De-risking the seeding program - early sowing and the performance of pre-seeding herbicides in wheat

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Location
Poochera (Karcultaby closest BOM site)
Rainfall
Av. Annual: 308 mm
Av. GSR: 210 mm
2025 Total: 265 mm
2025 GSR: 210 mm
Paddock History
2024: Calibre wheat
2023: Medic Pasture
Soil type
Calcareous sandy loam
Trial design
Split plot design x 3 reps x 2 blocks (TOS)
Plot size
12 m x 2 m

Key messages

- **TOS1 occurred on 24 April before a predicted rainfall event and TOS2 on 16 June after rainfall, with crop establishment being lower in TOS1 (8 weeks from seeding) compared to TOS2 by 29 plants/m^2.**
- **In 2025, crop establishment did not occur earlier with early and dry sowing so the advantage was only operational timeliness.**
- **There was no effect of herbicide treatments on plant establishment at either seeding times. Ideally weed seed banks would be low for dry sowing paddocks.**
- **All herbicides achieved some level of weed control in a high weed burden paddock compared to the Untreated control and the early post emergent (EPE) herbicide treatment.**
- **Mateno Complete 1 L/ha IBS, and Trifluralin 1.8 L/ha + Avadex (a.i.500 g) 1.6 L/ha + Sakura 118 g/ha IBS had the lowest weed numbers with early and dry sowing eleven weeks after sowing, however these are also the more expensive herbicide packages tested.**
- **There was a grain yield decrease of 0.18 t/ha with TOS1 but when ensuring timeliness of large seeding programs this maybe acceptable.**

Why do this trial?

Dry seeding is now an option which many farmers in the western and southern regions of Australia consider due to increased farm size, more variable breaks to the season and to make better use of all available water. In the 2025 season, most farming regions in southern Australia recorded well below average summer and autumn rainfall. Many farmers seeded a large portion of their program before the season break that occurred in mid-June. However, early and dry sown crops can be more vulnerable to water and nutrient deficiencies, higher soil temperature and pre-emergent herbicide toxicity, which may lead to patchy crop establishment.

The research reported here is to further fill knowledge gaps with dry sowing by investigating the effects of sowing time and early grass-control herbicides on crop establishment and yield of Calibre wheat on upper Eyre Peninsula (EP).

How was it done?

In 2025, a demonstration site with a split-plot design was conducted at Poochera in a calcareous sandy loam with a high burden of annual ryegrass with some brome grass and barley grass also present. The soil profile was dry prior to the first time of seeding (8-11% gravimetric water content in the top 80 cm on 11 June). Sowing with Primary Sales split system and press wheels took place on 24 April (TOS1) and 16 June (TOS2), with 75 kg/ha of Calibre wheat and 75 kg/ha of MAP banded below the seed. Herbicide treatments for early grass weed control were applied immediately prior to sowing at both times of sowing and were incorporated by seeding (IBS) (Table 1), except for Mateno Complete 1 L/ha EPE that was applied when plants reached 3 leaf stage (Z13).

Crop establishment, grass weed density and NDVI assessments were made on 24 June, 1 July, 10 July or 17 July. 50 kg/ha of urea was spread on all plots on 14 July. Treatment 6, Mateno Complete 1 L/ha EPE was applied on 11 July (Z13). Early biomass (Z30) cuts were taken on 18 August. Late biomass (Z70) was measured on 8 October. Harvest was undertaken on 10 December. Grain quality was assessed in January.

Table 1. Early season herbicide treatments at Poochera in 2025 on Calibre wheat.

Herbicide Treatments		Chemical Cost ($/ha)
1	Untreated	0
2	Sakura 118 g/ha IBS	$30
3	Overwatch 1.25 L/ha IBS	$43
4	Prosulfocarb 3 L/ha IBS	$24
5	Mateno Complete 1 L/ha IBS	$53
6	Mateno Complete 1 L/ha EPE (GS13)	$53
7	Trifluralin 1.8 L/ha + Metribuzin 100 g/ha IBS	$19
8	Trifluralin 1.8 L/ha + Avadex (a.i.500 g) 1.6 L/ha + Sakura 118 g/ha IBS	$61

What happened?

There was very little moisture available in the soil profile on the 11 June. In 2025 the first significant rainfall event was on 20 March with 19 mm, but only small events occurred in April (3.6 mm) and May (3.4 mm) that was not enough moisture for wheat to emerge. The first significant rainfall event to enable germination and seedling emergence was not until 12 June with 12 mm received. The late seasonal break resulted in most crops being dry sown followed by good winter rainfall (Karcultaby had 46 mm in June, 102 mm in July and 19 mm in August). October rainfall was 30 mm with cooler conditions which resulted in good grain fill and higher than expected yields in the area.

The season break in 2025 occurred on 12 June with 12 mm of rain and the growing season was a decile 4. The first time of sowing (TOS1) was undertaken on 24 April before a predicted rainfall event which ended up being only 1.5 mm, and TOS2 on 16 June after 12 mm of rainfall.

Wheat from TOS1 did not emerge until 24 June (8 weeks after sowing) with an average of 36 plants/m^2, but wheat in TOS2 had still to emerge. However, by 1 July crop establishment was the same for both times of sowing (Table 2). Herbicide treatments had impacted on crop establishment by 1 July with untreated and Prosulfocarb 3 L/ha IBS having the best crop establishment. Plant numbers were lowest with Overwatch 1.25 L/ha IBS and Trifluralin 1.8 L/ha + Metribuzin 100 g/ha IBS.

By 17 July, there was no effect of herbicide treatments on wheat plant density. On 17 July, wheat density in TOS1 was lower by 29 plants/m^2 than in TOS2 (Table 2).

Grass weed pressure was high at Poochera site with an average of 195 grass weeds/m^2 on 17 July. TOS1 had higher grass weed numbers compared to TOS2 at all samplings, indicating that herbicide activity from the later application timing was greater when rainfall finally fell. Untreated and Mateno Complete 1 L/ha EPE had higher grass weed numbers than most other herbicide treatments (Table 3 and Figure 2). By 17 July most herbicide treatments had reduced grass weed numbers compared to untreated and Mateno Complete 1 L/ha EPE.

At Z30, biomass from TOS1 was 0.2 t/ha more than TOS2. Trifluralin 1.8 L/ha + Metribuzin 100 g/ha IBS had lower biomass at both growth stages compared to untreated and Prosulfocarb 3 L/ha IBS.

Grain yield with TOS1 averaged 0.9 t/ha and 1.1 t/ha with TOS2. The Trifluralin 1.8 L/ha + Metribuzin 100 g/ha IBS and untreated treatment had similar and low yields (Table 5). Grain proteins were high in untreated and low with Overwatch 1.25 L/ha IBS, and Trifluralin 1.8 L/ha + Metribuzin 100 g/ha IBS treatments.

Table 2. Wheat density (plants/m²) in herbicide treatments at two times of sowing at 4 sampling times at Poochera in 2025. First time of sowing (TOS1) was 24 April and the second timing was 16 June. Treatments followed by the same letter are not statistically different.

Treatment	24 June		1 July		10 July			17 July	
	TOS1	TOS2	TOS1	TOS2	TOS1	TOS2	Average	TOS1	TOS2
1. Untreated	52	0	122	83	122	125	123 a	108	108
2. Sakura IBS	44	0	101	70	88	110	98 bc	82	100
3. Overwatch IBS	29	0	77	71	59	90	75 d	53	104
4. Prosulfocarb IBS	52	0	120	76	103	112	107 ab	91	107
5. Mateno Complete IBS	27	0	68	61	61	122	91 bcd	67	111
6. Mateno Complete EPE (GS13)	35	0	93	82	91	113	102 bc	83	102
7. Trifluralin + Metribuzin IBS	23	0	66	77	59	106	82 cd	72	100
8. Trifluralin + Avadex + Sakura IBS	25	0	68	67	65	136	100 bc	63	112
Average TOS	36 a	0 b	89	73	81 b	114 a		77 b	106 a
*LSD TOS*Herbicide (P = 0.05)*	*ns*		*ns*		*ns*			*ns*	
LSD TOS (P = 0.05)	*28*		*ns*		*28*			*28*	
LSD Herbicide (P = 0.05)	*ns*		*21*		*23*		*23*	*ns*	

Table 3. Grass weed density at 4 sampling times (plants/m²) in herbicide treatments at two times of sowing at Poochera, in 2025. First time of sowing (TOS1) was 24 April and the second timing was 16 June. *Treatment 6 applied on 11 July. Treatments followed by the same letter are not statistically different

Treatment	24 June		1 July		10 July		17 July	
	TOS1	TOS2	TOS1	TOS2	TOS1	TOS2	TOS1	TOS2
1. Untreated	276 a	42 e	340 a	72 cde	605 a	292 c	525 a	288 bc
2. Sakura IBS	101 d	37 e	152 b	50 de	253 c	93 efg	221cde	128 efgh
3. Overwatch IBS	158 bc	20 e	106 bc	43 de	145 def	160 de	152 efg	90 fgh
4. Prosulfocarb IBS	110 cd	16 e	150 b	27 e	324 c	56 fgh	360 b	69 gh
5. Mateno Complete IBS	32 e	40 e	48 de	49 de	100 def	69 fg	80 fgh	94 fgh
6. Mateno Complete EPE (GS13)*	200* b	40* e	334* a	58* cde	504* b	280* c	492 a	257 cd
7. Trifluralin + Metribuzin IBS	65 de	30 e	85 cd	21 e	175 d	41h	173 def	81 fgh
8. Trifluralin + Avadex + Sakura IBS	34 e	24 e	53 de	28 e	79 fg	32 h	69 gh	49 h
Average TOS	122	31	159	44	273	128	259	132
*LSD TOS*Herbicide (P = 0.05)*	*53*		*53*		*78*		*100*	
LSD TOS (P = 0.05)	*45*		*55*		*40*		*48*	
LSD Herbicide (P = 0.05)	*32*		*39*		*59*		*70*	

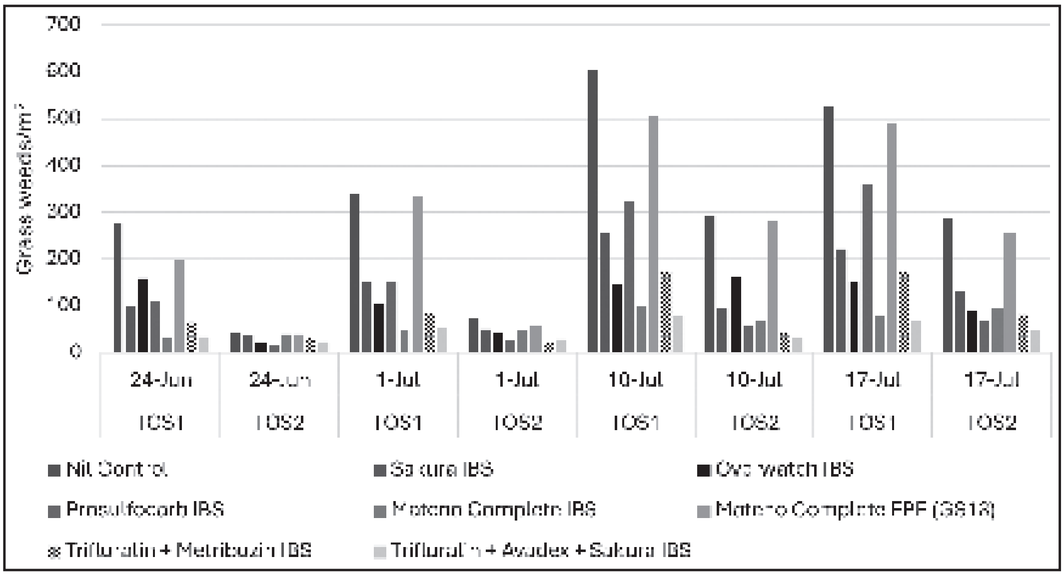

Figure 1. Grass weeds early in the season (plants/m^2) in herbicide treatments at two times of sowing at Poochera in 2025. Treatment 6 Mateno Complete EPE applied on 11 July 2025 (GS13). See Table 3 for statistical analysis and more detail of treatments.

Table 4. Early (Zadoks growth stage 30, stem elongation) and late (Zadoks growth stage 70, early grain fill) biomass (t/ha) of wheat in herbicide treatments from two times of sowing at Poochera in 2025. First time of sowing (TOS1) was 24 April and the second timing was 16 June. Treatment 6 was applied on 11 July. Treatments followed by the same letter are not statistically different

Treatment	Z30 Biomass (t/ha)			Z70 Biomass (t/ha)	
	TOS 1	TOS 2	Average	TOS 1	TOS 2
1. Untreated	0.36	0.29	0.32 a	1.41 a	2.03 a
2. Sakura IBS	0.26	0.28	0.27 ab	1.81 a	2.30 a
3. Overwatch IBS	0.23	0.25	0.24 bc	1.91 a	2.24 a
4. Prosulfocarb IBS	0.40	0.34	0.37 a	1.82 a	2.38 a
5. Mateno Complete IBS	0.22	0.56	0.24 bc	2.06 a	2.66 a
6. Mateno Complete EPE (GS13)	0.22	0.22	0.22 bc	2.08 a	2.61 a
7. Trifluralin + Metribuzin IBS	0.27	0.08	0.17 c	1.91a	1.22 b
8. Trifluralin + Avadex + Sakura IBS	0.24	0.29	0.27 ab	1.96 a	2.76 a
Average TOS	0.27	0.25		1.87	2.29
*LSD TOS*Herbicide (P = 0.05)*	*ns*			*0.55*	
LSD TOS (P = 0.05)	*0.02*			*0.28*	
LSD Herbicide (P = 0.05)	*0.08*		*0.08*	*0.41*	

Table 5. Combined grain yield and protein of wheat in herbicide treatments from two different times of sowing at Poochera in 2025. Treatments followed by the same letter are not statistically different.

Treatment	Yield (t/ha)	Protein (%)
1. Untreated	0.81 bc	10.8 a
2. Sakura IBS	0.99 ab	10.6 ab
3. Overwatch IBS	1.28 a	10.2 b
4. Prosulfocarb IBS	1.05 ab	10.4 ab
5. Mateno Complete IBS	1.16 a	10.3 ab
6. Mateno Complete EPE (GS13)	1.10 a	10.3 ab
7. Trifluralin + Metribuzin IBS	0.69 c	10.2 b
8. Trifluralin + Avadex + Sakura IBS	0.93 ab	10.4 ab
LSD (P = 0.05)	*0.40*	*0.3*

What does this mean?

The 2025 season had a late and dry start to the season that resulted in seed and herbicides with early and dry seeding being in the soil for eight weeks before reasonable rains allowed emergence and herbicides to become active. The large gap between sowing and germination resulted in slower crop establishment and increasing seeding rates may be a tool to increase early plant numbers when sowing dry and early.

Neither times of sowing had a knock down herbicide applied, that is most often the situation when dry sowing, which places more pressure on the pre-emergent herbicides. The performance of pre-emergent herbicides is dependent on soil moisture, the persistence of the herbicide and the mobility of the herbicide in the soil that will depend on soil type. The low moisture conditions at TOS1 and the eight-week period before rainfall resulted in some herbicides that rely on soil moisture to be activated not performing as well in TOS1 as TOS2. However, all herbicides achieved some level of weed control in a high weed burden paddock compared to untreated and the early post emergent herbicide application.

There are large differences in the cost of herbicides and herbicide mixes (Table 1) so choosing herbicides depending on the timing of seeding, paddock weed burdens and potential to cause crop damage are important considerations. Mateno Complete 1 L/ha IBS, and Trifluralin 1.8 L/ha + Avadex (a.i.500 g) 1.6 L/ha + Sakura 118 g/ha IBS had the lowest weed numbers with early and dry sowing eleven weeks after sowing, however these are also the more expensive herbicides tested. Ensuring weed seed set and the seed bank are minimised every season is an important weed management tool.

Grain yields with early and drier seeding were 0.2 t/ha below seeding after the break but ensuring timeliness of large seeding programs in current farming systems is important to maximise plant growth and yield potential over the whole farm. In 2025 the exceptional winter rains and cooler than normal grain fill conditions may have resulted in better yields from the later seeding than might result in other seasons with poorer finishes.

Acknowledgement

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Previous SA Drought Hub and Future Drought Fund projects were ‘De-risking the seeding program - Adoption of key management practices for the success of dry early sown crops’ (4-IMX2CLR) 2024 and ‘Best practice for early sowing opportunities’ with demonstration sites located at Cowell and Penong in 2022 and 2023 (DN1 23 03 and DN1 22 02).

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Farming Systems