Managing Water Repellent Sands

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RESEARCH

Location: Wharminda
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Rainfall
Av. Annual: 322 mm
Av. GSR: 222 mm
2009 Total: 283 mm
2009 GSR: 245 mm

Yield
Potential: 2.7 t/ha (W)
Actual: 1.4 t/ha (W)

Paddock History
2008: Medic pasture
2007: Wheat
2006: Medic pasture

Soil Type
Deep siliceous sand
24 m x 1.5 m x 4 reps

Yield Limiting Factors
Late sowing and nitrogen deficiency

Key messages

- **Incorporating seed behind press wheels resulted in the best crop establishment and one of the higher yields.**
- **A split application of seed, some broadcast in front of the seeder and some sown through the seeding boots shows promise.**
- **Soil wetters were ineffective for increasing emergence or grain yield.**

Why do the trial?

Growing crops on water repellent siliceous sands have been a challenge ever since the country was first cleared. This challenge is greatly increased where water repellence is severe. Wharminda is a district "blessed" with a large area of this challenging soil type. These sands "wet up" slowly and unevenly at the start of the season, so getting an even, rapid and satisfactory germination and subsequent establishment before winds hit is important.

This is the fourth season of sowing systems research at Wharminda investigating methods for successfully establishing crops in a single pass to reduce erosion potential and improve productivity. Previous results can be found in EPFS 2006, p 176, EPFS 2007, p 177, EPFS 2008, p 67.

How was it done?

The trial was sown on 8-9 June with 50 kg/ha Wyalkatchem wheat and 50 kg/ha DAP banded with the seed. The site received a knockdown spray, but no pre emergence herbicide. The site was monitored for crop emergence post sowing. Grain was harvested using a small plot header with samples kept for grain quality assessment. Brome grass seeds were graded out to assess levels of contamination in the grain sample.

The majority of treatments were sown on 254 mm row spacing, however due to strong interest from local growers, 203 and 152 mm row spacings were included as additional treatments.

More high seed bed utilisation (SBU) systems were included in the trial design in 2009. Incorporating seed behind press wheels is a treatment which has been included in trials sown since 2006 and the Anderson boot has been included in trial work since 2007, with the Anderson disc levellers (rolling shields) also included to the Anderson treatment in 2008. The new concepts explored in 2009 were the Morris N10988 spreader boot, which gives full SBU when sowing with 200 mm sweeps on 203 mm row spacing. The other new idea was to "split" the application of seed, broadcasting some in front of the seeder, but still sow the rest through the seed boots. This was achieved by utilising all the outlets from the airseeder head and directing 40% of the seed to be broadcast at the front of the seeder bar and the remainder sown through the seed boots on the tines.

Soil wetters were applied through fluid fertiliser tubes attached behind the press wheels.

What happened?

Wharminda missed out on the early opening rains that other regions on Eyre Peninsula had benefited from. The trial was sown in the second week in June while showers were still falling sporadically.

The crop established with no wind erosion, which was a good change from 2008! The crop was generally slow growing, due to the colder conditions which prevailed after sowing. A lack of nitrogen was also apparent and reflected in the low protein levels achieved in the crop.

Incorporating seed behind the press wheels gave the best crop establishment in the trial. The next best establishment was achieved with knife points and press wheels on 152 mm and 203 mm row spacings and the high SBU systems; sweeps + Morris spreader boot, Anderson system and the broadcast seed + sow through seed boots treatment.

Getting seeding depth right on 21 different seeding systems is quite a challenge, especially when trying to find seed in sandy soil under torch light!

The shallowest systems were in the 24-31 mm range, such as incorporating seed behind press wheels, knife points and press wheels set to sow shallow, broadcast seed + sow through seed boots, knife points and press wheels working shallow and sowing through the deep banding boot and knife points and press wheels sowing on 152 mm row spacing. Almost half the treatments were in the 40-47 mm range. The deepest sown plots were between 61 and 68 mm; the Atom Jet Mallee point and the knife points and press wheels working and sowing deep.

The Atom Jet points, sweeps + rotary harrows, 100 mm sweeps + press wheels and knife points + press wheels working and sowing deep were the poorest emerging plots.

The highest yielding treatments in the trial were, incorporating seed behind press wheels, knife points and press wheels on 152 mm row spacing, broadcast seed at the front of the seeder + sow through seed boots, and knife points and press wheels sowing shallow.
The poorest yielding treatments were 100 mm sweeps and press wheels and the Atom Jet Mallee points. These treatments emerged from 60 and 69 mm depth respectively.

Brome grass contamination within the grain sample was highly variable, however the worst treatment for brome grass contamination in the grain sample was the 100 mm sweeps + press wheels system.

Screenings ranged from 3.3% to 1.1%. The highest screenings were in the plots sown with 100 mm sweeps and press wheels.
Test weight ranged from 82 to 77 kg/hL, while protein ranged from 8.7 to 10 %.

Soil wetters were ineffective for increasing crop emergence or grain yield. Wetter TX and Wettasoil were used at rates of 0.5, 1 and 1.5 L/ha with a total fluid volume of 40 L/ha (data not presented).

Table 1 Seeding systems impact on seeding depth, crop establishment, brome grass contamination, grain quality and yield

Tmt No.			Depth (mm)	Emergence (plants/m^2)	Brome (seeds/kg)	Screenings (%)	Test weight (kg/hL)	Protein (%)	Grain Yield (t/ha)
1	KPPW	152 mm row spacing	31	138	561	1.4	79.8	9.2	1.41
2	KPPW	203 mm row spacing	43	122	456	1.2	80.8	9.0	1.32
3	Sweeps + RH	Morris spreader boot 203 mm row spacing	46	124	952	2.0	79.9	9.1	1.05
4	Sweeps + RH		56	60	1231	2.3	79.1	9.4	0.92
5	Sweeps + RH	100 mm row spacing press wheels	60	55	2485	3.4	77.3	10.0	0.77
6	KPPW	12 mm point	43	83	584	1.4	79.0	9.6	1.23
7	KPPW	wing point	49	93	695	1.3	79.5	9.3	1.23
8	KPPW		40	95	843	1.9	79.2	9.2	1.14
9	KPPW	Snake Chains	48	90	945	1.8	79.0	9.5	1.08
10	KPPW	Chain	46	87	863	1.7	80.1	9.2	1.23
11	KPPW	broadcast seed at front + sow through seed boots	29	126	459	1.2	81.2	8.8	1.38
12	KPPW	work and sow deep	61	49	1384	1.8	78.4	9.5	0.88
13	KPPW	sow shallow	28	100	355	1.1	79.8	9.2	1.36
14	KPPW	work shallow & sow through deep band boot	31	111	498	1.3	80.0	9.2	1.28
15	KPPW + RH		44	97	886	1.4	79.5	9.4	1.23
16	KP + RH		46	94	653	1.3	80.1	9.2	1.21
17	KPPW + RH	Incorporation of seed behind press wheels	24	171	247	1.2	80.9	8.8	1.48
18	Atom Jet		56	58	1500	2.2	78.2	9.8	0.91
19	Atom Jet	Mallee Point	69	66	1403	2.3	77.8	9.7	0.70
20	KPPW	Anderson System (165mm seed spread)	46	123	910	1.9	79.4	9.2	1.12
21	K-Hart disc		49	83	597	1.5	79.7	9.3	1.10
LSD	*P=0.05*		*8*	*22*	*705*	*0.6*	*2.0*	*0.5*	*0.15*

**KP = Knife Points, PW = Press wheels, RH = rotary harrows, K-Hart = wavy coulter + v-paired discs + press wheel. All knife points used in trial were 16 mm unless otherwise indicated.*

What does this mean?

Incorporation of seed behind press wheels with rotary harrows was very effective; it resulted in the highest plant establishment and one of the higher yielding treatments. If this system can establish crops quickly without emergence delays, then the potential erosion risk of using harrows may be offset by good crop growth to provide surface cover.

Of the new concepts trialled the split application of seed; broadcasting some of the seed at the front of the seeder, which is incorporated by the sowing pass, while also sowing with knife points and press wheels shows significant promise. It is a low disturbance system which should reduce wind erosion potential, however the main benefit is the distribution of the seed. Seed depth on the inter-row ranged from 5 to 20 mm, while the crop row can be placed as deep as required. It's a bit like having a bet each way for intercepting moisture. How the system handles pre-emergence herbicides is not resolved at this point.

The split application of seed idea came from Tim Ottens, the grower hosting the trials, who set his machine up in this manner in 2009. He has a double shoot delivery from his airseeder, but has gone away from deep banding fertiliser. The deep banding air kit was sent to the front of the airseeder and directed to a series of deflector plates to spread the seed across the width of the bar. Tim directed half of his seed to the front of the bar, while sowing the rest through his seed boots on the tines. It's not precision seeding, but Tim was very happy with the results.

The Atom-Jet points performed poorly for crop establishment and final grain yield, however the seed placement was still too deep (56-69 mm). This is most likely the fault of the operator than the point design itself.

Brome grass contamination in the sample was a factor of crop competition within the plot. The plots with better emergence competed well and generally the more competitive wheat plots resulted in higher grain yields. Unlike 2008, no trend for increased brome grass seed contamination with higher disturbance systems was apparent. Some of the full disturbance systems resulted in high levels of brome grass contamination. The high disturbance systems which established well were able to compete with the brome grass comparably with the low disturbance systems.

The relative performance of these sowing systems may be different when pre-sowing herbicides such as Trifluralin are used. It is likely however that the downsides of Trifluralin damage may be less than the impact of poor emergence due to water repellent sands.

The soil wetter trials were completely ineffective for the fourth consecutive season and excuses as to why are fast running out. The wetters are banded in a stream behind the press wheels. Perhaps a full fan nozzle may produce a beneficial result.

The current no-till project which is funded through the Federal Government's Caring for our Country program will be finishing in June 2010. Hopefully further funding can be secured to see this type of work continue in the future.

Acknowledgements

Tim Ottens for the use of his land and coming up with the idea of a "split" application of seed. Can't beat farmer innovation! SANTFA, Caring for Our Country and SARDI for funding the work. Brenton Spriggs, Liam Cook and Willie Shoobridge for technical assistance. Thanks to SANTFA sponsors, CASE-IH, Flexi-Coil, K-Hart, Atom-Jet and Agmaster for trial equipment. Thanks to Jack Desbiolles from the University of SA for trial equipment assistance.