Seed Yield of Russian Wild Ryegrass Grown on an Irrigated Clay Soil in Southwestern Saskatchewan

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Russian wild ryegrass (*Elymus junceus* Fisch.) is well adapted to the Northern Great Plains region of Canada and the United States (Heinrichs and Lawrence, 1956, and Campbell, 1961 and 1963). Its general acceptance as a species for pasture seeding, however, has been slow because of high seed costs brought about by low seed yields. Solutions to seed production problems have been sought by several workers who studied the influence of various management factors on the seed yield of this grass. Stelfox *et al.* (1954) and Stitt (1954) found that a combination of wide row spacings and nitrogen fertilizer were essential for good seed yields. Schaaf (1961) found that early spring seedings produced more seed in the subsequent two years than later seedings. Lawrence (1961) studied methods of harvesting this species and found that swathing was preferable to straight combining from the standpoint of maintaining seed quality.

The present study was undertaken to provide information on fertilizer effects on seed yields of Russian wild ryegrass grown on irrigated land. Although the data were obtained from an experiment at one site only, the soil at the site was heavy clay, typical of many irrigated areas in southwestern Saskatchewan on which Russian wild ryegrass is grown for seed.

Experimental Methods

The study was conducted during the period 1955 to 1961 on part of a seed production field of Russian wild ryegrass which had been seeded in rows 3 feet apart in 1953 and produced its first seed crop in 1955. The experimental design was a split-plot with six replications in which kind of fertilizer constituted the main plots and rate of fertilizer application the subplots. The subplots were 12 feet wide and 40 feet long.

The fertilizers, ammonium nitrate (33.5-0-0) and ammonium phosphate-sulphate (16-20-0), were applied at rates supplying 0, 25, and 50 pounds of N per acre. Fertilizers were applied in April and August in 1955 and thereafter in August only. A power V-belt plot seeder was used to place the fertilizers into the soil in rows spaced one foot apart.

The soil at the site of the test was a Sceptre heavy clay (Mitchell *et al.* 1944). Irrigation water was applied in May and after seed harvest each year. Approximately three to four inches of water were applied per irrigation.

Results and Discussion

The seed yield of Russian wild ryegrass was increased by the application of fertilizer (Table 1). The yield response to fertilizer was proportionally greater as the stand became older. In 1955, the first crop year, there was very little increase from the use of either fertilizer but from then on it was substantial. The 50-pound rate of 16-20-0 gave a more consistent response than the 25-pound rate throughout the entire period of the test while the 50-pound rate of 33.5-0-0 yielded less than the 25-pound rate during the first two years. However, there was very little indication that phosphate produced any significant seed yield response under conditions of this study.

Russian wild ryegrass is rather unique in its erratic seed production pattern and the results from this study were no exception. This seems to be caused by some environmental influence which determines whether or not a plant will form seed stalks. The data indicate that a nitrogenous fertilizer should be used for suc-

Table 1. Seed yields of Russian wild ryegrass, as influenced by ammonium nitrate (33.5-0-0) and ammonium phosphate-sulphate (16-20-0) fertilizer applied at three levels.

Fertilizer and N	Seed yield						
	Year						Mean
	1955	1956	1957	1958	1959	1961	
	(Pounds per acre)						
33.5-0-0							
0	384	165	209	77	40	46	154
25	392	274	336	193	66	93	226
50	366	201	403	200	106	188	244
Mean	381	213	316	157	71	109	208
16-20-0							
0	438	149	228	125	35	53	171
25	411	203	308	133	48	122	204
50	505	209	398	269	118	105	267
Mean	451	187	311	176	67	93	214

Note: No seed yields were obtained in 1960 because of hail damage.

Table 2. Cost of fertilizer per pound of seed increase.

Fertilizer and N	Cost of fertilizer per pound of additional seed by years					
	1955	1956	1957	1958	1959	1961
(pounds per acre)	— — — — — — — (Cents) — — — — — — —					
33.5-0-0						
25	36.0	2.6	2.3	2.5	11.1	6.1
50	575.0	16.0	3.0	4.7	8.7	4.0
Mean	305.5	9.3	2.6	3.6	9.9	5.0
16-20-0						
25	555.0	10.3	6.9	69.4	42.7	8.0
50	16.6	18.5	6.5	7.7	13.4	21.3
Mean	285.8	14.4	6.7	38.6	28.0	14.6

cessful seed production of this grass, and corroborate the findings of Stelfox *et al.* (1954) and Stitt (1954).

There was a general tendency for seed yields to decrease as the age of the stand increased. The relatively low yield in the fifth crop year (1959) and seventh crop year (1961) suggested that a stand of Russian wild ryegrass should not be retained for seed production beyond the fourth crop year.

The economic importance of greater seed yields depends upon the cost of fertilizer. The cost of N per pound was 11.5 cents when applied as 33.5-0-0 and 22.2 cents as 16-20-0. On this basis the cost of fertilizer for each additional pound of seed was calculated (Table 2). The data clearly show that this was rather high for both fertilizers in 1955. However, in subsequent years the costs for 33.5-0-0 per pound of additional seed were considerably lower than those for 16-20-0 fertilizers.

Summary

1. Fertilizer applications resulted in increased seed yields of Russian wild ryegrass.
2. There was little value in applying fertilizer until after the first seed crop.
3. There was a tendency for seed yields to decrease with increasing age of the stand, suggesting that after four seed crops the yields are so low that it is impractical to maintain the stand.
4. Of the two fertilizers tested, 33.5-0-0 was the most economical to use.

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