# THE EFFECT OF ROW SPACING AND SEEDING RATE ON CHICKPEA YIELD IN NORTHERN NEW SOUTH WALES

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*Summary*. Cropping systems research in northern New South Wales aims to increase the use of pulse crops, and no-tillage fallow management, by farmers. Earlier research demonstrated that no-till increased chickpea yields by 10%. Wider row spacing will increase the commercial attractiveness of no-till chickpeas, but it is important to determine if this causes any decrease in productivity. Experiments at North Star and Croppa in northern New South Wales from 1991-94 examined chickpea yields grown in 25, 50, 75, and 100 cm rows, and at seeding rates of 20-80 kg/ha. In three low yielding experiments, there was no yield reduction due to row spacing. The other three experiments showed an average linear yield decline of 4.4 ? 1.3 kg/ha/cm. Increasing seeding rate improved yields in one experiment. There were no seed rate x row spacing interactions.

## INTRODUCTION

The proportion of legume crops sown in wheat rotations in the summer rainfall region of Australia is small, < 5%. On many farms no legume crop is sown in the rotation which adds to the problem of declining soil nitrogen fertility. Nitrogen fertiliser is being used at increasing rates in an attempt to improve both wheat yield and grain quality. This could be complemented by an increase in legumes in the rotation. We have found chickpea and fababean to be useful rotation crops in this region, and yields with no-till to be 10% better than with a cultivated fallow.

Significant problems with winter grain legumes are the lack of adequate ground cover after the legume crop is harvested to protect the soil from erosion, and the difficulty in reliably controlling broad-leaved weeds. More residue protection can be obtained by sowing the grain legume no-till in wider rows (50-100 cm), thus reducing the amount of cereal straw that is destroyed by the sowing operation. Turnip weed (*Rapistrum rugosum*), New Zealand spinach (*Tetragonia tetragonoides*), black bindweed (*Fallopia convolvulus*), milkthistle (*Sonchus oleraceus*), and prickly lettuce (*Lactuca serriola*) are common problems in commercial crops even where simazine and cyanazine are used. In our environment the unreliable rainfall, particularly in the weeks after sowing and herbicide application, result in variable and usually inadequate control. There are several herbicides including fluazifop-P, haloxyfop, sethoxydim, quizalofop-p-ethyl, and clethodim, that can be used for post-emergence control of grass weeds, so these pose less of a problem in chickpea than the broad-leaved weeds.

Previous work with soybeans demonstrated that if weeds are satisfactorily controlled, row spacing has a negligible effect on yield (1). Wide rows allow inter-row spraying with a shielded sprayer. This has the potential to considerably enhance control of many of the current problem broad-leaved weeds. We examined the effect of planting arrangement on the yield of chickpea, cv. Amethyst, in 6 experiments in northern New South Wales from 1991-94.

## METHODS

Chickpeas were grown in the factorial combinations of 25, 50, 75, and 100 cm rows, and at seeding rates of 20, 40, 60 and 80 kg/ha in either 3, or 4, randomised complete blocks. Each treatment, 3.5x20 m, was sown with a no-till seeder (2). Sowing dates were *Windridge* North Star 4 June 1991, 4 May 1992, and 27 May 1993, *Glenhoma* North Star 5 May 1992, *Gabo* Croppa Creek 9 June 1993, and 2 June 1994.

A REML analysis was used to gauge the significance of linear and quadratic contrasts amongst row spacing (SPl, SPq), seed rate (SRl, SRq) levels, and their interactions, treating the effect due to the experiment as random. The units for SPl and SRl are yield kg/ha/cm, and yield kg/ha per seed rate kg/ha, respectively, and their quadratic counterparts have squared denominators.

## RESULTS AND DISCUSSION

The range of seasons experienced for these experiments reflects a reasonable sample of what can be expected in this region, except that there was not a high yielding year. After a good start in 1991, there was no rain after early July. Severe frosts occurred in mid September 1992 and seriously affected the *Windridge* experiment where we estimate that the yields were halved. Conditions were dry in 1993 until August, but good spring rainfall resulted in our highest yields for the experiments. Extremely dry conditions prevailed in 1994 resulting in very low yield.

The fitted regressions are listed in Table 1, and the effect of row spacing is illustrated in Fig. 1.

Table 1. The fitted regressions for the effect of row spacing and seeding rate on yield (kg/ha in six chickpea experiments in northern NSW.

| Site | Year | Mean Yield | SRl | SPl | SPq |
|---|---|---|---|---|---|
| Windridge | 91 | 1360 | | | |
| Windridge | 92 | 1000 | | | |
| Windridge | 93 | 2300 | | -3.0 | |
| Glenhoma | 92 | 1730 | | -5.2 | -0.23 |
| Croppa Creek | 93 | 2170 | 8.6 | -4.8 | |
| Croppa Creek | 94 | 560 | | | |
| s.e. | | 50 | 2 | 1.8 | 0.08 |

Sowing dates for the experiments were within the optimum range (3) for the cultivar Amethyst and should not have been a factor confounding the results.

We conclude from the 4 years of experimentation in northern New South Wales that chickpea is ideally adapted to sowing in rows wider that the conventional 18-25 cm used for wheat. In 4 of the 6 experiments WR91, WR92, GH92, and CC94, there was no significant reduction in chickpea yield by increaasing row spacing to 75 cm. In the other experiments WR93 and CC93, the reduction in yield using the SPl values, were 150 and 240 kg/ha, respectively.

The advantages of row-cropping chickpea outweigh any potential yield reductions that occur. Sowing chickpeas in 50 or 75 cm rows may even be the difference between farmers electing to no-till or continue to cultivate their fallow.

Future work will examine strategies such as directed inter-row spraying, to improve weed control in chickpea.

Figure 1. The effects of row spacing on chickpea yield for six experiments in northern NSW, 1991-94.

## ACKNOWLEDGMENTS

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