Crop establishment on non-wetting soil

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RESEARCH

Searching for answers

Location:
Murlong
Stuart Hentschke
Rainfall
Av. Annual: 336 mm
Av. GSR: 250 mm
2014 Total: 352 mm
2014 GSR: 256 mm
Yield
Potential: 3.6 t/ha (B)
Actual: 0.86 t/ha
Paddock History
2014: CL Scope barley
2013: CL Kord wheat
2012: Medic pasture
Soil Type
Non-wetting sandy loam
Plot Size
12 m x 2 m x 3 reps

Key messages

- **Deeper sowing at 3-4 cm achieved better early dry matter and increased grain yield in a later sowing.**
- **Frost damage may have lowered yield with early sowing, but inter-row placement at TOS1 had the highest yield.**
- **TOS 3 placement in row achieved better early plant growth and higher grain yield.**
- **Later sowing reduced brome grass numbers, and the size of the panicles, so it substantially lowered returns to the seed bank.**

Why do the trial?

The 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 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 germination. The 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.

How was it done?

The trial site was selected at Murlong in 2013 and wheat plots were established with Kord CL wheat @ 60 kg/ha and base fertiliser of 18:20:0:0 @ 60 kg/ha. The site was sprayed with 700 ml/ha of Intervix on 18 June to control small brome grass and capeweed. Urea @ 50 kg/ha was applied on 7 August. The trial was harvested on 13 November with an average yield of 1.78 t/ha and grain quality of 77.8 kg/hL (test weight), protein 11.2 % and screenings 2.3 %.

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 (early, mid and late) on 15 April (TOS 1), 13 May (TOS 2) and 10 June (TOS 3). At each time of sowing there were two sowing rates of 40 kg/ha and 60 kg/ha, two different seed placements; in row and inter row, and two sowing depths of 0-1 cm and 3-4 cm. The treatments were replicated 3 times. Pre-sowing chemical applications were Roundup Powermax @ 1.5 L/ha, Avadex @ 1.5 L/ha and trifluralin @ 1.5 L/ha.

Broad-leaved control was applied using Amicide Advance@ 1.2 L/ha and Lontrel @ 100 ml/ha on 17 June (TOS 1), 14 July (TOS 2) and 25 August (TOS 3), respectively. On 25 August 500 ml/ha of propiconazole was applied over the whole trial for spot form of net blotch.

Stubble load, soil moisture at sowing, plant emergence counts, grain yield, grain quality and harvest soil moistures were measured. The first and second times of sowing were harvested on 10 November and TOS 3 on the 24 November.

Data were analysed using Analysis of Variance in GENSTAT version 16, with covariates used to account for plot position in the TOS blocks, which were analysed independently. Least significant differences were based on $P=0.05$.

What happened?

The early time of sowing occurred after 13 mm of rain on 15 April. The second time of sowing occurred after 38 mm rain (13 May). In both TOS 1 and TOS 2 the deeper sowing (3-4 cm) resulted in visually better plant growth after 4 weeks than the shallow sowing depth (0-1 cm). The 3-4 cm sown plots had 1- 2 leaves more than the shallow sown plots at that time. The third time of sowing established slowly and looked poor compared to TOS 1 and TOS 2 all season.

The earliest sowing TOS 1 had similar grain yield but higher screenings than TOS 2 (Table 1). This may have been as a result of frost damage at critical growth stages. Frost events in this region (seven events) were recorded between 9 and 20 August and on 16 and 18 September. Other growers had significant frost damage to wheat sown in the last week of April and minor damage to wheat sown in the first week of May.

Table 1 Grain yield and quality as affected by seed placement, depth and sowing rate at Murlong in 2014

		Yield (t/ha)	Plants/m^2	Protein (%)	Test weight (kg/hL)	1000 Grain weight (g)	Screenings (%)
TOS 1							
Placement	In-row	0.87	145	9.9	69.4	36.6	11.4
	Inter-row	0.91	134	9.7	69.7	36.7	11.1
Depth	0-1 cm	0.90	159	9.8	69.4	36.1	12.3
	3-4 cm	0.89	120	9.8	69.7	37.2	10.2
LSD (P=0.05)		*ns*	*21*	*ns*	*ns*	*ns*	*2*
Sowing rate	40 kg/ha	0.92	124	9.8	69.3	36.6	11.9
	60 kg/ha	0.86	155	9.8	68.8	36.7	10.6
LSD (P=0.05)		*ns*	*21*	*ns*	*ns*	*ns*	*ns*
TOS 2							
Placement	In-row	1.11	133	10.2	69.7	38.2	8.2
	Inter-row	1.18	129	10.5	69.9	38.2	8.7
Depth	0-1 cm	0.97	128	10.5	69.5	37.2	10.1
	3-4 cm	1.32	134	10.1	70.2	39.2	6.8
LSD (P=0.05)		*0.13*	*ns*	*0.3*	*0.4*	*0.8*	*1.4*
Sowing rate	40 kg/ha	1.12	117	10.5	69.7	37.9	8.7
	60 kg/ha	1.18	145	10.2	69.9	38.6	8.2
LSD (P=0.05)		*ns*	*17*	*ns*	*ns*	*ns*	*ns*
TOS 3							
Placement	In-row	0.57	165	11.0	67.6	34.5	13.8
	Inter-row	0.44	156	11.1	66.7	33.9	15.3
LSD (P=0.05)		*0.04*	*ns*	*ns*	*0.8*	*ns*	*ns*
Depth	0-1 cm	0.48	165	11.1	67.2	34.1	15.0
	3-4 cm	0.53	156	10.9	67.2	34.3	14.1
LSD (P=0.05)		*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
Sowing rate	40 kg/ha	0.51	162	11.1	66.9	34.1	14.8
	60 kg/ha	0.50	159	11.0	67.5	34.3	14.3
LSD (P=0.05)		*ns*	*ns*	*ns*	*ns*	*ns*	*ns*

Table 2 Significant interaction of treatment effects in TOS 2

TOS 2 – Interaction effects			
Yield (t/ha)	**(cm)**	**In-row**	**Inter-row**
Depth x Placement	0-1	1.01	0.93
	3-4	1.21	1.43
LSD (P=0.05)		*0.17*	
Protein (%)		**In-row**	**Inter-row**
Depth x Placement	0-1	10.2	10.9
	3-4	10.2	10.1
LSD (P=0.05)		*0.36*	
1000 Grain weight (g)		**In-row**	**Inter-row**
Depth x Placement	0-1	37.7	36.7
	3-4	38.8	39.7
LSD (P=0.05)		*1.1*	
1000 Grain weight (g)		**40 kg/ha**	**60 kg/ha**
Depth x Sowing Rate	0-1	36.6	37.9
	3-4	39.2	39.3
LSD (P=0.05)		*1.1*	

Early dry matter was higher in TOS 2 with greater depth of sowing; 395 g/m^2 at 3-4 cm depth compared to 322 g/m^2 at 0-1 cm. In TOS 3 early dry matter was higher in-row (254 g/m^2) than inter-row (193 g/m^2).

Sowing rate increased the number of plants established in TOS 1 and TOS 2 only. In TOS 1 the 0-1 cm depth also had greater screenings at the end of the season.

The highest yield in TOS 2 was achieved inter-row at the 3-4cm depth. Deeper sowing resulted in greater 1000 grain weight. TOS 3 had the lowest yield and the highest screenings but also the highest protein.

Brome grass numbers were similar regardless of sowing depth, placement or sowing rate. However there were differences depending on the time of sowing with the TOS 1 having an average 14.2 plants/m^2 in crop, TOS 2 having 8.8 plants/m^2 and TOS 3 having 4.5 plants/m^2, indicating greater weed control was achieved with later sowing.

What does this mean?

Deeper sowing at 3-4 cm resulted in less or similar plant establishment but achieved better early dry matter production in TOS 2 and increased grain yield.

- Inter-row placement had the highest yield in TOS 1, but the lower yield than TOS 2 indicates frost damage may have been a factor.
- TOS 3 in-row seed placement achieved better early plant growth and was higher yielding than TOS 3 inter row, but was still much lower than the earlier times of sowing.
- The later time of sowing lowered brome grass weed numbers with smaller seed panicles and hence should have reduced the weed seed bank.

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