaction also was observed; however, no variability due to species was observed. As flurprimidol rate increased, germination generally decreased. Rates ≥ 0.56 kg·ha⁻¹ significantly reduced germination when compared to the control (Table 1). The significant rate \times test date interaction and test date main effect result from the germination values observed for the 1.68 and 2.24 kg·ha⁻¹ rates. No explanation is evident for the significant rise in germination observed for the 2.24 kg·ha⁻¹ rate in test date 2.

Examination of nongerminating seed found no evidence of radicle emergence, indicating that flurprimidol may act as a germination inhibitor. Flurprimidol is in a class of plant growth regulators shown to inhibit gibberellic acid (GA) biosynthesis (3, 4). Gibberellic acid is produced in the embryo of the grass seed during germination. The GA produced stimulates the cells of the aleurone layer to manufacture α -amylase, an enzyme necessary for endosperm digestion (9). If the embryonic production of GA is inhibited by flurprimidol, the products normally made available from endosperm digestion are limited, which may account for the germination inhibition seen in this study.

Results of this experiment indicate that at low rates (0.28 kg·ha⁻¹), flurprimidol exhibits no inhibition of annual bluegrass or creeping bentgrass germination. At rates ≥ 0.56 kg·ha⁻¹, both species show the same germination response to flurprimidol application. Thus, there would be no advantage

in using flurprimidol in an overseeding program in terms of reducing the competition from germinating annual bluegrass. Results also indicated that the use of flurprimidol at rates ≥ 0.56 kg·ha⁻¹ should not be practiced at or near time of bentgrass overseeding. If overseeding is not planned, flurprimidol will have some preemergence activity on annual bluegrass seed present in the soil. Only one biotype of annual bluegrass was evaluated, and the extreme variability exhibited by this species should be considered when extending these results to all annual bluegrass biotypes.

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