

Germination of *Lolium multiflorum* genotypes in high salt conditions

L. R. Nelson & J. Crowder

Texas AgriLife Research and Extension Center, P.O. Box 200, Overton, TX 75684 USA

E-mail: lr-nelson@tamu.edu

Abstract

Results from this study indicated best levels to select ryegrass genotypes for germination under high salt levels would be from 13,000 to 16,000 mg L⁻¹. At 19,000 mg L⁻¹, little differentiation was apparent, although some seed did germinate. Second, high seed quality is important in germination studies, and low seed quality of the experimental lines may have masked possible salinity tolerance at germination. Lastly, if these experimental lines have salt tolerance during the seedling stage, this resistance was not effective during the germination process.

Materials and Methods

Five annual ryegrass genotypes ('Gulf', 'Panterra', TXR2009-SS, Pecos Bulk, and SS₃) were subjected to five concentrations of salinity during germination. The latter three germplasm lines were selected for salt tolerance under either field conditions at Pecos, Texas or under greenhouse growing conditions. Therefore seed was extremely light, and of low quality compared to seed of the first 2 germplasms, which was produced in Oregon. The germination protocol for ryegrass from the Proceedings of the Association of Official Seed Analysis, Vol. 60, No. 2 was followed as closely as possible. One hundred seed of each entry were placed on germination paper in 1.5 x 14 cm Petri dishes. There were 4 replications, which resulted in 100 Petri dishes for the entire study. Salt concentrations of NaCl in distilled water were 0 (check), 10,000 (16.0 dS/m⁻¹), 13,000 (20.8 dS/m⁻¹), 16,000 (25.6 dS/m⁻¹), and 19,000 mg L⁻¹ (30.4 dS/m⁻¹), respectfully. Data are presented on percent germination after 7 and 14 days after seed were placed in a germination chamber at 15 C nights (12 hr) and 25 C days (with light). Data was analyzed as a randomized complete block as a factorial with 4 replications.

Results

Significant differences were observed for genotypes (G), salt concentrations (SC) and for G x SC levels. The mean % germination of genotypes averaged over all salt concentrations indicated Gulf had the highest level at 14 days of 70% followed by Panterra (66%), TXR2009-SSBk (54%), SS₃ (41%) and Pecos Blk (38%). Percent germination for salt levels averaged over genotypes were 92% at 0, 81% at 10,000, 61% at 13,000, 28% at 16,000, and 8% at 19,000 mg L⁻¹, respectively. Germination percentages at 7 days were from 10 to 20 % lower; however, followed the same trend as at 14 days. Since there was a significant interaction between G x SC, the performance of each genotype must be looked at under different salt concentrations. Gulf had more tolerance to high salt concentrations than other genotypes until a concentration of 19,000 mg L⁻¹, where little germination occurred for any line. Panterra was the next best genotype and followed a similar trend. The three experimental lines selected for salt tolerance after germination all had less tolerance to germination under high salt concentrations in this study. After 14 days, Gulf and Panterra had some seed germinate even at 19,000 mg L⁻¹ (13 and

20%, respectively). The experimental lines had less than 4% germinate at 19,000 mg L⁻¹ salt concentration.

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