

Crop establishment on non-wetting sand

Amanda Cook and Ian Richter

SARDI, Minnipa Agricultural Centre

RESEARCH

Farming Systems

Searching for answers



Location
Lock

Rainfall
Av. Annual: 336 mm
Av. GSR: 250 mm
2017 Total: 338 mm
2017 GSR: 185 mm

Yield
Potential: 2.0 t/ha (B)
Actual: 0.5 t/ha

Paddock History
2017: Spartacus barley
2016: Kord wheat
2015: Mace wheat

Soil Type
Non-wetting sand

Plot Size
12 m x 2 m x 3 reps

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 was undertaken from 2013 to 2015 at Murlong (near Lock) to compare crop establishment and performance with time of sowing, sowing rate, row position and sowing depth on a non-wetting sand. The trial site was moved in 2016 to another non-wetting site near Lock due to excessive weed issues.

Measurements taken during the season were pre-seeding soil moisture, emergence counts – three timings, late dry matter, grain yield and grain quality. The trial was harvested on 21 November.

What happened?

The sand had a near neutral pH (7.1 in CaCl_2), good P reserves (Colwell P of 36 mg/kg in 0-10 cm) and very low phosphorus buffering index, and reasonable N reserves (mineral N 49 kg/ha in 0-100 cm) in March. In 2016 the MED non-wetting soil test was 1.2 which is moderate. The initial soil moisture at sowing in 2017 was 66 mm within the profile to 100 cm, with most located below 20 cm.

In 2017, topsoil moisture at seeding was just sufficient and there was also good soil moisture below 20 cm, however these were not joined. Barley establishment was very uneven and poor, with seedlings still emerging on late rainfall events in August as shown with plant establishment in Table 1. The overall establishment was very low with highly variable growth stages, which was reflected in the low yields achieved. There were no differences between either row placement or seeding rate (Table 1). There were also no differences in late dry matter, grain yield or quality (Table 1). Grass weed numbers were low in 2017.

There were no differences in final soil moistures with the average volumetric soil moisture after harvest (0-100 cm) being 87.5 mm, which was more than at the start of the season due to a large rainfall event shortly after harvest.

Key messages

- **Neither crop establishment, grain yield nor quality were changed by on-row seeding or by increased seeding rate in 2017, similar to results in 2016.**
- **Crop establishment in the non-wetting soil was poor in 2017.**
- **In 2015, with low moisture at seeding, improved crop establishment from on-row seeding in the non-wetting soil increased crop competition and lowered brome grass weed seed set.**

Why do the trial?

The GRDC project 'Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula' aims to produce sustainable management guidelines to control pests, weeds and diseases while retaining

How was it done?

Treatments in 2016 were imposed on the same plots in 2017. Those treatments were two row placements; on previous crop rows and between previous crop rows (inter-row), each at two seeding rates of 50 and 70 kg/ha.

The trial was sown with Spartacus barley on 19 May at 30 cm row spacings. Base fertiliser was 18:20:0:0 (DAP) @ 60 kg/ha and a trace element mix of manganese sulphate @ 1.5 kg Mn/ha, zinc sulphate @ 1 kg Zn/ha and copper sulphate @ 0.2 kg Cu/ha was also delivered as banded fluid at seeding.

The trial was sprayed with a knockdown of 1.5 L/ha of glyphosate, 1.5 L/ha trifluralin, 80 ml/ha of carfentrazone-ethyl and a wetter, LI700, prior to sowing.

Table 1. Plant growth, grain yield and quality as affected by seed placement and seeding rate at Lock in 2017.

Placement	Sowing rate	June establishment (plants/m ²)	July establishment (plants/m ²)	September establishment (plants/m ²)	Early dry matter (t/ha)	Late dry matter (t/ha)	Yield (t/ha)	Protein (%)	Screenings (%)
On-row	50 kg/ha	4.6	9.9	24	0.38	1.51	0.45	12.7	5.9
	70 kg/ha	8.6	9.6	26	0.35	1.08	0.44	11.5	2.9
Inter-row	50 kg/ha	9.8	15.2	21	0.44	1.21	0.47	13.0	2.5
	70 kg/ha	12.8	15.0	23	0.46	1.41	0.61	12.7	3.7
LSD (P=0.05)		ns	ns	ns	ns	ns	ns	ns	2.5

What does this mean?

In 2017, for the non-wetting soil trial and in reasonable topsoil soil moisture at sowing, there were no differences in crop establishment or yield due to seed placement or sowing rate. In 2015 in a similar trial but with a dry start to the season the sowing position of on-row resulted in better crop establishment which increased crop competition with brome grass.

In 2017 there were no differences in plant dry matter, grain yield or grain quality. In 2016 there were early dry matter differences due

to the higher sowing rate, but these reduced during the growing season. In 2016 there were no differences in grain yield or grain quality due to seed placement or sowing rate.

Over the five growing seasons of the GRDC project 'Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula' this research has shown that sowing on-row may be an advantage for improving crop establishment and lowering brome grass weed seed set by increased crop competition on non-wetting soils with low moisture at sowing.

Acknowledgements

Thank you to the Polkinghorne family for having this trial on their property, and the Hentschke family in previous seasons. Trial funded by GRDC Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula (EPF00001).



EPARF
Eyre Peninsula
Agricultural Research Foundation Inc.



SOUTH AUSTRALIAN
RESEARCH AND
DEVELOPMENT
INSTITUTE



GRDC
GRAINS RESEARCH
& DEVELOPMENT
CORPORATION