Chickpea cultivar by planting time studies in Queensland

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Summary. Cultivar by planting time field trials were conducted in the main chickpea production areas of southern and central Queensland. Supplementary irrigation was used to minimise seed yield reduction due to moisture stress. In southern Queensland the mean optimum planting period for all cultivars for yields within 10% of the maximum um was 10 May to 20 July. In central Queensland the period was 15 April to 10 June. Seed yields were considerably reduced by planting earlier or later than the optimum. Early plantings produced excessive vegetative growth causing flower abortion from frost, shading, and/or grey mould, *Botrytis cinerea,* infection. At the population of 30 plants/m^2 late plantings produced inadequate biomass to support high seed yields. Highly significant planting time by cultivar interactions were recorded in three of the six trials.

Introduction

There has been a rapid increase in the area under commercial chickpea production in Queensland in the past 10 years (2). The principal regions are the Darling Downs in southern Queensland and the Highlands of central Queensland where the predominant soils are alkaline black earths. The crop is sown in the April to August period in the south and April to July in central Queensland. Cultivars under production include introductions from India (Tyson) and the USSR (Dooen) or from the co-operative plant breeding program of New South Wales Agriculture and Queensland Department of Primary Industries (Amethyst).

The objective of the study was to determine the optimum planting time in the two production regions and to examine if either optimum, early or late sown response was similar for several cultivars.

Methods

Field trials were conducted at Warwick (28?14'S 152?02'E), Gatton (27?33'S 152?20'E), Biloela (24?24'S 150?30'E) and Emerald (23?28'S 148?05'E). Either six or eight cultivars were included in a time of planting study using a split plot randomised block design, with three replicates. The main plots were sowing times and the cultivars were the split plot sub treatment. Amethyst, Dooen and Tyson were included along with CPI56288 (ex Iran), CPI56566 (ex USSR), 244.1, 571.5 and Barwon (ex NSW Agriculture-Queensland Department of Primary Industries breeding program).

The study was conducted over three years from 1988 to 1990 at Hermitage (near Warwick), Gatton, Biloela and Emerald Research Stations. A standard population of 30 plants/m^2 in seven rows of 25 cm at Emerald and Biloela and five rows of 35 cm at Warwick and Gatton was used. Harvested area for seed yields exceeded 10 m^2 at all sites. Moisture stress was minimised by supplementary irrigation.

Results and discussion

Significant or highly significant seed yield responses to planting time were recorded at four of the six sites (Table 1). For the Warwick and Gatton trials in 1990, where only two plantings were made, the early planting at both sites received heavy rain during the vegetative period causing water logging and probable yield reduction. No significant planting time response occurred at these two sites.

Table 1. Variation in seed yield (g/m^2) of chickpea cultivars over a range of sowing days at four sites in Queensland during 1988-90.

Sowing Day	Amethyst	Dooen	Tyson	244.1	CPI56288	CPI56566	Barwon	571.5
WARWICK 1988 l.s.d. = 52 (P=0.05)								
148	306	296	291	345	281	292	--	--
176	278	232	260	266	289	215	--	--
211	227	222	193	274	230	228	--	--
250	180	163	156	238	208	185	--	--
WARWICK 1989 l.s.d. = 64 (P=0.05)								
114	195	177	178	181	117	241	--	--
135	284	292	316	220	168	312	--	--
170	233	214	259	290	275	302	--	--
195	311	222	263	209	211	288	--	--
240	117	72	39	89	67	113	--	--
WARWICK 1990 l.s.d. = 38 (P=0.05)								
166	220	232	231	287	229	242	249	189
232	194	249	199	221	183	205	235	215
EMERALD 1989 l.s.d. = 53 (P=0.05)								
65	148	160	197	103	185	182	--	--
104	214	237	222	182	224	190	--	--
123	274	220	276	251	262	163	--	--
187	179	89	162	141	163	98	--	--
BILOELA 1990 l.s.d. = 45 (P=0.05)								
72	197	36	200	96	80	158	--	--
117	262	174	242	246	179	145	--	--
170	198	174	194	221	164	211	--	--
198	212	141	191	171	189	130	--	--
GATTON 1990 l.s.d. = 56 (P=0.05)								
141	359	348	398	#279	368	283	343	368
219	321	282	326	315	254	265	291	333

Curvilinear functions for the three commercial cultivars and 244.1 were fitted to pooled data from Warwick and Biloela-Emerald (Fig. 1). Regression coefficients were significant for some cultivars even though data was limited especially for Biloela-Emerald.

ANALYSIS OF VARIANCE

	Warwick 1988	Warwick 1989	Warwick 1990	Emerald 1989	Biloela 1990	Gatton 1990
Planting time (pt)	*	**		**	**	
Cultivar (cv.)	**	**	**	**	**	**
pt % cv.		**	*	**	**	
c.v. (%)	13.0	18.5	10.2	17.0	14.6	9.6

= inadequate plant stand; * = P<0.05; ** = P<0.01

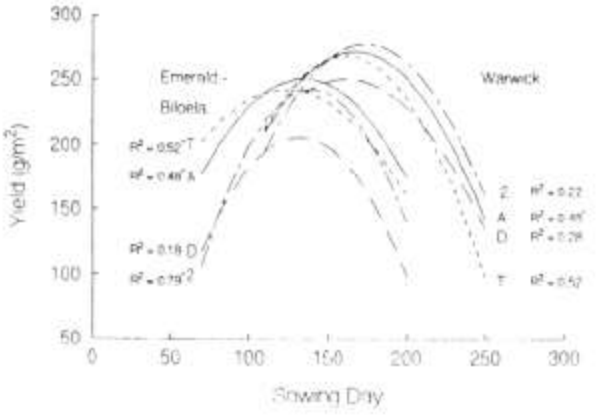

Figure 1. Curvilinear functions of seed yield (g/m^2) of Amethyst (A), Dooen (D), Tyson (T) and 244.1 (2) at Warwick 1988-90 and Emerald Biloela 1989-90 for a range of sowing days (P<0.05).

Dooen yielded relatively poorly at both centres. This result was unexpected for the Darling Downs as Dooen was superior to Tyson and Amethyst when mean yields from 15 trials were considered (Fig. 1). This cultivar may have been adversely affected by the supplementary irrigation.

At both centres yield reductions were evident for early as well as late planting. Early plantings experienced excess vegetative growth with frost, shading and/or grey mould, *Botrytis cinerea,* infection, causing loss of flowers and young pods. Late plantings suffered from inadequate dry matter accumulation before flowering commenced at the plant population and row spacings used in this study. When the Julian days are converted to calendar dates the mean optimum planting period or seed yield within 10% of the maximum for southern Queensland was from 10 May to 20 July. For central Queensland the period was from 15 April to 10 June.

Significant interactions between planting time and cultivars were recorded in four of the six trials. For example, Tyson was superior when sown early but inferior when sown late in both regions. In contrast 244.1 was the reverse. This may be attributed to the respective differences in plant type. Tyson has a more determinate growth habit with less propensity to produce additional branches, and therefore less able to compensate for inadequate biomass which accompanies later plantings.

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References

1. Brinsmead, R.B., Laufer, M.J. and Keys, P.J. 1991. Agdex 168/38 SQA91005 Queensland Department of Primary Industries.

2. Simmons, K.V., Mullen, C.L. and Kay, G. 1991. Agfact P4.2.2, 4th Edn. NSW Agriculture.