The effect of sowing date on yield of different lentil types

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Abstract

The lentil cultivars, Digger (autumn type) and Ic128/85 (spring type) were compared for grain yield in a time of sowing experiment in Tasmania. Dates of sowing ranged from the end of May to the end of September 2000. The yield of Digger decreased significantly with each of the four sowing dates from 2.9 t/ha at the early sowing to 1.2 t/ha at the latest sowing date. In contrast the yield of Ic128/85 only decreased significantly between the second and third sowing dates. Yield differences between cultivars in response to sowing date can be explained in terms of flowering time. It will be necessary to grow lentil cultivars that are specifically suited to either autumn or spring sowing to maximise yield in the higher rainfall areas of southern Australia.

Keywords

flowering response

Introduction

Lentil production in the higher rainfall areas of southern Australia (500 – 800 mm annually) is principally limited by waterlogging. Waterlogging can be overcome by sowing in spring, however attempts at spring sown production using current Australian lentil cultivars have met with little success. In previous trials conducted in Tasmania, genotypes selected for autumn sowing in Australia (autumn types) yielded 40% less than overseas 'spring types' when sown in spring, but yielded 20% greater than 'spring types' when sown in autumn. The ‘spring type’ large green lentil accession, Ic128/85, is currently being multiplied in Tasmania for spring production in the high rainfall cool climate areas of Australia and yielded 78% and 243% of Digger (autumn type) in the autumn and spring sown trials respectively. This study builds on previous trials to quantify the yield response to sowing date for the lentil cultivars Digger and Ic128/85.

Methods

In 2000, a field trial comparing two lentil genotypes (Digger and Ic128/85) across four sowing dates (29th May, 4th July, 14th August and 22nd September) was sown on a grey sodosol soil at Symmons Plains, northern Tasmania. Raised beds were used to minimise waterlogging and ensure timeliness of sowing. Plots were 15 m long with 8 rows at 15 cm spacing. The experimental design was a randomised complete block with four replicates. All seed was inoculated prior to sowing with rhizobia and sown at 150 viable seeds/m2 with 250 kg/ha of 4:13:7:9 fertiliser. Weeds and insects were controlled by the application of suitable herbicides and insecticides at relevant stages of crop growth. There were no significant fungal diseases.

Seedling emergence, number of days to flowering and grain yield at harvest were recorded. Grain yield data is presented on a per hectare basis taking into account the furrow area between beds. To test for significant differences a two-way analysis of variance between cultivar and sowing date was conducted.

Results

The season was characterised by an absence of severe frosts at flowering and good spring rains (Decile 7) until mid November after which there was very little rainfall during grain fill (Decile 2).

Plant establishment of Digger was significantly higher than that of Ic128/85 (Table 1). Ic128/85 flowered approximately 2 weeks later than Digger for all sowing dates (unreplicated). At flowering, biomass production from the early sowing dates was visually greater than later sowing dates and this effect was particularly evident for Digger. Both lentil cultivars lodged into the furrows between beds. At the two earlier sowing dates this resulted in estimated yield losses of 5-10% in both cultivars.

The grain yield of Digger decreased significantly with each sowing date, while for Ic128/85 only the August and September sowing dates were significantly less than the July sowing date (Table 1). The yield of Digger was significantly greater than that of Ic128/85 for the late May (44%), early July (18%), and mid August (13%) sowings but 13% less than Ic128/85 in September.

Table 1: Effect of sowing date on emergence, number of days to flowering and grain yield of Digger (autumn type) and Ic128/85 (spring type) at Symmons Plains, northern Tasmania, 2000-01. The l.s.d (*P* = 0.05) for the interaction between genotype and sowing date and each of the main effects is shown.

Sowing Date	Emergence (plants/m^2)		Days to flowering*		Grain yield (t/ha)	
	Digger	Ic128/85	Digger	Ic128/85	Digger	Ic128/85
29 May	97	87	143	159	2.92	1.63
4 July	94	87	117	131	1.84	1.52
14 August	94	84	86	100	1.57	1.37
22 September	89	89	56	69	1.19	1.36
$l.s.d._{(interaction)}$	NS		-		0.19	
$l.s.d._{(genotype)}$	6.1		-		0.10	
$l.s.d._{(sowing\ date)}$	NS		-		0.14	

*observations from one replicate only

Discussion

In previous spring-sown trials (Dean, unpublished) Ic128/85 significantly out-yielded Digger (means from four trials of 2.3t/ha and 1.6t/ha respectively) and yields were higher than for the spring sowing dates of the current trial. It is likely that the exceptionally dry finish to the season in 2000-01 was not conducive to the longer vegetative growth stage of Ic128/85 and this resulted in lower yields than previously obtained.

The rate of progress from sowing to flowering in lentils can be explained by genotypic response to photoperiod and temperature after a non responsive growth phase (1). Digger is largely responsive to temperature and consequently the time to flowering decreases when sown later (1). When sown in spring Digger flowers very early with low biomass and seed yield. However in an autumn sowing Digger has a longer vegetative period and produces more biomass and subsequently grain yield. Spring type lentils also respond to environmental stimuli but have a longer non responsive phase prior to flowering. Therefore spring lentil types such as Ic128/85 flower later compared to genotypes with a shorter non responsive phase (Digger). This suggests Ic28/85 will potentially have higher biomass and grain yield when sown in spring compared to Digger, as was the case in this experiment. However as Ic128/85 has a

low yield potential, when sown in autumn it yields significantly lower than Digger. This study highlights the differences in yield potential of spring and autumn lentils when sown across a range of sowing dates. It will be necessary to grow lentil cultivars that are specifically suited to either autumn or spring sowing to maximise yield and profitability in high rainfall areas of southern Australia.

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References

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