

Emergence of several Triticeae range grasses influenced by depth of seed placement

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Abstract

Seed of 8 Triticeae species was planted in petri dishes (depth = 0) and 2, 4, 6, and 8 cm deep in soil in the greenhouse. Total emergence at 6 weeks after planting declined significantly with increased depth and the species by depth interaction was significant ($P < 0.001$). Dahurian wildrye (*Elymus dahuricus* Turcz. ex Griseb.) and tetraploid Russian wildrye (*Psathyrostachys juncea* [Fisch.] Nevski) exhibited similar emergence from deep seedings and were superior to all other species except Altai wild ryegrass (*Leymus angustus* [Trin.] Pilger). The better emergence of the tetraploid Russian wildrye entry compared to diploid cultivar suggests that the establishment of the tetraploid cultivar will be less affected by poor seed depth control. Newly released cultivars of Dahurian wildrye will be less affected by variable seed depth than several of the species currently recommended for seeding rangelands.

Key Words: Dahurian wild ryegrass, Altai wild ryegrass, Russian wild ryegrass, slender wheatgrass, intermediate wheatgrass, crested wheatgrass, Nuttall's alkali grass

Variable seed depth is a major cause of establishment failure on semiarid rangelands and may result from inadequate depth control of seeding equipment (Lawrence and Dyck 1990), rough microtopography, or poor seedbed preparation. Emergence of seedlings from seed depths greater than 2.5 cm would be an advantageous trait in dryland grasses. 'Tetracan', a newly released tetraploid (2N = 4X = 28) Russian wildrye (*Psathyrostachys juncea* [Fisch.] Nevski) cultivar has larger seed mass and greater emergence from 4.5 cm depth of seeding than diploid cultivars (Lawrence et al. 1990b). The emergence of Tetracan from deeper seeding has not been documented. Dahurian wildrye (*Elymus dahuricus* Turcz. ex Griseb.) is a recently introduced species with high establishment year forage yield that has been identified for seeding in mixtures with slower establishing species in semiarid locations in Western Canada (Lawrence and Ratzlaff 1985, Lawrence et al. 1990a). The present study was conducted to determine the response of these new cultivars to increasing seed depth relative to other grass species.

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Manuscript accepted 28 May 1990.

Methods

The experiment was conducted over a 6-week period in a greenhouse with temperature maintained at approximately 25° C in a 16-hour photoperiod with surface applied water as required. One hundred viable seeds in single rows constituted individual plots. The experimental design and treatments were as follows:

Design—4 replicate split plot.

Main Plots—8 grasses: Altai wildrye (*Leymus angustus* [Trin.] Pilger) 'Prairieland'; Dahurian wildrye 'James'; Russian wildrye-diploid 'Swift'; Russian wildrye-tetraploid 'Tetracan'; slender wheatgrass (*Elymus trachycaulus* [Link] Gould ex Shinnery) 'Revenue'; intermediate wheatgrass (*Thinopyrum intermedium* (Host) Barkworth and D.R. Dewey subsp. *intermedium*) 'Clarke'; crested wheatgrass (*Agropyron desertorum* [Fisch. ex Link] Schultes) 'Summit'; and Nuttall's alkali grass (*Puccinellia tenuiflora* Schribn. & Merr.) Sc 186169 (an accession from People's Republic of China via S. Smoliak, Lethbridge Research Station).

Split-plots—Five seeding depths: 0 (in petri dishes), 2, 4, 6, and 8 cm, using methods outlined by Lawrence (1979).

Soil Mix—loam: with 41.5% sand, 21.6% clay and 36.9% silt.

Data Analysis—Emergence (%) was determined 6 weeks after planting. Emergence at all depths was adjusted to correct 0 depth data to 100%. Analysis of variance based on the split plot model and regression of entry means on depth were computed with SAS General Linear Models procedure.

Results and Discussion

The final emergence of the 8 grass species decreased with increasing depth of seeding (Table 1). The species, depth, and species by depth interaction effects were all highly significant ($P < 0.001$). First or second order regression equations with depth as the independent variable accounted for more than 90% of the variability in emergence for all species. Altai wildrye was least affected by deep seed placement as previously reported (Kilcher and Lawrence 1970). The tetraploid Russian wildrye had greater emergence than the diploid Russian wildrye. This conclusion indicates that seedling establishment of the new cultivar Tetracan should be less variable than has been observed for previous diploid cultivars. Dahurian wildrye exhibited excellent emergence to 6 cm depth and was less affected by seed depth than crested wheatgrass or diploid

Table 1. Mean emergence (%) of 8 grasses (n = 4), 6 weeks after planting at 5 depths and regression equation of mean emergence on depth.

Grass	Depth (cm)					Regression	R ²	SEE ¹
	0	2	4	6	8			
	----- (%) -----							
Dahurian wildrye	100	95.3	86.3	68.7	17.6	97.4+ 4.92Depth-1.81Depth ²	0.98	3.77
Russian wildrye-tetraploid	100	93.1	75.5	48.3	21.3	101.0- 3.01Depth-0.89Depth ²	0.98	1.09
Russian wildrye-diploid	100	73.6	47.4	10.2	0.3	98.9-13.14Depth	0.98	1.09
Altai wildrye	100	85.1	66.9	63.9	48.7	97.7- 6.19Depth	0.97	0.67
Intermediate Wheatgrass	100	64.5	45.0	27.6	12.7	98.4-16.73Depth+0.77Depth ²	0.99	1.82
Crested Wheatgrass	100	76.1	25.5	2.8	0.6	105.6-23.79Depth+1.27Depth ²	0.96	6.56
Slender Wheatgrass	100	91.4	64.4	36.4	15.7	106.3-11.18Depth	0.98	0.98
Nuttall's Alkaligrass	100	13.2	0	0	0	92.0-37.34Depth+3.33Depth ²	0.92	9.44

¹SEE = Standard error of estimate for first order regression coefficient.

Russian wildrye. The higher seedling vigor (Lawrence et al. 1990b) of this species and its better emergence from deep seed placement than current dryland grasses are agronomic advantages for seeding on semiarid rangelands. The very low emergence of Nuttall's alkali grass from 2 cm depth indicates that if this species is used in reclaiming wet saline soil seeps, broadcast seeding will be required.

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