

SKIP ROW SPACING IN WYALKATCHEM AND ARRINO WHEAT

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Aim To evaluate the effectiveness of skip row spacing of wheat in a low rainfall environment with subsoil constraints.

BACKGROUND

This trial is a satellite site of the Liebe Group's GRDC funded soil health project '**A sustainable dryland community achieved through proactive research on effective management of the soil resource**'. The site was selected as a poorer performing paddock and since 2003 has been benchmarked for soil quality parameters. Subsurface alkalinity (effectively reducing rooting depth) and availability of stored soil moisture were identified as two of the main constraints limiting crop production in this seasonally variable low rainfall environment.

Very wide rows or skip rows in wheat is a concept that is being tested to reduce the level of screenings without a large sacrifice to yield in situations where a dry finish to the season is often experienced. On shallow soils that have limited rooting depth and relatively high fertility, wide rows have also resulted in significant yield improvements over standard row spacing. Improved grain size can be obtained from reduced tillering or greater tiller survival bought about by lower plant density and increased availability of stored soil moisture. This trial is testing similar concepts to work that Dr Paul Blackwell, Department of Agriculture WA is conducting on Mike Kerman's property, a fellow Liebe Group member at Pindar and also that of wheat growers in Queensland.

At crucial stages of crop growth, plants rely heavily on the availability of stored soil moisture. This can be a major issue on soils that have limited rooting depth through either physical or chemical constraints i.e. shallow rock or 'wodjil' soils, on soils with low water holding capacity and in situations where crops experience extended dry periods through the growing season.

In 2004 a paddock scale demonstration comparing 10-inch row spacing to 20 inch row spacing at this site indicated that there was no real difference in yield between standard and wide rows and suggested that there may even be a yield benefit when sowing on wide rows.

The 2005 trial was designed to evaluate the response of Wyalkatchem and Arrino sown at 30 kg/ha and 60 kg/ha on both standard 10-inch spacings and 10-inch skip row spacings. The trial was sown using a DBS bar on a 10-inch skip row configuration i.e. every third tyne removed. This creates a situation where there are two rows, 10 inches apart separated by a 20-inch gap until the next pair of rows. By removing every third row, we are effectively providing a greater volume of stored soil moisture available for plant root access.

Trial Details

Property	Grant & Stacey Hudson, Goodlands
Plot size & replication	12m x 155m x 3 replicates
Soil type	Loamy clay – alkaline at depth
Sowing date	25 th May 2005
Seeding rate	30 kg/ha & 60 kg/ha. Arrino & Wyalkatchem
Fertiliser (kg/ha)	70 kg/ha AgflowZn (all below seeded rows), 45 L/ha FlexiN
Paddock rotation	2004 Wheat, 2003 Wheat, 2002 Wheat
Herbicides	1.1 L/ha Roundup Powermax, 700 mL/ha SpraySeed, 1.0 L/ha Decision, 400 mL/ha MCPA LVE + 3 g/ha Logran.
Growing Season Rainfall	239mm (April-October)

Results

Table 1. Yield components and estimated gross margins of skip and standard row spacing in Wyalkatchem and Arrino Wheat 2005.

Variety	Seed Rate	Row Spacing	Yield (t/ha)	Biomass @ Anthesis (t/ha)	Plant Density (no./m ²)	Head Density (no./m ²)	Protein (%)	Screenings (%)	Hectolitre (g)	Gross Margin (\$/ha)
Wyalkatchem	30	10 in	2.46	4.19	79	238	9.1	1.45	82.52	195
	30	10 in skip	2.20	4.05	68	273	9.8	1.01	82.68	168
	60	10 in	2.48	5.03	134	256	8.9	1.23	82.74	188
	60	10 in skip	2.42	4.62	121	314	9.4	1.26	82.76	190
Arrino	30	10 in	2.57	5.17	91	322	8.5	1.08	82.86	167
	30	10 in skip	2.26	4.29	114	343	9.1	1.49	82.51	138
	60	10 in	2.69	5.03	156	315	8.9	1.10	82.48	177
	60	10 in skip	2.37	4.47	196	363	8.8	1.31	82.46	142
LSD 5%			0.29	0.86	-	46	-	-	-	

Gross margins calculated with EPR APW \$191 & ASW \$176 for week of 1st December 2005 using full variable costs as per Farm Budget Guide 2005 and actual input costs.

Overall, when averaged across seeding rate and variety, 10-inch skip rows resulted in a yield penalty of 239 kg/ha to standard 10-inch spacing, representing an approximate 9% yield loss. However, the data from this one trial suggests that individual varieties do respond differently to changes in row spacing width. Growing Arrino wheat on 10-inch skip rows resulted in a significant yield penalty of about 320 kg/ha to standard 10-inch row spacing in season 2005 regardless of seeding rate.

When looking at Wyalkatchem it appears that there is less of a yield penalty for skip rows and in this particular trial there was actually no significant yield penalty to growing Wyalkatchem on 10 in skip rows compared to standard 10-inch spacings in season 2005 regardless of seeding rate. However there was a trend towards lower yield at the wider row spacing.

There were no apparent differences in grain quality for any of the treatments. It is likely that the favourable finish to the 2005 season masked any treatment differences that may be experienced in other seasons with a much tighter finish where increased moisture availability of skip rows may have an influence.

Historically this soil type produces high protein levels however a long history of cereal crops combined with the soft finish resulted in lower protein levels compared to what is usually recorded for this paddock.

Determining if skip row spacing is suitable for growing wheat in this environment requires that it is assessed over a number of years so as to fully appreciate the benefits that may be obtained from increased moisture availability in years that are of average to below average rainfall.

Season 2005 was, despite an unusually dry July, a good year for rainfall. Grant's rainfall records show that 71mm was received in March with another 75mm in May ensuring an excellent soil moisture profile to start the season off. While only 3mm fell in July, a total of 74.5mm was received across August and September, which provided a good finish to the growing season.

Considering a 9% yield penalty for skip rows was obtained in what could generally be referred to as a better than average rainfall year, it may be the case that in years with average rainfall there is much less and maybe no significant yield penalty to skip rows, as was suggested in the wide row demonstration conducted last year. In terms of rainfall or more specifically distribution of growing season rainfall, 2004 was much closer to an average year. The 2004 results, comparing a more extreme row spacing of 10-inch versus 20-inch suggested that there was no difference in yield (according to harvester yield monitor) or perhaps a even a slight improvement with wide rows (approximately 300 kg/ha more according to hand harvest cuts). One could speculate that with a less extreme row spacing (10-inch skip rows rather than 20 inch rows) in an 'average' rainfall year, skip row wheat will yield the same as standard row spacing. Also, it may be that in years with below average rainfall, skip rows may provide yield benefits over standard row spacings, thus providing some

income protection by protecting gross margins in poor rainfall years. Averaged over a five or ten year period it may be that skip row spacing could provide a much more consistent and perhaps improved gross margin than compared to the same period using standard row spacing.

To answer these questions, more trial work will need to be conducted as this management practice needs to be viewed as a long term approach to maintaining and improving grain production in this specific environment.

Acknowledgements Liebe Group would like to acknowledge GRDC for project funding and the assistance of the Department of Agriculture WA, especially input and assistance of Paul Blackwell and Dave Gartner. Thanks also to Grant & Stacey Hudson for hosting the trial site and assistance with implementing the trial.

PAPER REVIEWED BY: PAUL BLACKWELL