Canola Establishment under Various Stubble Management Treatments Pre-Sowing

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Key Points:

- Local seeding machines successfully established canola into a heavy barley stubble
- There was no benefit in pre-sowing cultivation or burning to plant establishment.

Background to the trial

In recent years, canola has proven to be a profitable break crop for the Upper North. Successful crop establishment is critical in achieving maximum yield potential. Typically, about 40-60% of sown canola seeds establish as plants, which is quite low compared to cereals (typically 80%). However, if conditions for canola are favourable, establishment can be as high as 80%. Being a small seed, canola is more vulnerable to poor establishment caused by inadequate seed to soil contact, marginal soil moisture conditions, and sowing depth (either too deep or shallow). Sowing canola into heavy stubble (>4t/ha) can reduce emergence, crop growth and yield. If sowing canola in these conditions, growers may revert to stubble burning, and/or pre-sowing tillage (usually with fertiliser) to help overcome the potential negative effects of stubble.

The aim of this trial was to demonstrate whether current seeder set ups within the region are capable of successfully sowing canola into heavy stubble.

The paddock used is at Booleroo Centre and was used for the 2013 Barley Seeder Demonstration. It is characterised by having two fairly distinct soil types. One is a higher yielding friable loam, and the other is a lower yielding sodic clay soil. In this demonstration four different machines were used across three pre-sowing treatments and two soil types.

Table 1: Seeder Units used in the Canola Establishment under different stubble treatment Demonstration

Owner	Bar	Tynes	Box and Press Wheel Configuration
Todd Orrock	Primary Sales Precision Seeder	10" spacing, double shoot	Tow Between with In-Frame press wheels
Gavin Schwark	2013 Flexi Coil 5000HD Airdrill	Agmaster 15mm points, 10" spacing, Primary Sales Double Shoot Boots	Tow Between with 100mm In-frame press wheels
Joe Koch	2004 Bourgault 8810	Agmaster Double Shoot and 12mm points, 9.5” Row Spacing.	Tow Behind with Gang Press Wheels
Andrew Walter	Bourgault Para Link	10"' spacing, single shoot	Tow Behind with In-frame press wheels

Each machine was calibrated in the paddock and the seed weighed in and out of the boxes to ensure accurate seeding rates. The canola seed used was certified to ensure uniform germination potential.

Three pre-seeding stubble treatments were applied to the Hindmarsh Barley Stubble;

1. Retained stubble (5t/ha)
2. Burnt stubble
3. Cultivated pre-sowing with knife points

The demonstration site was sown on the 17th of April 2014 with 3 kg/ha of ATR Bonito canola and 120 kg 27:13. The paddock had been treated with a pre-emergent herbicide application (1.5L Treflan + 1L Rustler) post stubble management and prior to sowing. Plant counts were conducted on 12/6/2013.

Image 1: Burnt Stubble (left), cultivated stubble (middle) and standing stubble treatments prior to seeding.

Results and Discussion

Variation in plant counts across the paddock range from 19 to 76 plants/m2, with an overall average of 44 plants/m^2 (Table 1). This is within the GRDC guidelines of an average target of 40-70 plants/m^2 for low rainfall regions.

On average, retained stubble resulted in even plant establishment rates across soil types (Figure 1). In contrast the burnt and cultivated stubble treatments resulted in varied plant establishment across the two soil types. The burnt treatment resulted in higher plants numbers on the loam soil type, but lower establishment on the clay. Conversely, the cultivated treatment appeared to have a negative effect on the loam soil and a slightly positive response on the clay. Three of the seeders performed similarly on average across the different treatments and soil types. The seeder provided by Andrew Walter resulted in poorer plant establishment in all treatments where stubble was not retained, suggesting that this machine has been set-up to perform at its optimum in retained stubbles.

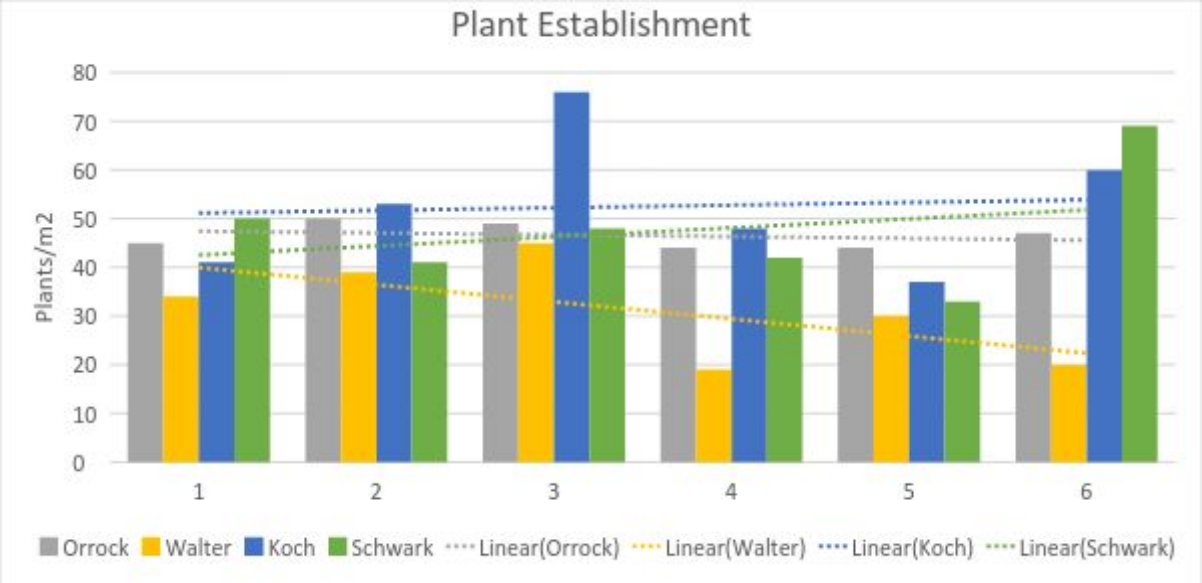

Figure 1: Plant Establishment resulting from pre-seeding stubble treatments sown using four commercial seeding units.

Table 1. Canola establishment under different treatments and soil types

Seeder	Retained		Burnt		Cultivated		Average of seeder
	Loam	Clay	Loam	Clay	Loam	Clay	
	Plants/m2		Plants/m2		Plants/m2		
Orrock	45	50	49	44	44	47	46
Walter	34	39	45	19	30	20	31
Koch	41	53	76	48	37	60	53
Schwark	50	41	48	42	33	69	47
Average	43	46	54	38	36	49	

	Retained	Burnt	Cultivated
	Plants/m2	Plants/m2	Plants/m2
Average all data	44	46	42

	Loam	Clay
	Plants/m2	
Average all data	44	44

This demonstration site supported the hypothesis that the seeding units being used within the Upper North are set up and capable of sowing into high stubble loads and resulting in plant establishment rates within the optimum window for the low rainfall environment. It showed that it is unnecessary to burn or cultivate a paddock prior to sowing canola to get good crop establishment, and in many circumstances stubble removal or incorporation reduced plant establishment rates.

Plant establishment is not the sole reason for burning or cultivation, and as such there are circumstances where burning or cultivating a paddock prior to sowing will be a viable option.

Burning and cultivation can be valuable tools in managing for pests, such as snails and earwigs, and weeds, in particular herbicide resistant or hard to control weed populations.

It is important to consider the full impact of burning and cultivation both in the paddock and to the overall efficiency and viability of the farm operation. In particular, many farmers do not consider the labour cost or machinery cost of these activities; Is controlling snails with burning more cost effective than using a bait when you consider the labour cost, the lost opportunity cost resulting from delays to the sowing program, reduction in soil organic matter and soil health, the increased soil erosion risk and the potential reduction in plant establishment? Is cultivating a paddock to control and/or stimulate weed germination a cheaper and more effective option than herbicide control when considering the cost of operating the tractor, the extra labour required to undertake the cultivation, the erosion risk and the potential reduction in plant establishment? It may still be the most effective option and least risky for your operation, but ensure that you understand the opportunity costs of your actions to the whole of the farm enterprise, not just the target pest or weed.

In the Upper North it will be rare that there are stubble loads high enough (7-10t/ha stubble residue) to cause a significant issue at seeding to reduce seeding efficiency. The stubble loads experienced in the Upper North will on average be able to be sown through and produce effective canola establishment without burning or cultivation. Undertaking burning or cultivation was shown in this demonstration to have a negative impact on canola plant establishment if undertaken unnecessarily (barley stubble residue ~5t/ha).

Further reading

http://www.grdc.com.au/Resources/Publications/2009/08/Canola-best-practice-management-guide-for-southeastern-Australia

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Image 2: Resulting soil cover from burning (top left), cultivation (top right) and standing stubble (bottom).