EFFECT OF FOLIAR APPLICATIONS OF UREA AND SIMAZINE DURING AND AFTER ANTHESIS ON SEED GERMINATION OF *POA PRATENSIS* L. 'MERION' AND 'KENBLUE'

ABSTRACT

Since previous research has shown that the growth of perennial ryegrass (Lolium perenne L.) to be increased by foliar applications of simazine and atrazine, and also since foliar applications of urea on wheat (Triticum aestivum L.) increased yield and protein content, this study was undertaken to determine what effect such foliar applications would have on the rate of germination of turfgrass seeds formed under the influence of such treatments. Kentucky bluegrasses (Poa pratensis L.) 'Merion' and 'Kenblue' were treated with foliar applications of simazine and urea with both one and three application treatments. The first application to the inflorescence was at anthesis, with the second and third applications being seven and fourteen days after anthesis. Identical treatments were made with and without using a wetting agent.

The results indicate that none of the treatment combinations with urea, simazine, and a wetting agent were significantly better than the control in terms of percent seed germination at 5, 10, 15, 20, and 30 days after establishment, according to Dunnett's test for two-sided comparisons at the 5% level.

INTRODUCTION

Kentucky bluegrass (Poa pratensis L.) is notorious for a relatively slow germination rate compared to most other cool season turfgrasses. Attempts have been made at finding a method of reducing the time of emergence of Kentucky bluegrasses Andersen (1957), Bass (1953), Behrendt (1960), Daniel and Goetze (1957), Daniel (1958), Harrington (1923), Maguire and Steen (1971). Germination requirements of a given species or cultivar vary depending on conditions during development, on maturity, and on age of seed, according to Toole and Toole (1955).

Sub-herbicidal rates of atrazine and simazine have been reported by Kay (1969) to double yields, and also to increase protein and nitrate nitrogen in wheatgrass seed (Agropyron intermedium (Host) Beauv.), as well as increase growth and protein content of perennial ryegrass (Lolium perenne L.). An application rate of 1.121 Kg./ha. was reported most effective.

Finey, Meyer, Smith, and Fryer (1957) found that foliar spray applications of urea consisting of one to several applications before and during anthesis caused higher yields and increased protein content in the seed of Pawnee wheat (Triticum aestivum L.). The effect of multiple sprayings was not additive, Finney et al. (1957).

The objectives of this study were to determine (1) if a foliar spray application of urea during seed development at one or three applications, with and without wetting agents, would promote development of a more vigorous seed in terms of rate of shoot emergence, and (2) if sub-herbicidal rates of simazine applied during seed development would promote development of a seed which had a more rapid rate of shoot emergence. Improving emergence rates of Kentucky bluegrass could possibly eliminate the need for mixing rapid germinating species with Kentucky bluegrass when seeding to prevent soil erosion, reduce weed infestation during establishment, and even replace the use of sod in some instances.

MATERIALS AND METHODS

Field Site Description

Mature stands of Kentucky bluegrass (Poa pratensis L.) 'Merion' and 'Kenblue' grown on a Houghton muck soil were used for this investigation. The uniformity and density of stand and seedhead formation were excellent for Kenblue and good for Merion. These two blocks were set up in a completely randomized block design comprising four replicates of each treatment. Plot size was 1.82 X 1.52 m. for Kenblue and 1.98 X 2.13 m. for Merion. Phosphorus and potassium levels were medium for turfgrass culture, with the soil having a pH 6.9. Nitrogen was not applied during the study, other than in the treatments described, or in the year previous to the study. No irrigation was used in the past years nor during the investigation. Finally, the plot area had been mowed once per year for the past four years.

Foliar Spray Applications

The eight inflorescence treatments included: (a) one application of 56.05 kg. urea/ha. (150.13 g. of urea/liter of water) applied with wetting agent at anthesis, (b) one application of 33.63 kg./ha. of urea (90.08 g. of urea/liter of water) applied with wetting agent at anthesis, (c) one application of 56.05 kg./ha. of urea applied without wetting

agent at anthesis, (d) one application of 33.63 kg./ha. of urea applied without wetting agent at anthesis (e) three applications of 56.05 kg./ha. of urea applied with wetting agent at anthesis and at seven and fourteen days after anthesis, (f) three applications of 33.63 kg./ha. of urea applied with wetting agent at anthesis and at seven and fourteen days after anthesis, (g) one application of 0.28 kg. a.i. of simazine per hectare applied at anthesis, and (h) one application of 0.07 kg. a.i. of simazine per hectare applied at anthesis. Wetting agent, Adjuvan-T®, was applied at a concentration of 25.43 liters/ha. The simazine was 80% A.I. Four replications of an untreated control were maintained for each of the two Kentucky bluegrasses.

Spray applications were applied with a 3.78 liter capacity, hand pump, pressure sprayer which had a boom with two nozzles giving a 2.0 meter spray width. Calibration of the sprayer was performed prior to each application. Spray volume was 570 liters of water/ha. (60.5 gal./A.). Conditions during spraying were partly cloudy to clear, 1-7 mph. winds, and from 15.6 - 28.3 C. Precipitation of 0.5 cm. occurred four hours after the first application, June 13, 1974, with no precipitation measured for 48 hours after the second and third applications, June 20 and June 27, 1974.

Harvest and Drying

Harvest took place on July 10, 1974 when the seed heads were golden brown and the seed was just beginning to fall. The peduncles with the spikes were harvested from each

plot and placed in paper bags which were placed in the greenhouse to dry for two months. The seed was then removed by rubbing the spikelets between the fingers, and afterwards was placed in sealed envelopes.

Germination Test

Germination evaluations were conducted in new 10 cm. plastic petri dishes containing #3 qualitative Whatman filter paper. Each dish received water as needed to maintain moist conditions at all times. Eight petri dishes with 25 seeds per dish were made for each treatment, comprised of four replicates with two subsamples per replicate. The optimal germination conditions used were 18 hours of darkness at 15 C and 6 hours of light at 25 C (Harrington - 1923), and Nelson (1927), which were maintained in a controlled environment chamber. Germination was defined as the point at which the shoot first emerged from the seed coat. Observations were made at 5, 10, 15, 20, and 30 days after placement in the petri dishes.

Statistical Analysis

A completely randomized analysis of variance was made on each of the two grasses, with a two-sided Dunnett's test performed at the 5% level of significance on the means. Each mean was made up of eight germination evaluation percentages. Also, all percentages were transformed by arc sine transformation prior to the analysis of variance and Dunnett's test.

RESULTS AND DISCUSSION

Merion Kentucky bluegrass

None of the inflorescence treatments were significantly different from the untreated control at the 5% level using Dunnett's test (Dunnett 1955) for two-sided comparisons (see Table 10). Yet, several of the treatments did produce results which ranked higher than the untreated control at the 10 and 15 day observation times. There is no literature to refer to on the effect of foliar applications of simazine and urea on the germination rate of Merion Kentucky bluegrass.

Kenblue Kentucky bluegrass

Some of the inflorescence treatments on Kenblue Kentucky bluegrass were significantly different at the 5% level, yet none of the treatment means were significantly different from the untreated control at the 5% level using Dunnett's test for two sided comparisons (see Table 11). As with Merion, several of the treatments did produce results which ranked higher than the control, in this case at 10, 15, 20, and 30 day observation times. Again, since similar work has never been published, there is no means of comparison with this study.

In conclusion, the effects of foliar applications of urea and simazine on Merion and Kenblue Kentucky bluegrass do

not seem to have a place in terms of improving the rate of emergence of these turfgrasses under optimal conditions in a growth chamber. This study does confirm that the effect of multiple sprayings was not additive, as previously stated by Finney et al. (1957). The effects of multiple applications, varied concentrations of both simazine and urea, and a wetting agent did not prove to be significantly effective in terms of improving the germination rates. Further studies are needed to determine yield, seed size, protein content, field germination response, and optimum treatment, if any, after similar treatments as described in this study.

TABLE 10. Effects of foliar applications of urea and simazine on the germination rate of Merion Kentucky bluegrass.

Treatments (as described in materials and methods	% Germination: 10,15,20,and 30 days after establishment (means of 8 replications)			
	10 day	15 day	20 day	30 day
Control	45.00	72.00	81.50	84.00
C	45.50	65.00	75.00	78.00
A	40.50	55.00	69.50	72.50
E	42.00	61.00	69.50	71.50
D	26.00	51.00	66.50	74.38
B	46.00	74.50	79.50	83.50
F	49.50	69.00	75.00	79.50
H	25.00	66.50	77.00	78.50
G	58.00	73.00	80.00	81.00

None of the above means are significantly different from the control at the 5% level using Dunnett's test for two-sided comparisons.

TABLE 11. Effects of foliar applications of urea and simazine on the germination rate of Kenblue Kentucky bluegrass.

Treatments (as described in materials and methods)	% Germination: 10,15,20,and 30 days after establishment (means of 8 replications)			
	10 day	15 day	20 day	30 day
Control	31.75	55.50	64.50	67.00
C	29.00	63.50	73.50	78.50
A	44.50	65.60	72.00	77.00
E	47.00	65.50	74.50	79.00
D	39.00	60.50	68.38	74.88
B	23.00	42.00	54.00	63.00
F	24.50	48.50	66.50	71.00
H	28.50	48.50	60.50	64.00
G	26.50	55.00	63.00	68.00

None of the above means are significantly different from the control at the 5% level using Dunnett's test for two-sided comparisons.

REFERENCES

Andersen, A.M. 1957. The effect of certain fungi and gibberellin on the germination of Merion Kentucky bluegrass seed. Proc. Ass. Offic. Seed Anal. 47:145.

Bass, L.N. 1953. Relationship of temperature, time, and moisture content to viability of seeds of Kentucky bluegrass. Iowa Acad. Sci. 60:86-88.

Behrendt, S. 1962. Possibilities of acceleration of the germination of perennial grass species by gibberellic acid. Eigenschaften Wirkungen Gibberelline, Symp. Giessen, Germany, 1960. pp. 195-199.

Daniel, W.H., and N.R. Goetze. 1957. Germination of turf cover species as influenced by periods of soaking in various fertilizer solutions. Agron. Abstr. p. 44.

Daniel, W.H. 1958. Why soak grass seed? Proc. Midwest Regional Turf Conf. pp. 30-31.

Dunnett, C.W. 1955. A multiple comparison procedure for comparing several treatments with a control. J. Am. Stat. Assn. 50:1096-1121.

Finney, K.F., J.W. Meyer, F.W. Smith, and H.C. Fryer. 1957. Effect of foliar spraying of Pawnee wheat with urea solutions on yield, protein content, and protein quality. Agron. J. 49:341-347.

Harrington, G.T. 1923. Use of alternating temperatures in the germination of seeds. Agr. Res. 23:295-332.

Kay, Burgess L. 1969. The increase in protein content and yield of simazine and atrazine treated range forage. (Unpublished data). California.

Maguire, J.D., and K.M. Steen. 1971. Effects of potassium nitrate on germination and respiration of dormant and non-dormant Kentucky bluegrass (Poa pratensis L.) seed. Crop Sci. 11:48-50.