

## Row spacing and productivity of Russian wild rye pastures in semiarid environments

J.D. Berdahl, S.L. Kronberg, J.R. Hendrickson and J.F. Karn

USDA-ARS, Northern Great Plains Research Lab., P.O. Box 459, Mandan, North Dakota 58554-0459, USA,  
Email: berdahlj@mandan.ars.usda.gov

**Keywords:** semiarid climate, seeded pasture, Russian wildrye, row spacing

**Introduction** To sustain forage yields in dry years in semiarid climates, row spacings >59cm have been recommended for Russian wild rye [*Psathyrostachys juncea* (Fisch.) Nevski] (Lawrence & Heinrichs, 1968). However, wide row spacings promote weed invasion, soil erosion, and elevated plant crowns resulting in a rough, “washboard” ground surface (Kilcher, 1961). Jefferson and Kielly (1998) suggested a 30-cm row spacing for optimum sustainable forage yields in Russian wild rye in the semiarid prairie region of Canada. This study aimed to evaluate the relationship between row spacing and productivity of Russian wild rye at two semiarid sites near Mandan, in the northern Great Plains region of the USA (46° 48’ N latitude, 100° 55’ W longitude).

**Materials and methods** Four Russian wild rye cultivars were seeded in rows spaced from 15-90 cm apart in 15-cm increments at two field sites. Data are presented for the 15, 45, and 90-cm spacings in Tables 1 and 2. Soils were a sandy-loam at site 1 and a silt-loam at site 2. Dry matter (DM) yields were measured from a single annual harvest for 3 years at each site when plants were at the hard-dough stage of maturity. Crude protein (CP) content was measured at site 2 for 2 years when plants were at the hard-dough stage and again after forage regrowth.

**Results** DM yields varied significantly ( $p < 0.01$ ) among years at both sites (Table 1), primarily in response to differences in precipitation among years. Yields tended to be greater for the 15-cm spacing than the other row spacings when the tests were newly established, but differences among row spacings diminished in succeeding years. A significant ( $p < 0.01$ ) row spacing x year interaction for DM yield was present at site 1 but not at site 2. Severe drought in 2002 resulted in few reproductive tillers being produced and little regrowth after harvest. In 2002, forage regrowth had greater CP concentration ( $p < 0.05$ ) than forage at the hard-dough stage of development in July, but differences among row spacings were not significant at either sampling date (Table 2). In 2003, forage regrowth at the 90-cm row spacing had greater CP concentrations than the 15-cm spacing, but DM content of the regrowth, a measure of succulence, was equal for the two extreme row spacings.

**Table 1** Mean DM yields of 4 Russian wild rye cultivars at 3 row spacings in different years at two sites (Mg/ha)<sup>#</sup>

Row spacing (cm)	Site 1			Site 2		
	1999	2000	2001	2002	2003	2004
15	6.58	4.22	3.56	2.08	5.82	3.25
45	6.57	3.90	3.09	1.89	5.31	3.19
90	5.69	3.56	3.42	1.67	5.13	3.16

<sup>#</sup> Differences among row spacing means within years were not significant ( $p \leq 0.05$ )

**Table 2** Mean CP concentrations of 4 Russian wild rye cultivars at three row spacings at different sampling dates (g/kg)<sup>#</sup>

Row spacing (cm)	2002		2003	
	9 July	28 Oct	8 July	22 Oct
15	132a	138a	92a	161b
45	123a	135a	71b	186ab
90	129a	144a	83ab	204a

<sup>#</sup> Means within a column followed by a different letter were significantly different ( $p \leq 0.05$ )

**Conclusions** DM yields among row spacings at the July harvest dates were essentially equal by the third production year at both field sites. Even though forage regrowth from the wide row spacing treatments may have higher CP concentrations in some years, potential weed invasion and other problems would negate any advantage for row spacings >45 cm for Russian wild rye pasture.

### References

- Jefferson, P. G. & G. A. Kielly (1998). Reevaluation of row spacing/plant density of seeded pasture grasses for the semiarid prairie. *Canadian Journal of Plant Science*, 78, 257-264.
- Kilcher, M. R. (1961). Row spacing affects yields of forage grasses in the Brown soil zone of Saskatchewan. Publ. 1100, Research Branch, Canada Dept. of Agriculture, Ottawa, ON, Canada.
- Lawrence, T. & D. H. Heinrichs (1968). Long-term effects of row spacing and fertiliser on the productivity of Russian wild ryegrass. *Canadian Journal of Plant Science*, 48, 75-84.