Seeding rate and date of sowing effects on two wheat varieties in the Victorian Mallee

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Abstract

A comparison of wheat seeding rates in the Victorian Mallee challenges the low seeding rates traditionally employed by growers. Grain characteristics, yield and grain quality of the large seeded variety Frame, and the small seeded variety Silverstar were compared at five seeding rates and two times of sowing. Yields of Silverstar increased in proportion to seeding rate, whereas neither the yield nor protein level of Frame improved when more than 170 seeds/m^2 were sown. The yield penalty suffered by crops sown in late June over sowing in late May was approximately 25% for both varieties.

Key Words

Wheat, Frame, Silverstar, seeding rate, yield, protein, screenings.

Introduction

A range of factors may contribute to wheat cultivars not achieving their potential yield. These include varying grain size, conservative sowing rates, germination and establishment difficulties due to issues such as hard setting soils, sowing depth and coleoptile lengths, which may result in less than the desired number of plants/m^2. Studies have suggested that lower seeding rates produce a higher proportion of secondary tillers, which may be more prone to producing small grain. This is attributed to higher temperatures and water stress during grain filling than the earlier forming primary tillers (1).

The traditional view of farmers in the Victorian Mallee has been that by low and conservative seeding rates in cereal crops such as wheat, more moisture is available in the critical grain filling period. The perception has been that by increasing seeding rates, too many plants would be competing for moisture and in a dry finish to the season, yields and grain quality are reduced. Small, shrivelled grain would result from the lack of available moisture.

The primary aim of this study was not only to improve grain yields by optimising seeding rates, but also to improve grain quality by reducing screening levels in a notably small grained variety, Silverstar.

Materials and methods

A field experiment was conducted at the VIDA Walpeup Mallee Research Station, (average annual rainfall 336mm) in 1999, on a sandy loam soil. The grain yield and quality of Frame wheat, a large seeded (41grams/1000grain weight) and Silverstar wheat, a small seeded (32 grams/ 1000 grain weight) variety were compared. Three replications of plots (8 rows x 18m) were sown at 70, 120, 170, 220 and 270 seeds/m^2) and 2 sowing times (27/5 and 29/6). A late break to the season prevented earlier sowing but provided an opportunity to evaluate the comparative performance of the early season cultivar Silverstar, compared to the mid season cultivar Frame, in a shorter than normal growing season. Analysis of variance of data was conducted using GENSTAT. Differences in treatment means of $P<0.05$ were considered significant.

Results and discussion

Grain yield: At the lowest seeding rate of 70 plants/m^2, Frame significantly yielded more grain than Silverstar. There were no significant differences between the two varieties at other seeding rates.

However, the yield of Silverstar increased progressively with seeding rate whereas the yield of Frame did not increase with seeding rates above 170 seeds/m^2 (Figure 1a).

For both varieties, sowing in late June produced significantly lower yields compared to sowing in late May. The relationship between yield and seeding rate was similar at both sowing times, and seeding rates of less than 120 seeds/m^2 reduced the yield potential of both varieties. Data from both sowing times are combined in Figure 1.

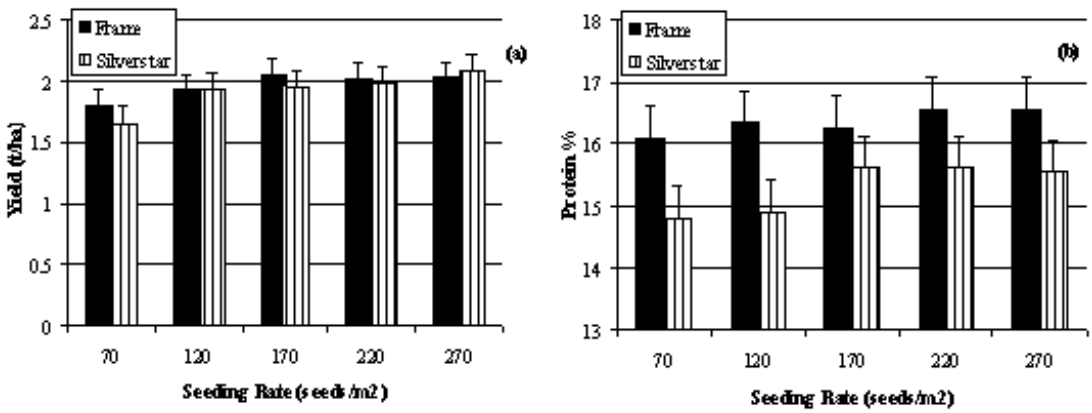

Figure 1: (a) Grain yield (t/ha) and (b) Protein (%) of Silverstar and Frame sown at 70-270 seeds/m^2. Bar is LSD for seeding rate($P<0.05$).

Grain protein: Frame had higher grain protein content than Silverstar at all seeding rates and sowing times, Figure 1(b). Silverstar averaged approximately 1% lower protein but showed significantly increased protein content at higher seeding rates.

Grain size: The average grain size of Silverstar was 27g/1000 compared with Frame at 35.5g/1000. Silverstar also had higher screenings than Frame at both sowing times and at each sowing rate. Although the lower grain size was associated with higher screenings, neither cultivar exceeded 1.6% of the sample passing through a 2.0mm screen. Excessive screenings were thus not evident with Silverstar in these results, contrary to the experience of many farmers growing Silverstar in 1999.

Conclusion:

This experiment supports the use of higher seeding rates with the wheat variety Silverstar than those required with the variety Frame. Seeding rates greater than 170 plants/m^2 were not detrimental to Silverstar, slightly increasing its yields at the higher rates, whereas the yields of Frame did not increase at above 170 plants/m^2.

In this experiment, yield and grain size of Silverstar exceeded district averages in many instances. This suggests that the trial plots were not severely stressed during the crucial grain filling period, unlike other areas of the Mallee in 1999.

These results did not establish that high seeding rates would reduce screenings losses with Silverstar. Further research is necessary to ascertain wether additional factors other than seeding rates maybe associated with improving screening levels in a small grained wheat variety such as Silverstar.

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References

Young, A. 1991. Low sowing rates can mean losses in a dry finish. Australian Grain, Oct-Nov, 1991.