# PERENNIAL RYEGRASS RESPONSE TO FOLIAR APPLICATION OF TRINEXAPAC-ETHYL PLANT GROWTH REGULATOR, 1998

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**Introduction**

Perennial ryegrass grown for seed is prone to lodging at the high fertility rates used to maximize seed production. Lodging of the crop can result in increased problems from disease and can reduce the efficacy of pollination. Use of manufactured plant growth regulators (PGRs) to control stem elongation and optimize seed production in cool season grasses had some success in the mid 1980s. Research developed during this period was based on the use of a residual, soil applied PGR in the triazole family (paclobutrazol) that gave reliable control of lodging and was able to improve seed yields. However, due to the longevity of this chemical in the soil, and difficulties in funding registration of chemicals for use on minor crops, use of this family of chemicals is not allowed.

Recent development of new foliar applied PGR type chemicals that readily breakdown in the environment and are effective at controlling rapid stem elongation are being studied to assess their potential for use in grass seed production systems. These experiments were conducted to examine the effect of Trinexapac-ethyl, a foliar applied PGR manufactured by Novartis on perennial ryegrass grown for seed production.

**Procedure**

Established stands (planted fall 1994) of 'Affinity' and 'Buccaneer' perennial ryegrass at Hyslop Crop Science Research Farm were used for these trials. The experiment was treated with 1.6 lb a.i./a diuron in the fall as well as 250 lb/a 16-20-0 fertilizer. Spring N was applied March 9 at 120 lb N/a and April 17 at 30 lb N/a. The experimental designs were randomized complete blocks replicated four times. PGR treatments were applied at walking speed using a bicycle type 6-foot wide boom sprayer with nozzles at 18 inch spacing. The sprayer operated at 20 psi with XR TEEJET 8003VS nozzles (approx. 30 gal/a water). In the 'Affinity' perennial ryegrass stand, seven treatments were applied as follows: an untreated check and three rates of Trinexepac-ethyl (200, 400, and 600 g a.i./ha) applied at one of two dates (April 19 and May 2, 1998). In the 'Buccaneer' perennial ryegrass stand, four treatments were applied as follows: an untreated check, Trinexepac-ethyl applied @ 400 g a.i./ha on April 21, May 5, and split equally (200 + 200g a.i./ha) on both dates. Plot size was 6 ft x 25 ft. The first (early) application was made at the onset of active internode elongation and during rapid leaf development. The second (late) application was made at about two palpable nodes during rapid internode elongation. Elongation and nodal development was assessed using a weighted average of tiller size and internode expansion from plant samples taken the day of or day prior to treatments.

Plots were sampled (9-inch row samples) at early bloom for fertile tiller counts, length measurements, and above ground biomass weights. Ten inflorescences were also randomly sampled for yield component analysis and spike length measurements. Harvesting was done using a 5 ft wide swather for windrowing and a Hege 180 small plot combine for harvest. All plots were swathed July 15 and combined July 27. Combined seed samples were cleaned using an M2-B clipper cleaner for final cleanout; subsamples of clean seed were taken for 1000 seed weights.

**Results**

The highest seed yields in the Affinity stand resulted from the highest PGR rate at both early and late application dates. Seed yield from the 600 g a.i./ha rate was almost twice the untreated check (Table 1). In the Buccaneer stand all of the treated plots yielded about the same whether the treatment was done in a single application or split (Table 2). Yields from both varieties were similar at the 400 g a.i./ha rate application rate. No differences in maturity were observed due to PGR treatments. All treatments increased seed yield and no phytotoxic effects were observed from the foliar applications. Last year (1997 crop), treatments in the Affinity stand indicated higher rates (1000 - 1500 g a.i./ha) had some phytotoxicity and did not yield as much as the 500 g a.i./ha rate. It was suggested that the expected maximum rate should be around 500-600 g a.i./ha for highest yield. This year's data also indicates the same.

Fertile tiller number per unit area in the Affinity stand were increased by the treatment when using a contrast analysis comparing all the treated plots with the untreated check, yet a similar increase was not observed in the Buccaneer stand. Specifically what component(s) of harvest improved seed yield was not apparent in either experiment. Floret numbers and spikelet numbers were affected (data not presented), but with mixed results. However, the effect on crop lodging was dramatic in relation to the check. The untreated stands were lodging by bloom and were level with the ground at harvest, in contrast, the stand in treated plots remained upright past bloom and were well into seed fill when the lower rates began leaning. At harvest the treated plots were still off the ground which allowed for easy windrowing. In the highest PGR treated plots, the windrows were much smaller and had less crop residue to combine.

Cleanout was significantly reduced in the treated plots. Improved cleanout may be attributed to less total dry matter running through the combine as well as the makeup of the windrow. In the untreated plots there was a lot of leaf and stem material, and in the treated plots the swaths were much smaller and had less plant material as previously mentioned.

In addition to improved cleanout, the increase in harvest index indicates better seed set in the crop. The overall tiller length and the spike length was reduced an average of 30% across all treatments (Table 1). This along with reductions in lodging may have improved conditions for seed set as well as seed recovery during harvest.

It should be noted that these trials were conducted on older stands (3-4 years old) and therefore results may be affected by the age of the stand as younger and first year fields often yield at the levels the treated plots did in this trial. But this study shows the significant impact this product has on seed yield in older stands. Experiments are being conducted during the 1999 crop year in young stands of perennial ryegrass, tall fescue and fine fescue to determine the impact this PGR has on seed production in these species.

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Table 1. Effects of foliar applied Trinexepac-ethyl on seed yield, harvest components, and tiller length in Affinity perennial ryegrass, 1998.

| Treatment | Seed Yield | Seed Yield | Aboveground biomass | Fertile tillers | Clean-out | Harvest index | Culm reduction | Lodging score |
|---|---|---|---|---|---|---|---|---|
| (g a.i./ha) | (lb/a) | (% of check) | (ton/a) | (no./sq. ft.) | (%) | | | (1-5)[2] |
| Untreated check | 952 e* | 100 | 5.1 | 209[1] | 20 a | 8.5 d | 0 c | 5.0 a |
| Early (April 19) | | | | | | | | |
| 200 | 1441 cd | 151 | 4.7 | 227 | 12 c | 14.3 abc | 15 b | 4.5 b |
| 400 | 1644 bc | 173 | 4.9 | 268 | 14 bc | 14.7 ab | 27 a | 3.8 c |
| 600 | 1894 a | 199 | 5.1 | 286 | 13 c | 15.8 a | 33 a | 3.3 d |
| Late (May 2) | | | | | | | | |
| 200 | 1316 d | 138 | 5.8 | 235 | 15 bc | 10.8 cd | 13 b | 4.5 b |
| 400 | 1555 c | 163 | 5.9 | 256 | 14 bc | 12.0 bcd | 24 ab | 3.8 c |
| 600 | 1831 ab | 192 | 5.2 | 343 | 17 ab | 15.4 ab | 29 a | 3.0 d |

*Means in columns followed by the same letter are not significantly different by Fisher's protected LSD values at P=0.05.
[1]Contrast of treated vs untreated significant P=0.05
[2] Lodging score at harvest 1-5: 1 = vertical; 5 = horizontal

Table 2. Effects of foliar applied Trinexepac-ethyl on seed yield, harvest components, and tiller length in Buccaneer perennial ryegrass, 1998.

| Treatment | | Seed Yield | Seed Yield | Aboveground biomass | Fertile Tillers | Clean-out | Harvest index | Culm reduction | Lodging score |
|---|---|---|---|---|---|---|---|---|---|
| (g a.i./ha) | | (lb/a) | (% of check) | (ton/a) | (no./sq ft) | (%) | | | (1-5) [2] |
| Untreated check | | 826 (b)* | 100 | 4.8 | 177 | 19 | 6.7 | 0 b | 5.0 a |
| Early | Late | | | | | | | | |
| 400 | 0 | 1418 (a) | 172 | 5.5 | 209 | 13 | 10.2 | 23 a | 3.6 b |
| 0 | 400 | 1508 (a) | 183 | 5.4 | 218 | 15 | 9.4 | 29 a | 3.4 b |
| 200 | 200 | 1485 (a) | 180 | 5.6 | 215 | 13 | 9.2 | 27 a | 3.8 b |

*Means in columns followed by the same letter are not significantly different by Fisher's protected LSD values at P=0.05, letters in parenthesis are significant at probability values P<0.10.
[2] Lodging score at harvest 1-5: 1 = vertical; 5 = horizontal