

Crop establishment on non-wetting soil

Amanda Cook, Wade Shepperd and Ian Richter
SARDI, Minnipa Agricultural Centre

RESEARCH

Searching for answers



Location:
Murlong
Stuart Hentschke

Rainfall
Av. Annual: 336 mm
Av. GSR: 250 mm
2015 Total: 294 mm
2015 GSR: 229 mm

Yield
Potential: 2.4 t/ha
Actual: 0.6 t/ha

Paddock History
2015: Mace wheat
2014: Scope CL Barley
2013: Kord CL wheat

Soil Type
Non-wetting sandy loam

Plot Size
12 m x 2 m x 3 reps

guidelines to control pests, weeds and diseases while retaining stubble to maintain or improve soil health, and reduce exposure to wind erosion. The major outcome to be achieved is increased knowledge and skills allowing farmers and advisers to improve farm profitability while retaining stubble in farming systems on upper Eyre Peninsula (EP).

One issue EP farmers identified as a problem with stubble retained systems was sowing into non-wetting sands and the resulting uneven and reduced germination. A trial at Murlong (near Lock) was established in 2013 to compare how crop establishment is affected by time of sowing, sowing rate, and seed position and depth on a non-wetting sand and crop performance. The trial has been re-seeded in the 2014 and 2015 growing seasons.

In 2015 the trial was sown on 18 May in dry conditions with Mace wheat @ 40 and 60 kg/ha seeding rates, either on row (in same position every season) or inter row (between last season's stubble) and either 0-1 cm or 3-4 cm depths on the same previous season's treatments. The fertiliser was 60 kg/ha of DAP and 50 kg/ha of ammonium sulphate. A trace element mix of manganese sulphate at 1.5 kg Mn/ha, zinc sulphate at 1 kg Zn/ha and copper sulphate at 0.2 kg Cu/ha were also delivered as a fluid at seeding. Extra urea was broadcast on all plots on 10 August @ 40 kg/ha. The trial was sprayed with a knockdown of 1L/ha of Roundup Powermax, 1.5 L/ha Avadex and 1.5 L/ha Treflan on 18 May. The trial was also sprayed with 750 ml/ha Tigrex and 100 ml/ha Lontrel on 10 August.

Measurements taken during the season were stubble load pre-seeding, soil moisture, soil nutrition, emergence counts, grass weed counts (in crop early, 29 June and pre harvest, 28 October), grain yield and grain quality. The trial was harvested on 19 November.

Key messages

- **Crop establishment increased with on row sowing. Stubble from the previous season helps soil moisture infiltrate into non-wetting sands and into a position closer to the seed.**
- **Initial germination of brome grass weeds was higher with inter row sowing.**
- **Late brome grass weed numbers was also greatest with inter row sowing. Sowing on row may also increase crop and weed competition as will a higher seeding rate.**

Why do the trial?

The GRDC project 'Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula' aims to produce sustainable management

How was it done?

Wheat plots were established at Murlong in 2013 with Kord CL wheat @ 60 kg/ha and base fertiliser of 18:20:0:0 (DAP) @ 60 kg/ha. Average yield of wheat in that year was 1.78 t/ha (see EPFS Summary 2014, Crop establishment on non-wetting soil, p147 for management details). In 2014 the trial was sown with Scope CL barley at 65 kg/ha and 18:20:0:0 @ 65 kg/ha with three different times of sowing; 15 April (TOS 1), 13 May (TOS 2) and 10 June (TOS 3). At each time of sowing (main plots) there were two sowing rates of 40 kg/ha and 60 kg/ha, two different seed placements; on row and inter row, and two sowing depths of 0-1 cm and 3-4 cm. These factorial treatments were replicated 3 times. TOS 1 and TOS 2 were harvested on 10 November and TOS 3 on 24 November.

Table 1 Plant growth, grain yield and quality as affected by seed placement, depth and seeding rate (averaged across the other treatments) at Murlong in 2015.

		Establishment (plants/m ²)	2015 Harvest Index	Late dry matter (kg/m ²)	Yield (t/ha)	Protein (%)	Screenings (%)	Test weight (kg/hL)
Placement	On-row	95.4	0.38	0.43	0.58	11.7	10.4	75.8
	Inter-row	56.3	0.39	0.41	0.55	11.8	8.4	76.6
Depth	0-1 cm	78.2	0.38	0.40	0.57	11.7	10.0	76.1
	3-4 cm	73.5	0.39	0.44	0.56	11.7	8.8	76.3
Sowing rate	40 kg/ha	62.7	0.38	0.42	0.56	11.7	9.4	76.4
	60 kg/ha	88.9	0.39	0.42	0.57	11.7	9.4	76.0
<i>LSD</i> (<i>P</i> =0.05)		20.2	0.02	0.03		<i>ns</i>	1.8	<i>ns</i>

(Significant effects (*P*=0.05) in **BOLD**)

Table 2 2014 TOS effect on 2015 plant establishment.

2014 TOS	Establishment (plants/m ²) 2015 placement	
	On-row	Inter-row
TOS 1	111 a	46 b
TOS 2	113 a	44 b
TOS 3	62 a	79 a
Average	95a	56b
<i>LSD</i> (<i>P</i> =0.05)	30 (within TOS)	

Table 3 Average brome grass weed establishment in 2015.

Placement	Seeding Rate	Early Brome grass between crop rows (plants/m ²)	Early Brome grass in crop row (plants/m ²)	Late Brome grass (plants/m ²)
On row	40 kg/ha	8.5	3.1	5.3
On row	60 kg/ha	3.4	2.4	4.7
Inter row	40 kg/ha	12.4	1.3	6.0
Inter row	60 kg/ha	13.2	1.1	6.7
<i>LSD</i> (<i>P</i> =0.05)		6.9	1.5	<i>ns</i>

What happened?

Barley in 2014 had visually better plant growth after 4 weeks with deeper sowing (3-4 cm) in both TOS 1 which occurred on 15 April and TOS 2 on 13 May. The third time of sowing established slowly and looked poor compared to TOS 1 and TOS 2 all season.

Harvest biomass in 2014 was similar with TOS 1 and TOS 2 at about 1.5 t/ha. There was a decline in final dry matter production with TOS 3 to less than 1 t/ha, sown on the 10 June (data not presented). There were no differences in stubble dry matter production between inter row or on row seeding, or the different seeding rates.

In 2015 in drier than ideal seeding conditions, plant establishment was generally poor and patchy due to severe water repellency (Table 1 and 2). Sowing on row in 2015 more than doubled plant establishment except in TOS 3 which had less stubble. Increasing seeding rate resulted in greater plant numbers at seeding (Table 1) but seeding depth had little effect.

Grain yield achieved at this site (little more than 0.5 t/ha) was extremely low compared to the potential yield of 2.4 t/ha despite increased nitrogen fertiliser applications and the addition of trace elements as a fluid at seeding. The yield difference may be partly due to brome grass weed competition. Treatment effects on yield were small and inconsistent.

Early brome grass numbers before in crop spraying were lower with on row sowing (Table 3) and most of the brome grass came up in between the rows of the crop. Late brome grass numbers were slightly higher with inter row sowing (6 to 6.7 brome/m²) compared to on row (4.7 to 5.3 brome/m²).

What does this mean?

In 2015 crop establishment was very variable and patchy but improved with on row seeding. Previous research in other regions have shown in drier seasons the previous season stubble helps soil moisture infiltrate into non wetting sands and preserve it in a position closer to the seed.

The improvements in crop establishment from treatments last year did not improve yields in 2015.

Initial germination of brome grass was higher with inter row sowing and the total brome grass weed numbers before harvest was also greatest with inter row sowing. This result may be due to the seed falling into the last year's furrow at harvest. Sowing on row may also increase crop and weed competition as will higher seeding rate.

Acknowledgements

Thank you to the Hentschke family for having this trial on their property. Trial funded by GRDC Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula (EPF00001). Registered products: see chemical trademark list.