Plant Spacing for Seed Production of Tall Fescue

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Introduction

Tall fescue is a deep-rooted bunch grass that is grown extensively in the USA for amenity purposes on sports fields, golf courses and lawns and for the production of herbage for ruminant livestock. In the early 1990s, evaluation trials at Beaverlodge, Alberta, indicated that it was feasible to grow tall fescue for seed in the Peace River region. Studies were subsequently initiated to develop agronomic information for growers interested in diversifying their farming operations. A knowledge of the appropriate sowing rate and row spacing is a fundamental requirement for any grass seed crop, as plant spacing normally has a strong influence on the yield and longevity of the stand.

Objectives

To conduct a study in the Peace River region of north-western Canada in order to determine whether the seed yield of tall fescue can be optimized, for several consecutive seed crops, by manipulating the population density and spatial arrangement of plants at the time of crop establishment.

Experimental Details:

Seeds of 'Mustang' tall fescue were germinated in late May and individual seedlings were transferred to root trainers. Prior to transplanting into the field plots in mid-to-late July, the seedlings were placed in a greenhouse exposed to natural light and then hardened in a screen house. The seedbed received 150 kg/ha each of 11-55-0 and 0-0-5-17S and the transplants were irrigated to ensure good establishment. The plant density treatments were based on between-row spacings of 20, 40 and 80 cm and within-row spacings of 5,10, 20, 40 and 80 cm. Various combinations of these within- and between-row spacings were included in the trial so that seven plant density treatments could be compared, namely 1.6, 3.1, 6.3, 12.5, 25, 50 and 100 plants/square metre. Each treatment was replicated four times and the replicates were each oriented in a different direction to eliminate the effect of row orientation on crop performance. Observations on plant productivity, plant development, and seed quality were recorded for three successive production years (1991 to 1993) on 12, well-bordered, individual plants per treatment plot. Throughout the study, weeds and volunteer grass seedlings were removed by hand and/or hoeing, and an annual application of 200 kg/ha of 34-0-0 N fertilizer was made each October. The soil moisture during the study was about normal for the region in 1990 and 1993, and drier than normal in 1991 and 1992, with an annual moisture deficit (precipitation minus pan evaporation) of 101, 146, 131, and 106% of the long-term average.

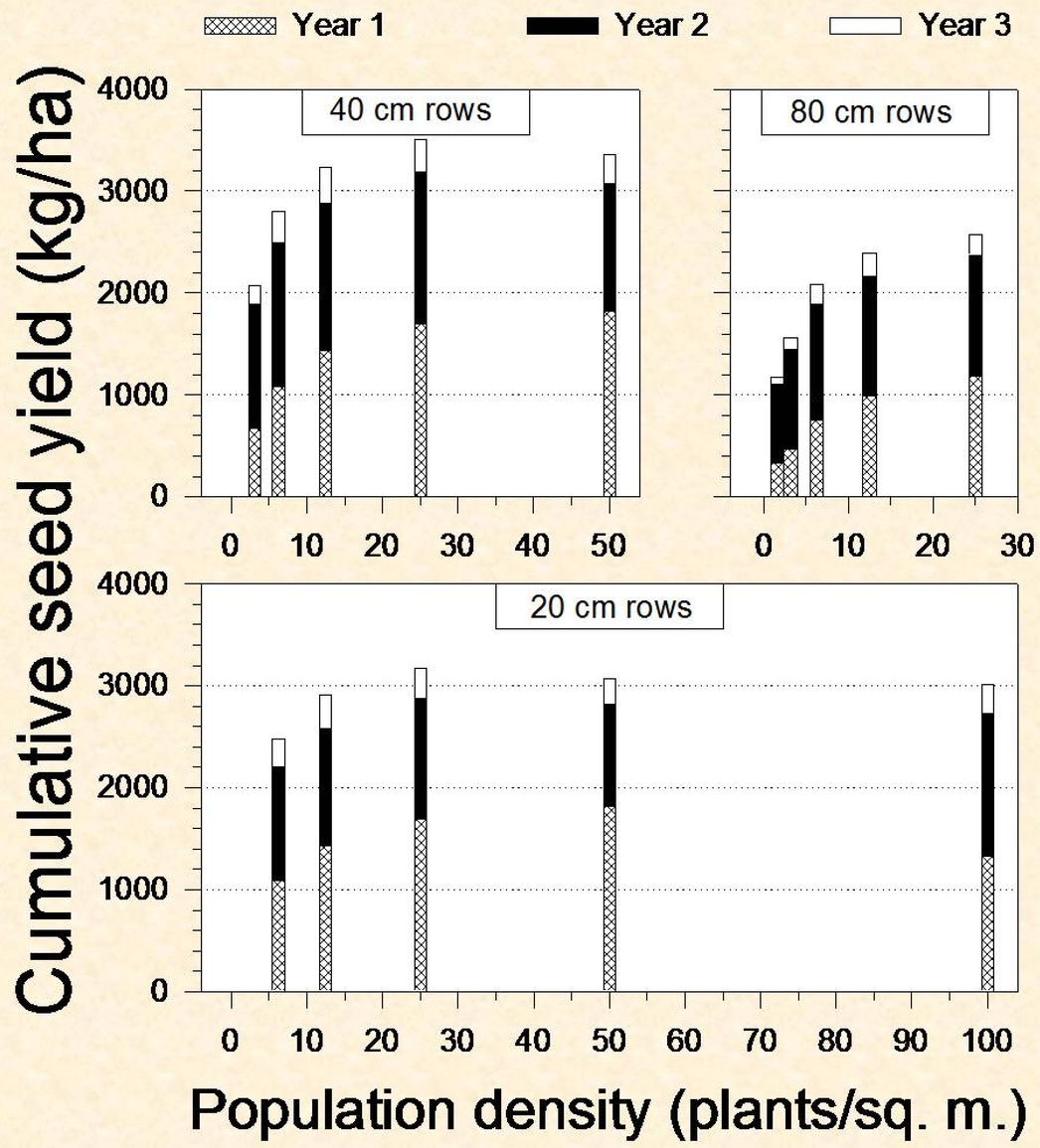
Results and Discussion

Heading commenced at dates differing by 16 days in the 3 production years and was delayed by up to 8 days as plant population density increased, particularly in the first production year. The time of seed maturity differed among production years (July 21 to August 4) but was generally unaffected by plant density or row spacing. The seed yield per plant, the number of seedheads per plant and the number of seeds per plant decreased exponentially as plant population density increased. The number of seeds per seedhead decreased as plant density increased in the first production year but was less affected subsequently, particularly with the narrow 20 cm row spacing. The 1000-seed weight was 1.68 to 2.22 g and decreased as plant density increased. The specific seed weight was 18 to 31 kg/hL; it differed among production years but the effect of plant density was inconsistent. The germination capacity of the seed was unaffected by plant density but differed among production years. Seed dockage was 15-16% for the three lowest plant densities and then increased as plant density increased, to 18% at 12.5 plants/square metre and 34% at 100 plants/square metre. The effect of plant population density on seed yield, for each of the three row spacings in each production year, is shown in Figure1.

Results and Discussion continued

The seed yield was correlated closely with the number of seedheads/square metre. In the first production year, seed yield increased with plant density up to 25 plants/square metre for each row spacing, and then remained constant to at least 50 plants/square metre with both 20 and 40 cm rows; it decreased somewhat at 100 plants/square metre with 20 cm rows. In the second production year, seed yield was relatively independent of the initial plant density except that it decreased when the initial density was less than 6 plants/square metre with a row spacing of 80 cm, and tended to be greatest with the 40 cm row spacing at 6 to 25 plants/square metre. In the third production year, seed yield was much lower than in the previous years because poor snow cover during the winter and the cumulative drought reduced the vigour of the plants in spring; however, the pattern of response to the density and row spacing treatments was similar to that of the second year.

Figure 1. Seed yield of tall fescue over three consecutive production years as affected by the initial plant population density at row spacings of 20, 40 and 80 cm.



Conclusions

1. Seed yield of tall fescue can be optimized for at least three consecutive crops by establishing an initial density of 20 to 100 plants/square metre in rows spaced 20 to 60 cm apart. Based on a 1000-seed weight of 2 g, the required seeding rate is only 0.4 to 2.0 kg/ha if 100% seedling establishment is assumed. In practice, excellent stands have been achieved with 3 to 4 kg/ha of seed.

2. If maximization of the first-year seed yield is a priority, then the initial establishment should be at a density of 25 to 50 plants/square metre in rows spaced 20 to 40 cm apart.

3. In the Peace River region of north-western Canada, low soil moisture in the fall combined with little subsequent snow cover, may reduce the spring vigour and subsequent seed productivity of tall fescue. The practice of selecting sheltered field sites to enhance snow trapping is advisable.

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