

Operation FerTill - Achievements at Birchip in 1998.

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The aim of this trial was to investigate the optimum fertiliser placement when sowing wheat

Operation FerTill is a joint research initiative between the GRDC, SARDI, Pivot Agriculture and Flexicoil with a threefold purpose:

- To determine crop yield, quality response and carry over effects to new methods of deep nitrogen (N), phosphorus (P) and zinc (Zn) placement in a range of soils and rainfall.
- To develop seeding system management practices, incorporating optimum seed drill design and fertiliser placement for integration into the Pivot Prescription farming program.
- To demonstrate improved fertiliser placement practices to the farming industry throughout southern Australia.

1997 trials

The initial trials, in South Australia during 1997, demonstrated that fertiliser placement effects can be of significant financial benefit to farmers. For example, grain yields were increased in wheat, barley and canola by 4.6%, 13% and 13.7% respectively on a sandy loam at Halbury in the mid-north of South Australia. This was achieved by split banding half of the DAP with, and below, the seed row and banding the N below the seed, compared to conventional seed row applied DAP and surface spread Urea at the same rates. The respective grain yield increases for wheat, barley and canola were 0.24, 0.71 and 0.4 t/ha.

Conclusions from 1997

- Where water was not limiting during the spring and also at grain fill, banded N was much more effective than conventional placement methods when higher rates of P were used and also when banded Zn was included. Banded N was not necessarily any better than conventional N placement when P was applied only in the seed row.
- These results support the hypothesis that there is a potential synergy of response to be gained from the combined placement of these nutrients.
- Best yield responses were obtained mostly with split or all banded fertiliser in a balanced combination of P and Zn at normal rates with N banded below.
- Canola emergence appears to be very sensitive to DAP applied at 100kg/ha in the seed row. Crop establishment was significantly improved with split or banded DAP.
- P and Zn placement are very significant management tools to reduce the severity of Rhizoctonia in all crop types. Some P and Zn placement in the seed row of cereal crops is beneficial in reducing the severity of Rhizoctonia infection.

1998 trials

Small plot research at the six permanent sites in SA continued in 1998. To supplement this research an additional 6 trials were sown in Victoria, in conjunction with the Birchip Cropping Group and Landcare groups, at Sea Lake, Birchip, Charlton, Wedderburn and Warracknabeal.

Large scale demonstration plots were also sown, using Flexicoil machinery, at Beulah and Birchip. Unfortunately, the trial at Wedderburn was frosted in October and abandoned, the trial at Warracknabeal suffered from a very dry year and was also frosted and the canola trial at Charlton also suffered from the dry season.

(i) Timing of N application

In this trial the optimum timing for N application was investigated (Table 3.9). Seed was sown with 90kg/ha of MAP and two rates of N (50 and 100kg N/ha) were applied either pre-drilled (immediately prior to sowing), pre-spread (immediately prior to sowing), top dressed

(mid tillering), or a combination of deep banded N (below the seed at sowing) with topdressed N (mid tillering).

Table 3.9 Wheat yield (t/ha) in relation to topdressing or pre-drilling fertiliser N.

N fertiliser applied (kg N/ha)				Sea Lake		Birchip		Charlton	
pre-drill	pre-spread	top-dress	deep band	yield t/ha	protein %	yield t/ha	protein %	yield t/ha	protein %
50				2.45	11.6	3.14	10.5	1.72	11.8
100				2.54	12.0	3.33	11.7	1.72	12.3
	50			2.53	11.7	2.80	11.2	1.58	11.7
	100			2.34	12.0	3.08	11.4	1.60	12.9
		50	50	2.49	12.6	3.00	11.8	1.85	12.8
		100		2.40	11.9	2.44	11.2	1.67	12.4
Significant difference:				NS		P<0.01 LSD=0.37		NS	

Interpretation: There were no yield differences between N application timing treatments in 1998, except for at Birchip. At the Birchip site, the best N application method was pre-drilling. There was a large response to N at the sites where soil available N was low at sowing (ie. Birchip and Charlton) (yield results for the zero N treatment were: Sea Lake 2.20, Birchip 2.16, and Charlton 1.31t/ha). There was only a small response to N at Sea Lake which was expected due to the high level of available N in the soil at sowing (also see the article 'What happens to N fertiliser').

(ii) **Banding fertiliser**

In this trial the optimum placement for P and N in relation to the seed were investigated (Table 3.10). P was either placed with the seed or banded (either half banded below the seed with the remaining half with the seed; or all banded below the seed). N as urea was always banded below the seed (at two rates: 50 and 100kg N/ha).

Table 3.10 Wheat yield in relation to banding fertiliser with and below the seed.

Fertiliser application (kg/ha)		Sea Lake		Birchip		Charlton	
with seed	banded	yield t/ha	protein %	yield t/ha	protein %	yield t/ha	protein %
90 MAP	50 N	2.46	12.0	2.94	11.0	1.63	12.1
45 MAP	45 MAP + 50 N	2.49	11.8	3.16	11.0	1.51	11.4
	90 MAP + 50 N	2.30	11.3	3.12	11.2	1.61	11.7
90 MAP	100 N	2.48	11.9	3.11	13.3	1.75	13.2
45 MAP	45 MAP + 100 N	2.63	12.3	2.91	12.7	1.76	12.6
	90 MAP + 100N	2.35	12.0	2.91	12.9	1.54	13.5
Significant difference:		NS		NS		NS	

Interpretation: In the 1998 trials there were no consistent trends in yield or protein between banding treatments. Placing all of the P fertiliser with the seed or half with the seed and half below were of equal yield. Banding all of the P fertiliser below the seed resulted in a small yield loss, but the results were not consistent between sites.

(iii) Zinc response

In this trial the requirements for zinc were investigated (Table 3.11). MAP (no Zinc) and MMI (Mallee Mix I, containing 2% Zinc) were sown at equal P rates (20 kg P/ha) with the seed or banded below the seed.

Table 3.11 Wheat yield in relation to zinc fertiliser.

Fertiliser application (kg/ha)		Sea Lake		Birchip		Charlton	
with seed	banded	yield t/ha	protein %	yield t/ha	protein %	yield t/ha	protein %
90 MAP	50 N	2.46	12.0	2.94	11.0	1.63	12.1
110 MMI	50 N	2.69	11.6	2.91	10.4	1.85	11.9
45 MAP	45 MAP + 50 N	2.49	11.8	3.16	11.0	1.51	11.4
55 MMI	55 MMI + 50 N	2.5	12.2	2.96	11.3	1.87	11.4
	90 MAP + 50 N	2.30	11.3	3.12	11.2	1.61	11.7
	110 MMI + 50 N	2.48	12.6	3.26	11.4	1.82	11.2
Significant difference:		NS		NS		NS	

Interpretation: There was no significant effect of zinc on yield at any of the sites, nor was there an effect if zinc was banded below the seed.

Conclusions and Implications:

- the response to nitrogen in these trials should encourage the application of urea for wheat crops in these regions when the deep soil N test shows that the soil is low in available N prior to sowing in relation to the target yield set for the crop
- Even though there was no zinc response at any of the sites, we know from previous work the importance of zinc to good crop nutrition. It is likely that there were no responses to zinc at these sites because zinc had been applied in the past at these sites as part of the normal fertiliser program. Nutrient histories for zinc are an efficient technique for determining a likely zinc response.
- adequate nitrogen nutrition is essential prior to top dressing a wheat crop to ensure potential yield is not lost.
- seed placement depth is critical to ensure quick, vigorous crop establishment and high plant numbers
- accurate placement of covering tynes and press wheels will also improve crop establishment, especially in a dry year

The FerTill trials will continue at Birchip in 1999.

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