TURFGRASS SEED GERMINATION AS INFLUENCED BY TEMPERATURE AND PLANT GROWTH REGULATORS

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IMPACT STATEMENT

Research was conducted to determine the effects of temperature and the plant growth regulator PGR IV on germination and seedling growth of six turfgrass species. Seeds of each species were placed in paper germination pouches and germinated in an incubator at 10, 15, 20, 25, or 30 °C for a period of 21 days. Duplicate samples were treated with PGR IV, a commercially available plant growth regulator consisting of a proprietary blend of indole butyric acid and gibberellic acid and a fermentation broth. PGR IV had no influence on the percentage of germination of any species but did increase root and shoot dry weight in tall fescue and perennial ryegrass.

BACKGROUND

Seed germination is influenced by oxygen availability, water, and proper temperature. For optimal germination, most grass species also require exposure to light. Both cool- and warm-season grass species have cardinal germination temperatures. These values are determined for each species by conducting germination tests over a range of tem-

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peratures, spaced at small temperature intervals. Although numerous commercial products have claimed to enhance germination for a wide variety of plant species, very few have proven effective. Several new categories of germination-enhancing plant growth regulators have proven effective in field crops but have not been tested on turfgrass species. A study was conducted to determine the influence of a plant growth regulator on the germination temperature requirements of six turfgrass species.

RESEARCH DESCRIPTION

The grasses studied were common bermudagrass, Kentucky bluegrass, tall fescue, perennial ryegrass, creeping bentgrass, and centipede grass. Each species was tested at six different temperatures, 5, 10, 15, 20, 25 and 30 ºC. Within each temperature treatment, seeds were either treated with PGR IV or untreated. There were three replications per treatment.

Specially prepared germination packets were used to germinate the seeds in a controlled climate chamber. The plant growth regulator (PGR IV, Microflow Corp, Lakeland, Fla.) solution was prepared by using 6.2 µL in 2 L of distilled water. Twenty milliliters of PGR IV solution was added to the germination paper and allowed to air dry. Each packet contained 50 seeds and was considered an experimental unit. Germination packets were set in plastic trays, water was added to the plastic trays, and the trays were placed in a temperature-controlled climate chamber. On day 14, the percentage of germination was determined, and on day 21, the seedlings were harvested for root and shoot dry weight.

FINDINGS

Application of PGR IV did not influence germination percentages for any grass species at any temperature (data not shown). The warm-season species, common bermudagrass and centipedegrass, had poor germination at temperatures below 25 °C. Even at 30 °C, germination values were still considerably lower in warm-season than cool-season species.

Creeping bentgrass and Kentucky bluegrass demonstrated a rapid increase in germination as temperatures increased from 10 to 15 °C, but as in the other species, no interaction with the growth regulator was detected.

A significant ($\alpha = 0.05$) species x temperature x growth regulator interaction was detected for shoot and root dry weights. Germination and growth of common bermudagrass, creeping bentgrass, and

centipedegrass were not affected by PGR IV.

Significant PGR IV treatment effects were found in tall fescue and perennial ryegrass (Table 1). Root and shoot dry weight was greater for PGR IV-treated tall fescue than for the untreated control at 15 °C, and treated tall fescue seeds produced more dry weight than the control at every temperature (Table 1). Similar increases due to PGR IV were found in perennial ryegrass except at 25 °C.

PGR IV positively influenced the root and shoot dry weight accumulation patterns of two cool-season turfgrass species; tall fescue and perennial ryegrass. The data also indicate that more growth occurs at cooler temperatures in treated seedlings than in the controls. From a practical standpoint, PGR IV would be valuable when applied to tall fescue and/or perennial ryegrass seed that is typically sown in the cool seasons of spring and fall.

Table 1. Root and shoot dry weight of six turfgrass species at five temperatures with and without PGR IV.

Species	PGR IV	Germination temperatures				
		10 °C	15 °C	20 °C	25 °C	30 °C
		(mg)				
Common bermuda	+	0	0	0	0	0
	_	0	0	0	0	0
Kentucky bluegrass	+	0	0	1.79	-	-
	_	0	0	0.97	-	-
Tall fescue	+	1.21[z]	1.69	2.28	3.23	2.44
	_	0.28	0.40	1.85	2.22	2.10
Perennial ryegrass	+	1.39	1.54	2.00	2.47	2.49
	_	1.15	1.31	1.91	2.51	1.93
Creeping bentgrass	+	0	0	0	0	0
	_	0	0	0	0	0
Centipedegrass	+	0	0	0	0	0
	_	0	0	0	0	0

[z] Significant differences ($P < 0.05$) existed in tall fescue and perennial ryegrass between treated and untreated plots over the entire temperature range.