Research Note

Studies on Seed Production of *Lolium perenne* L. in India[1]

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ABSTRACT

Two trials at the same site in two consecutive seasons were used to examine the effects of sowing date, sowing rate, row spacing and cutting on seed yield of perennial ryegrass (*Lolium perenne* L.). In both seasons from sowings on October 1, 15, 30 and November 15, maximum seed yield was recorded from the October 30 sowing. Seed yield did not differ among sowing rates of 5, 10, 15 and 20 kg ha^{-1}, but was greater at a 60 cm row spacing than for 30 and 45 cm row spacings because more tillers were produced. Not cutting the crop significantly reduced seed yield because growth was excessive and plots lodged badly. The difference in seed yield between one early spring cut and one autumn cut plus one early spring cut was significant for one of the two seasons. Commercially acceptable yields of perennial ryegrass seed (200-400 kg ha^{-1}) can be obtained provided irrigation is available.

Additional index words: **perennial ryegrass, sowing rate, sowing time, row spacing, forage cuts, seed yield.**

EXPERIMENTAL AND DISCUSSION

Perennial ryegrass (*Lolium perenne* L.) was introduced to the Punjab as an experimental multicut fodder crop in 1981. Since then it has performed well in monoculture, as well as in mixtures with berseem (*Trifolium alexandrinum* L.) under Punjab conditions (Tiwana and Puri, 1984). The widespread use of any crop depends on the availability and price of its seed. Seed production of perennial ryegrass was examined in two seasons with two separate experiments.

The effects of sowing date, sowing rate, row spacing and cutting were investigated at Punjab Agricultural University (PAU), Ludhiana on a loamy sand soil with irrigation. PAU is at 30°-56' N latitude and 75°-52' E longitude at 247 m above sea level. Two separate experiments were conducted in the same field and repeated over two seasons (1986/7 and 1987/88). The field had previously been in maize. For both experiments and in both seasons, plot size was 6 x 5.5 m, and treatments were replicated four times in a randomized block design. Each year farm yard manure was applied at 15 t ha^{-1} prior to sowing, and 75 kg P_2O_5 and 75 kg N ha^{-1} was applied after the last forage cut.

In September 1986, the field was disc harrowed and then rotary cultivated twice to prepare a seed bed. For Trial 1, seed was sown at 15 kg ha^{-1} on October 1, 15, 30 and November 15 at 50 cm row spacings. Three cutting treatments were imposed : uncut, one cut (March 5, 1987) and two cuts (2 months after each sowing and March 5). Plots were cut to a height of 7 cm above ground level and all cut material was removed. For Trial 2, seed was sown on November 15 at 5, 10, 15, 20 kg ha^{-1} in row spacings of 30, 45 and 60 cm. All plots were cut to 7 cm on March 5 and the cut material removed. Plots in both trials received an irrigation immediately after sowing, six days later, and from then on as required. Weeds were removed by hand hoeing. At harvest (30 May), the degree of lodging was visually assessed, using a scale of 1 = upright to 10 = completely flat. Each plot was hand cut using sickles and the cut material ambient air dried for five days before hand threshing and cleaning. Seed yield components were determined from within randomly selected quadrats at harvest.

After harvest in 1987 the field was ploughed and remained fallow over the following summer. A seed bed was then prepared as described for 1986, and both trials were repeated. Yield component data and lodging score were not recorded.

As there were no significant interactions between sowing date and cutting, or sowing rate and row spacing, data are presented separately. Maximum seed yield was recorded from the October 30 sowing in both seasons (Table 1). In 1986/87 yield did not differ amount the other sowing dates, but in 1987/88, yield was greater for the October 15 and November 15 sowings than for the October 1 sowing. Tiller numbers, florets per spike and thousand seed weight did not differ significantly (data not presented), but spikelets per spike decreased from 29.0 to 25.7 as sowing date was delayed, a result also reported by Hebblethwaite and Peirson (1983). The reason for the seed yield response cannot be explained from the data recorded, but may have arisen from differences in seeds per spikelet, as lodging was more severe for the October 1 and 15 sowings (data not presented). Sowing rate did not affect seed yield (Table 1), a result previously reported by other authors (*eg*. Evans, 1963). Tiller numbers and other yield components did not differ (data not presented), suggesting that plants at the lowest sowing rate tillered more profusely, and those at the highest rate lost tillers due to competition (Evans, 1963).

Not cutting the crop significantly reduced seed yield

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Table 1. Effect of sowing date and row spacing on perennial ryegrass seed yield.

Sowing date	Seed yield kg ha^{-1} 1986/87	Seed yield kg ha^{-1} 1987/88	Sowing rate kg ha^{-1}	Seed yield kg ha^{-1} 1986/87	Seed yield kg ha^{-1} 1987/88
October 1	327	323	5	293	332
October 15	328	352	10	205	321
October 30	372	387	15	189	320
November 15	330	350	20	187	311
LSD P<0.05	41	15	LSD P<0.05	NS	NS

Table 2. Effect of forage cutting and row spacing on perennial ryegrass seed and straw yield, yield components and lodging.

	Seed yield kg ha^{-1}		Straw yield kg ha^{-1}		Tillers m^{-1}	Lodging score	Thousand seed weight (g)
	1986/87	1987/88	1986/87	1987/88	1986/87	1986/87	1986/87
Cutting							
uncut	232	292	14000	15510	473	9.07	1.77
one cut	401	409	4000	4750	385	5.69	1.93
two cuts	385	358	4330	4750	370	5.40	1.87
LSD P<0.05	38	13	1010	330	21	0.63	NS
Row spacing							
30	169	289	7110	6030	332	-[1]	1.91
45	191	305	7190	6150	356	-	1.92
60	203	369	7310	6170	417	-	1.93
LSD P<0.05	21	24	NS	NS	42.6	-	NS

[1] *not assessed*

in both seasons (Table 2), while one cut outyielded two cuts in 1987/88 but not 1986/87. While not cutting produced more tillers in 1986/87, it also produced over three times the amount of dry matter, and plots were nearly completely lodged. Tillers in the uncut plots had more spikelets per tiller (31.1 cf. 25.1) and florets per tiller (263 cf. 140), but presumably seed yield was reduced because seeds per spikelet were reduced, as thousand seed weight did not differ. Lodging is known to significantly reduce perennial ryegrass seed yield (Hebblethwaite, Burbidge and Wright, 1978). In both seasons seed yield increased as row spacing increased (Table 2), because tiller numbers were increased. Other yield components did not differ. Increasing row spacing does not always increase perennial ryegrass seed yield, and in many temperate systems, a 15 cm row spacing is common. However where hand weeding is employed, a 60 cm row spacing allows for better weed control.

These trials have demonstrated that at this site where the crop was able to be irrigated to prevent moisture stress, commercially acceptable perennial ryegrass seed yields can be obtained. Farmers should sow at 5 to 10 kg seed ha^{-1} in 60 cm rows at the end of October, and one or more cuts can be taken before closing for seed production. Further work is needed to investigate the effects of time of cutting in the spring on seed production.

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