

Canola in

An update from the GRDC funded project
'The contribution of subsoil constraints to canola yield decline'.

Depth

This edition of *Canola in Depth* highlights the major outcomes from the 2007 trials. Drought conditions had a significant impact on results, particularly in relation to the sodic sites. Low soil moisture also limited responses to deep ripping at compacted sites. However dry matter measurements from the acidic sites provided useful data, with results suggesting that whilst canola responds to topsoil liming, it does not appear to respond to subsurface liming.

Lime response

There was no growth response to subsurface lime injection at any of the sites, despite an increase in pH. Two possible explanations for the lack of response to subsurface liming include:

- Canola roots were able to push through the 'acid throttle' into the neutral subsoil without damage.
 - Manganese (Mn^{2+}), which increases in concentration in acid soils and to which canola is particularly sensitive, was not present in sufficiently high levels in the subsurface to affect canola growth.
- **The 'manganese effect':** As soil pH decreases, the concentration of toxic forms of aluminium and manganese increases. Research by Moroni et al. has shown that canola is particularly sensitive to manganese (toxic at > 600mg/kg), but less sensitive to aluminium.



Manganese toxicity symptoms in canola at Culcairn

- None of the treatments at Greenethorpe and Milvale had an effect on manganese levels in the plant, but the combination of ripping and liming significantly reduced manganese at Culcairn.

- Glasshouse experiments are being undertaken to further investigate the 'manganese effect'.

Ripping response

Deep ripping successfully removed compaction layers, significantly reducing soil strength and root distortion, or 'J-roots', at all but one of the sites where it was measured (Table 1).

Despite removing the compacted layer, deep ripping resulted in a dry matter response at the two Greenethorpe sites only. Poorer growth in ripped plots at the other sites may have been due to a combination of greater moisture loss from soil disturbance in a very dry season, and in some cases, from poor seedling establishment where the ripper left a rough seedbed. Unfortunately the season was too dry for these dry matter responses to translate into a yield benefit.



Deep ripping (right) resulted in more dry matter at Greenethorpe than the unripped control (left). However the season was too dry for these responses to translate into a yield benefit.

Gypsum response

There was no growth response to injected or surface applied gypsum at any of the sites. Previous research has shown that gypsum responses are unlikely in dry years.

Salinity effects

Both the Lockhart and Rand sites (black clay and brown vertosols only) had high electrical conductivity (EC) levels below 40cm depth, indicating subsoil

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Project Update - 2008 trials

a) Acidic, compacted subsurface sites:

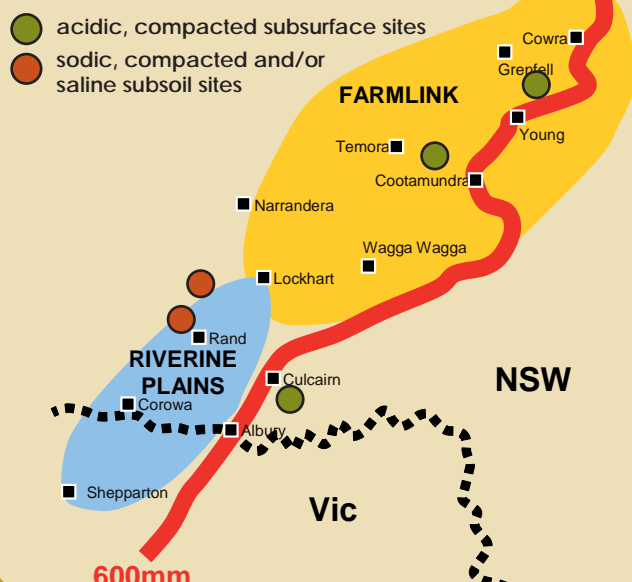
- **Culcairn** - Beacon & Bravo sown 14th May. Treatments:
 - ▶ deep rip (March '08)
 - ▶ deep rip + injected lime @ 6t/ha
 - ▶ knife point incorporation of surface lime @ 3t/ha
 - ▶ control (+/- fungicide)
 NB: all plots were also surface limed in Feb '08 @ 1t/ha
- **Greenethorpe** - Bravo sown 1st May. Treatments:
 - ▶ deep rip (March '07)
 - ▶ deep rip + injected lime @ 4t/ha
 - ▶ control
- **Milvale** - Hyola 50 sown 7th May. Treatments:
 - ▶ deep rip (March '07)
 - ▶ deep rip + injected lime @ 3.75t/ha
 - ▶ deep rip + injected lime @ 7.5t/ha
 - ▶ surface lime @ 3.75t/ha + deep rip
 - ▶ control

b) Sodic, compacted and/or saline subsoil sites:

- **Rand** - Tornado sown 24th April. Treatments:
 - ▶ deep rip (March '08)
 - ▶ deep rip + injected lime @ 4t/ha
 - ▶ control
- **Boree Creek** - 45Y77 sown 30th April. Paddock has variable salinity levels - will be monitored during season and correlated to EM map.
- **Brimpaen** - canola sown 26th May. Treatments:
 - ▶ deep rip (May '08)
 - ▶ deep rip + Gyplife @ 600L/ha
 - ▶ deep placement of nutrients (N, P, Zn)*
 - ▶ surface organic matter @ 20t/ha*
 - ▶ control*
 *treatments repeated on raised bed trial.

NB: The 2007 Lockhart, Rand and Greenethorpe sites have been sown to wheat and will be monitored during 2008.

Location of 2008 trial sites:



salinity. However many of the samples from these sites also had low chloride concentrations, suggesting that the high EC values may be a result of gypsum salts rather than chloride salts. Chloride salts are far more damaging to plants, with levels above 600mg/kg considered to inhibit plant growth.

Organic matter/deep nutrient response

The surface organic matter (pig bedding straw) and deep nutrient placement at the Wimmera site produced 30% and 20% more dry matter respectively, although only the organic matter treatment resulted in a significant yield response (7%). The response to organic matter may have been due to a combination of additional nutrients (particularly N & P) and improved soil structure.

Acidic & compacted subsoil				
Location	Dry matter response to lime	Dry matter response to ripping	Soil strength response to ripping*	Root response to ripping**
Greenethorpe (1)	No	Yes 0.4→0.7 t/ha	Yes 4.5→1.0 MPa	Yes 2.5→1.5
Greenethorpe (2)	No	Yes 4.2→6.3 t/ha	NA	Yes 3.5→2.5
Culcairn	No	No	Yes 4.3→2.6 MPa	NA
Milvale	No	No	Yes 2.5→1.0 MPa	No
Sodic, compacted &/or saline subsoil				
Location	Dry matter response to gypsum	Dry matter response to ripping	Soil strength response to ripping*	Root response to ripping**
Rand	No	No	Yes 3.0→0.8 MPa	Yes 3.1→2.5
Corowa	No	No	Yes 4.2→1.5 MPa	Yes NA
Lockhart	No	No	NA	Yes 2.2→1.8
Brimpaen	No	No	NA	NA

*Soil strength was measured using a penetrometer; results are from 10-15cm depth.

**Root response was measured on a visual scale of 0-5, with 0 = no restriction to root growth; 5 = right-angle roots ('J-root').

For more information...

- **Canola in Depth E-list** - If you are not a member of FarmLink but would like to receive the 'Canola in Depth' fact sheets via E-mail, please E-mail kirily@farmlink.com.au (previous Canola in Depth fact sheets can be downloaded from www.farmlink.com.au)
- **Distribution of subsoil constraints** - For an overview of the distribution of subsoil constraints in the FarmLink region, download the brochure 'Subsoils in the FarmLink Region' from www.farmlink.com.au, or phone FarmLink on (02) 6924 4633 to receive a hard copy.
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