Agronomic strategies for water repellent soils in WA - mouldboard ploughing, deep ripping and lime incorporation

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AIM

To determine if the addition of lime and its method of incorporation (mouldboard ploughing or deep ripping) has an effect on the soil pH profile, topsoil water repellence and crop productivity.

TRIAL DETAILS

REP1							REP 2							REP3					
1	2	3	4	5	6		7	8	9	10	11	12		13	14	15	16	17	18
Control	Control with lime (2t/ha pre+ 2t/ha post)	MBP	MBP with lime (2t/ha pre+ 2t/ha post)	Deep rip	Deep rip with lime (2t/ha pre+ 2t/ha post)		MBP	MBP with lime (2t/ha pre+ 2t/ha post)	Control with lime (2t/ha pre+ 2t/ha post)	Control	Deep rip with lime (2t/ha pre+ 2t/ha post)	Deep rip		Deep rip	Deep rip with lime (2t/ha pre+ 2t/ha post)	MBP with lime (2t/ha pre+ 2t/ha post)	MBP	Control	Control with lime (2t/ha pre+ 2t/ha post)

Property:	**Craig Jespersen**
Plot size & replication:	5m x 120m – 3 replications
Treatments:	Control, Control + Lime, Mouldboard plough (MBP), MBP + Lime, Deep rip, Deep rip + Lime; applied 9th May 2014
Crop Variety:	Canola - Bonito TT
Sowing Date:	30th April 2016
Seeding Rate:	2.8kg/ha
Fertiliser (kg/ha):	Vigour 100kg, MAXamFLO 80L, Urea 55kg, MOP 25kg
Paddock rotation:	(2013) Wheat, (2014) Lupins, (2015) Wheat
Herbicides:	02/01/16 - Ester 680 500ml, Garlon 150ml, Glyphosate 800ml 01/03/16 - Ester 680 500ml, Garlon 100ml, Glyphosate 800ml 24/04/16 - Atrazine 1.1kg, Glyphosate 1.4L, Propyzamide 900WG 550gm 13/06/16 - Atrazine 1.1kg, Select 500ml
Insecticides:	Bifenthrin 300EC 60ml, Chlorpyrifos 400ml
Fungicides:	Flutriafol 500 200ml

METHODOLOGY

This ongoing trial was set up in 2014 to monitor the effects of mouldboarding and deep ripping on lime incorporation and non-wetting soils over time.

Plant establishment and weed burden counts were taken 5 weeks after sowing. Each plot had 9 x 1m row counts taken; giving 27 counts per treatment, these numbers were then converted to plants/m^2.

The trial was harvested with a small plot header, taking 3 cuts per plot for yield tonnes per hectare and grain samples were taken from each of these 3 cuts to assess protein and oil content.

RESULTS & DISCUSSION

Canola germination counts were taken on the 4th July 2016 at approximately the 8-leaf stage. Plant numbers were lower on mouldboard ploughed plots (Figure 1) and there was no significant impact of lime apparent between each of the treatments. The variation in establishment could be clearly seen across the plots. Problems with canola establishment on mouldboard ploughed soils has been observed before. The exact cause requires further research but it is known that pre-emergent and residual herbicides can cause crop damage on ploughed soils. Weed burden counts were taken at the same time (Figure 2), showing that the mouldboard sites had significantly reduced weed burden.

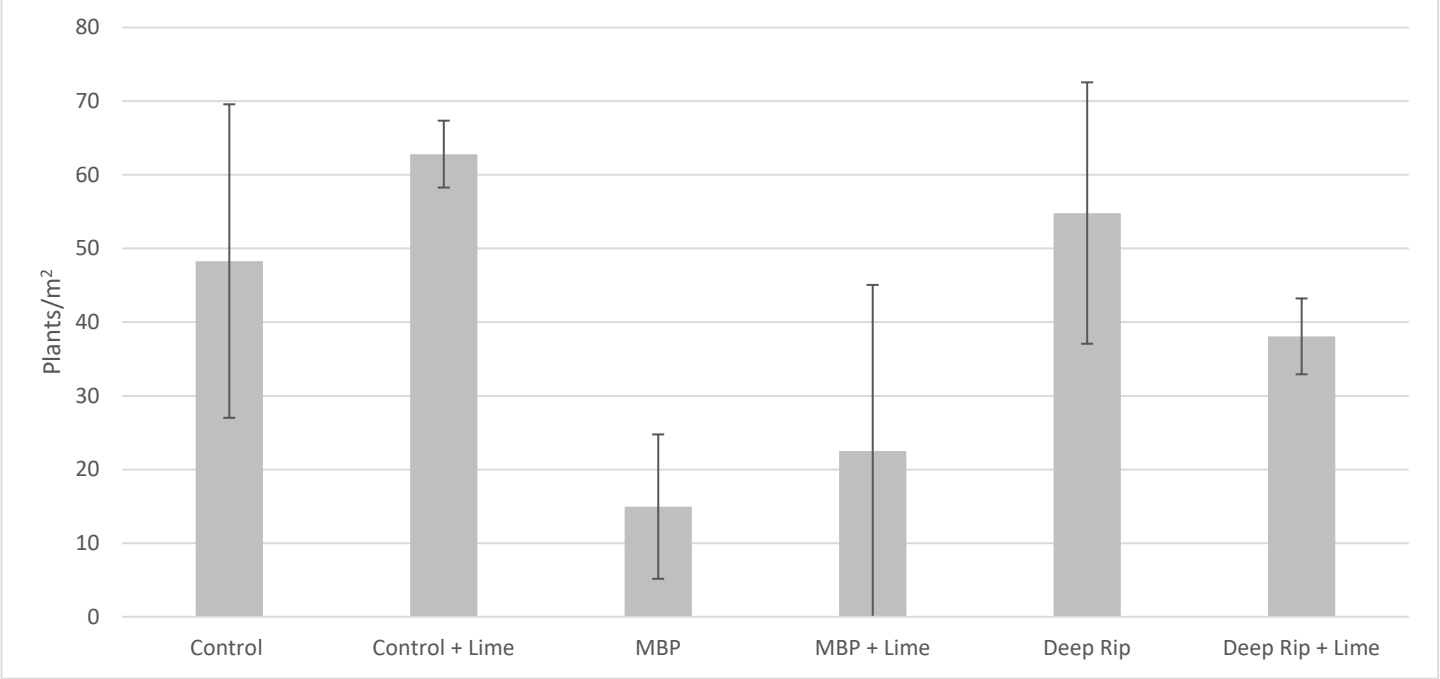

Figure 1: Canola establishment counts - average plants/m^2 for each treatment

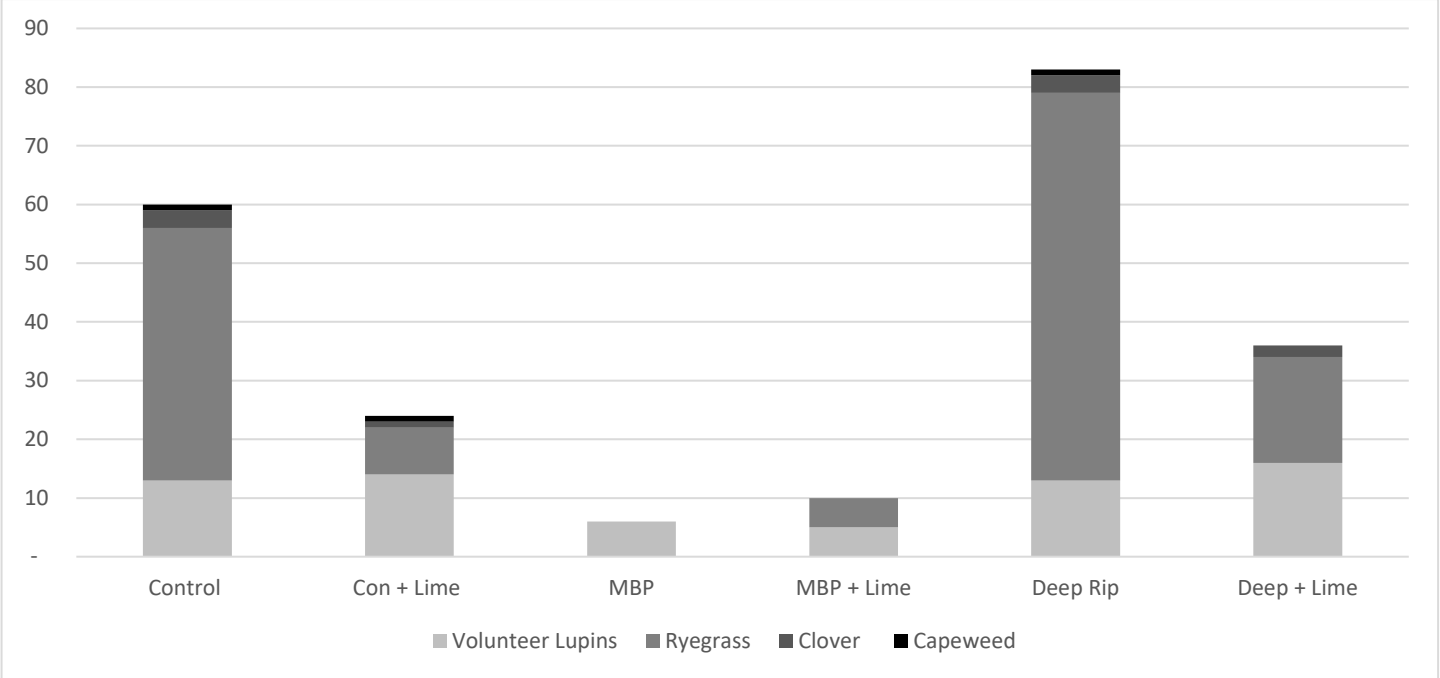

Figure 2: Total weed burden for each treatment

The trial was contract harvested using a small plot header, taking three cuts per plot to assess grain yield; as well as grain samples taken from each cut to be analysed for protein and oil content. The treatments did not show a significant difference in yield (Figure 3), though the deep ripped plots did not have a large variation from the average tonnes as the rest of the treatments. The mouldboard treatments show marginally higher grain protein content (Figure 4) than the other treatments, though this cannot be determined as an effect of the treatment itself. There was no significant trend in oil content (Figure 5), though it did reflect a similar correlation to that of each treatments yield.

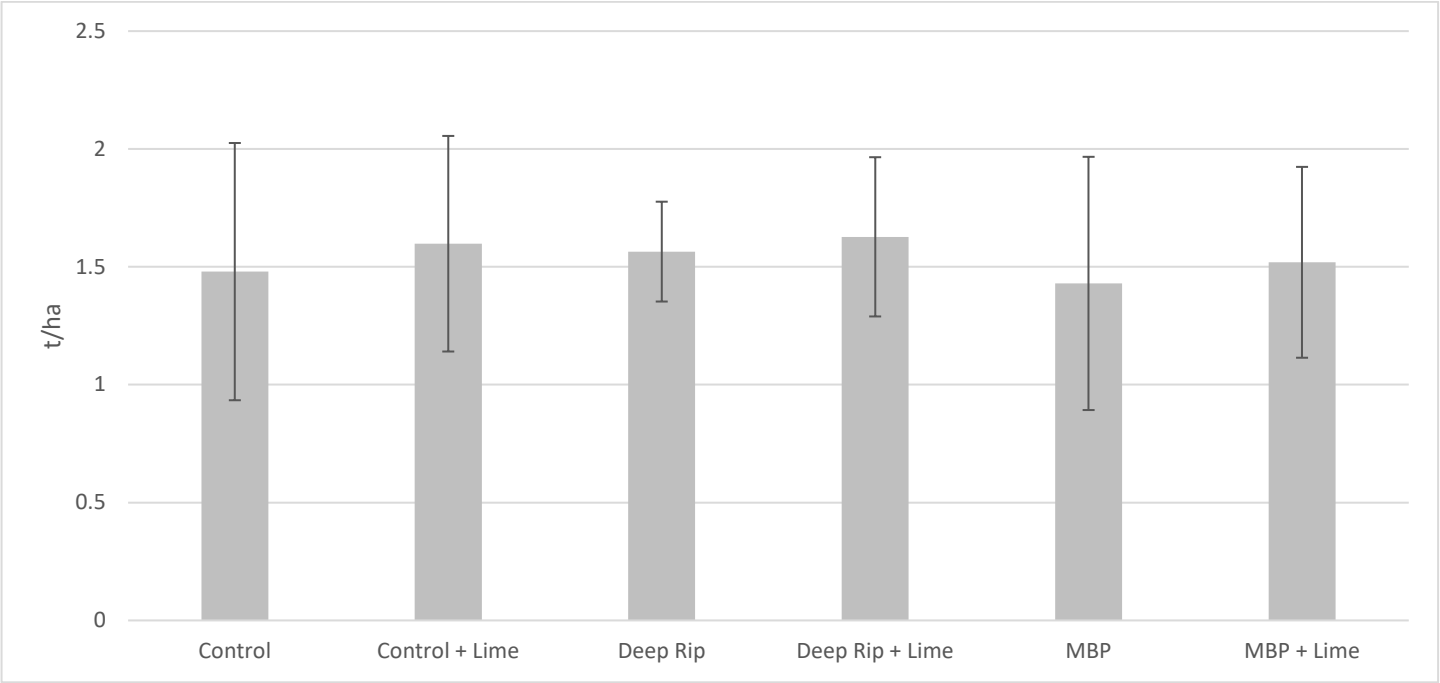

Figure 3: Average grain yield of Bonito TT canola (t/ha)

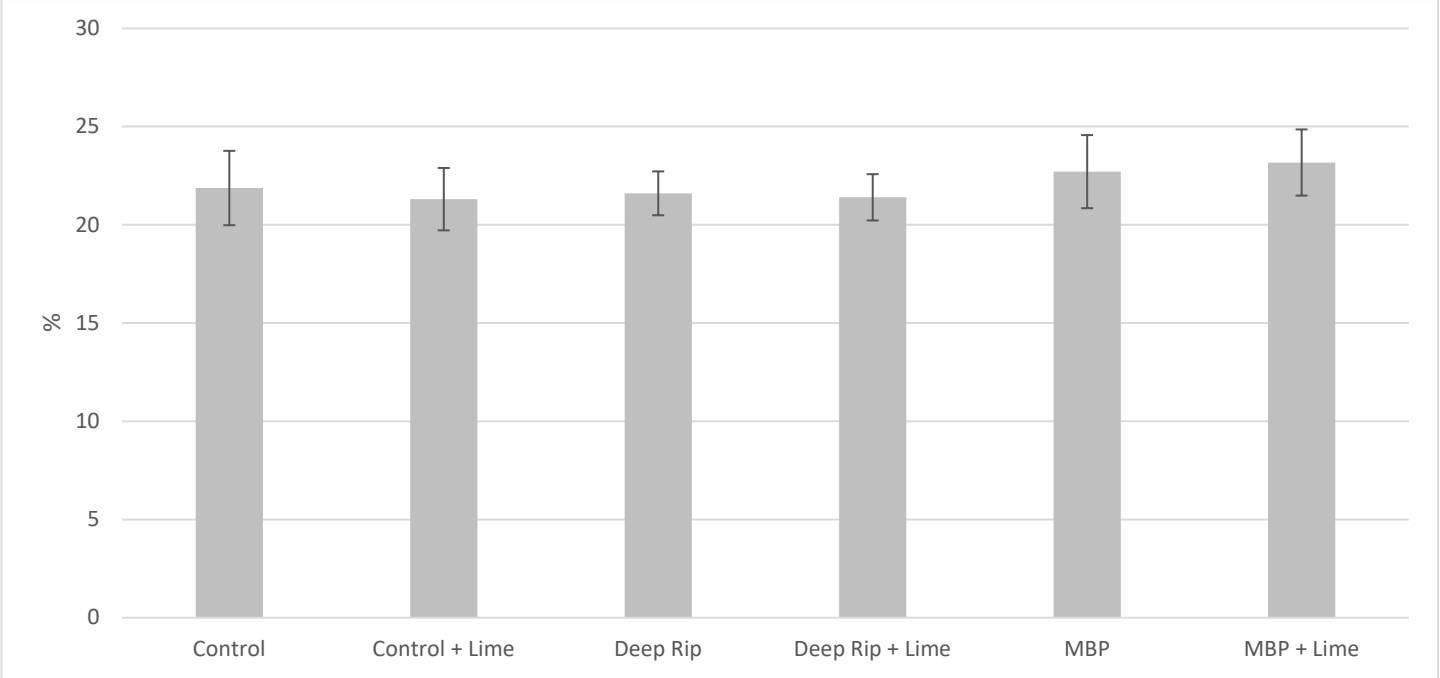

Figure 4: Average grain protein content (%) of Bonito TT canola

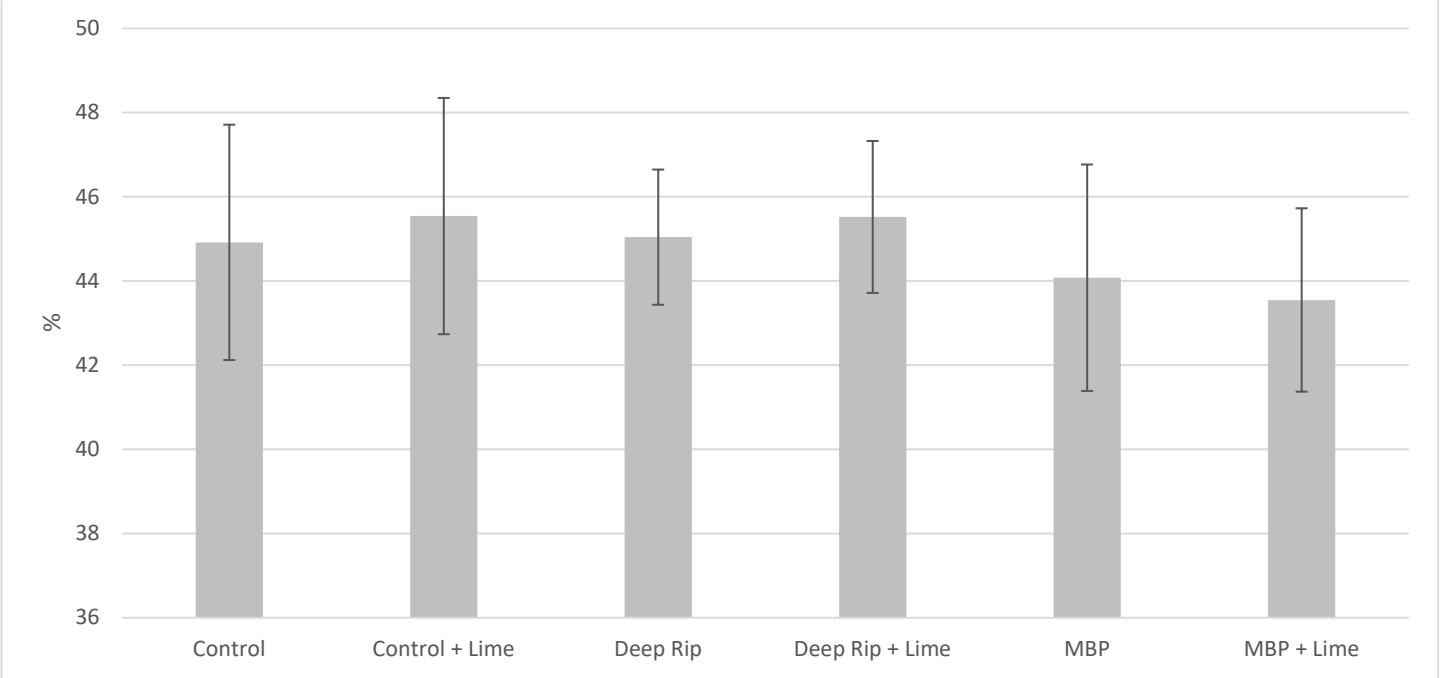

Figure 5: Average grain oil content (%) of Bonito TT canola.

CONCLUSION

As canola has the ability to compensate for bare areas by closing over the canopy, it is likely that if the trial area was planted to cereals, the variation between yields may have been greater. Over the first three seasons there have not been significant yield responses to the tillage treatments. Establishment on the mouldboard plough areas has been poor and this may be related to herbicide damage but weed control on the ploughed areas has been improved. Monitoring of this trial is ongoing, to see the impact of the treatments over time.