Canola establishment - Is it improved through the application of wetters to the seed in marginal conditions

Organisation: Facey Group and DPIRD

Contact: Contact Person – Geoff Anderson geoff.anderson@dpird.wa.gov.au, Sarah Hyde eo@faceygroup.org.au

AIM

To investigate the use of wetting agents, applied directly to canola seed to understand its impact on crop establishment and yield in water repellent soils. These results will also be used to benchmark the effectiveness of seed coating wetters against the current in-furrow banded applications, with relation to both ease of operation and cost-benefit.

TRIAL DETAILS

Property:	Scott Young-673 Yornaning Rd, Cuballing
Plot size & replication:	2 x 16m plots 20 treatments per rep x 3 reps = 60plots
Soil type:	Gravel/loam
Crop Variety:	Canola Hybrid 3000 TR
Sowing Date:	18/05/2020
Seeding Rate:	3 kg/ha
Fertiliser:	K-Start 10 Trace – 120kg/ha - N 12%, P 13.1%, K 10%, S 3%
Paddock rotation:	2018 Lupins: 2019 Wheat (2.4t/h) 2020 Hay
Herbicides:	IBS 10/032020 Post emerge 8/07/2020

METHODOLOGY

The site was selected as it was Scott's most water repellent area of his farm. The MED test value was 2.5, and the Divine soil water repellence indicated the soil was slightly hydrophobic.

The design for the experiment included three commercial wetters (Revolution®, R, Watermaxx2®, W, and SE14™, SE14) applied at three rates to the seed (0, 0.5%, and 1.0%) using two different coating methods, (with, +G and without glue -G). We compared these treatments to the approach of applying a wetter (SE14™) banded in-furrow at three different rates of 1, 2 and 5 L/ha. The control (C) had no wetter applied. The treatments used in the experiment are summarised in Table 1. Each treatment is replicated three times equaling 60 plots in total with two buffer strips. A significant difference between treatments was determined using Genstat® analysis of variance at p=0.05 (VSN International Genstat. 2019).

Revolution® supplied by Aquatrols is a wetter used for seed treatment in the USA. Watermaxx2® is a new Aquatrols wetter provided to the Australian market by Loveland Agri Products. SE14™ is the most commonly used wetter for treating water repellent soils in Western Australia. We applied the wetter seed treatment at a rate of SE14™ and Revolution®. Both Revolution® and SE14™ contain about 80% of the active wetter, while Watermaxx2 only has 17% of the active wetter. Hence, we increase the application of Watermaxx2® to the same rate of active wetter as applied for Revolution® and SE14™. It is important to note wetter for use as seed treatments need to be registered as seed treatment by APVMA.

Previous experimental work using wetter seed coating technique uses a glue (Selvol-205) to stick the wetter onto the seed using a specialised seed coating machine (Anderson *et al*. 2018, 2019). In the past, we used this approach because it was based on Madsen *et al*. (2016). Using this approach requires a significant amount of lime to dry down the seed treatment. This seed treatment technique is not suitable for grower on-farm equipment or other commercial on-farm seed treatment. Hence, we used a wetter diluted 1:1 with water and sprayed directly onto the seed without the glue. Sometimes, the seed becomes sticky or to wet, and a low rate of lime is required.

Table 1. Treatment summary used in the experiment and growth cabinet germination percentage.

No	Wetter	Placement	Glue	Rates	Treatment code	Germination (%)
1	**control**	**control**	**nil**	**nil**	**C**	**96%[a]**
2	**Revolution®**	**coated to seed**	**plus**	**0.5%**	**R +G 0.5%**	**88%[bcd]**
3	**Revolution®**	**coated to seed**	**minus**	**0.5%**	**R -G-0.5%**	**92%[abc]**
4	**Revolution®**	**coated to seed**	**plus**	**1.0%**	**R +G-1.0%**	**88%[bcd]**
5	**Revolution®**	**coated to seed**	**minus**	**1.0%**	**R -G-1.0%**	**85%[cd]**
6	**SE14**	**coated to seed**	**plus**	**0.5%**	**SE14 +G 0.5%**	**90%[abcd]**
7	**SE14**	**coated to seed**	**minus**	**0.5%**	**SE14 -G-0.5%**	**91%[abc]**
8	**SE14**	**coated to seed**	**plus**	**1.0%**	**SE14 +G-1.0%**	**91%[abc]**
9	**SE14**	**coated to seed**	**minus**	**1.0%**	**SE14 -G-1.0%**	**92%[ab]**
10	**Watermaxx2®**	**coated to seed**	**plus**	**0.5%**	**W +G 0.5%**	**86%[bcd]**
11	**Watermaxx2®**	**coated to seed**	**minus**	**0.5%**	**W -G-0.5%**	**87%[bcd]**
12	**Watermaxx2®**	**coated to seed**	**plus**	**1.0%**	**W +G-1.0%**	**86%[bcd]**
13	**Watermaxx2®**	**coated to seed**	**minus**	**1.0%**	**W -G-1.0%**	**87%[bcd]**
14	**SE14™**	**on top of furrow**	**nil**	**1**	**SE14 F 1 l/t**	**NA**
15	**SE14™**	**on top of furrow**	**nil**	**2**	**SE14 F 2 l/t**	**NA**
16	**SE14™**	**on top of furrow**	**nil**	**5**	**SE14 F 5 l/t**	**NA**

Germination % followed by the same letter is not significant at p=0.05.NA no seed treatment.

Coating SE14™ onto the seed did not reduce germination (Table 1), but both Revolution® and Watermaxx2® seed coat resulted in an 8-10% reduction in germination.

RESULTS & DISCUSSION

The experiment was sown into dry soil on 18 May 2020 with a germination event of 28 mm occurring on 25–30 May (Table 2). The rainfall total for 2020 was below the long-term medium value.

Table 2. Monthly rainfall for Wickepin for 2020 compared to the long term median rainfall.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2020	**0**	**44**	**15**	**5**	**42**	**38**	**32**	**45**	**30**	**3**	**33**	**0**	**288**
median	**3**	**5**	**11**	**19**	**45**	**62**	**65**	**49**	**32**	**21**	**13**	**5**	**331**

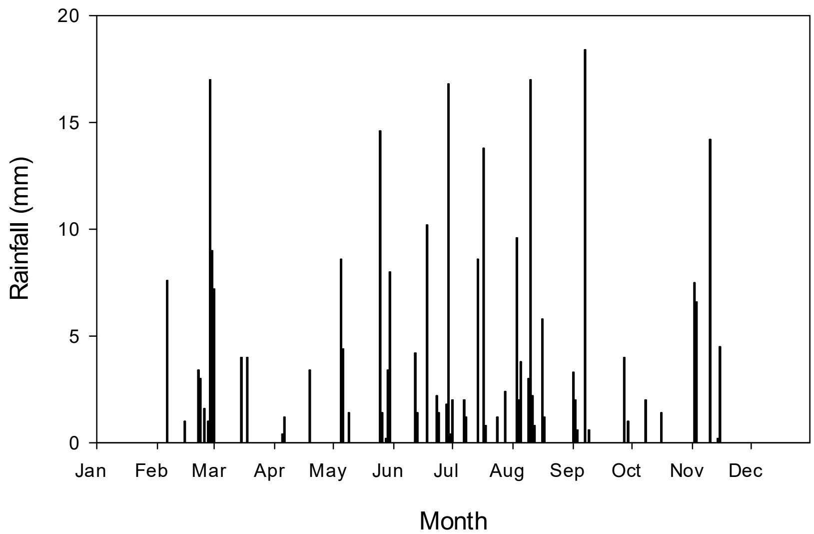

Figure 1: Daily rainfall (mm) at Wickepin in 2020. The x-axis positioning of the month abbreviation is for the 1st day of the month.

The late 25–30 May germination event was sufficient to result in good germination of the canola with no treatments effect (Figure 2). Subsequent rainfall in June did not result in additional canola germination. Late May rainfall was observed to promote sufficient germination with no wetter, including seed coating treatment response in other seed treatments experiments (Anderson *et al*. 2018, 2019). There was an earlier May rainfall (7–8 May) event of 13 mm. However, Covid-19 restriction delayed the seed treatment preparation for the experiment, which resulted in the mid-May seeding. In previous seed coating experiments, the benefit of wetter seed treatment has only occurred when germinating rainfall was only 12 mm, followed by four weeks of no additional rain (Anderson *et al*. 2018, 2019). In this situation, subsoil water is also essential, enabling the germinated seedling to survive this extended dry period. The most common sowing time for dry seeding for the area is April with the intention to capture the break of season rainfall events.

Both plant density and grain yield resulted in high site variability, which reduced the experiment's ability to define treatment difference (Figures 1 and 2). Nevertheless, there was a trend of lowering germination for the high rates of Revolution® (Figure 1). We also observed a reduction in germination percentage in the growth cabinet study (Table 1). However, the germination percentage in the growth cabinet experiment was not correlated to plant density in the field experiment. Indicating the soil water repellence was having some effect of germination under field conditions. The wetter treatment of SE14™ coated without glue at a rate of 1.0% provided the highest grain yield in the experiment. This seed treatment also had no impact on canola germination.

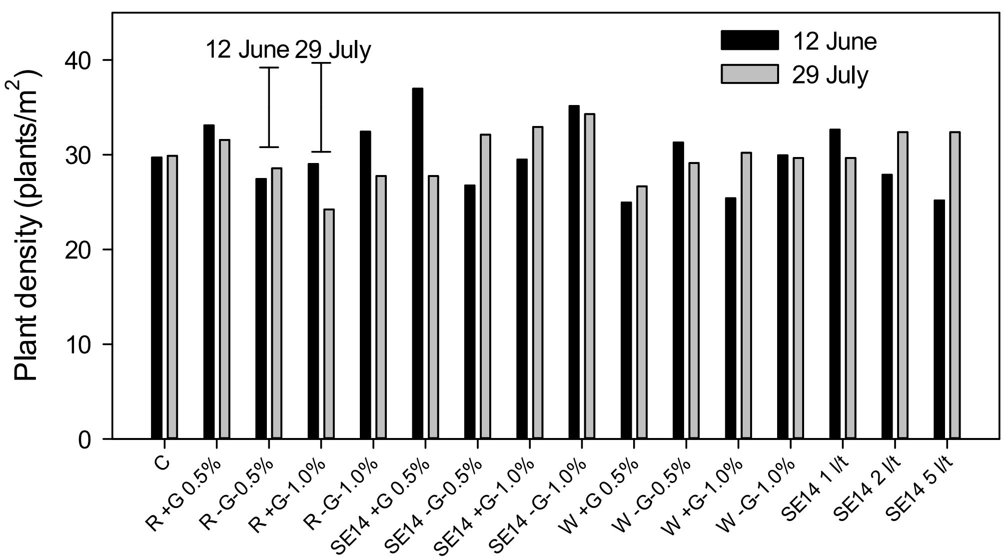

Figure 2: Canola plant density (plants/m^2) measured on 12 June and 29 July when seeds are coated with Revolution® (R), Watermaxx2® (W) and SE14™ (SE14) without (-G) and with glue (+G) at rates of 0.5% and 1.0%. The wetter SE14 applied to the top of the furrow at 1, 2 and 5 L/ha rates. The error bars represent LSD values at p = 0.05, n = 3.

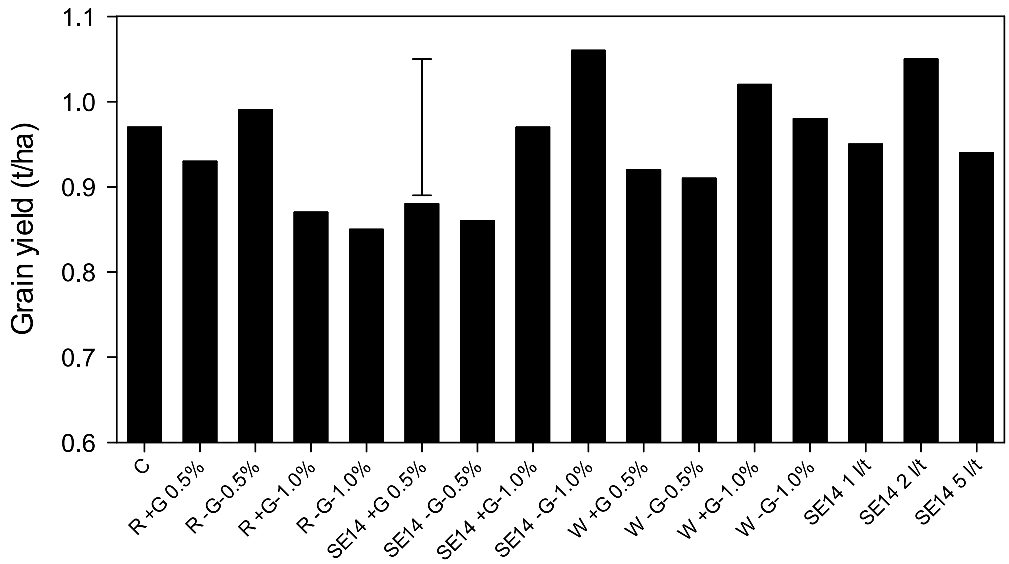

Figure 3: Canola grain yield (t/ha) when seeds are coated with Revolution® (R), Watermaxx2® (W) and SE14™ (SE14) without (-G) and with glue (+G) at rates of 0.5% and 1.0%. The wetter SE14 applied to the top of the furrow at 1, 2 and 5 L/ha rates. The error bars represent LSD values at $p = 0.05$, $n = 3$.

The wetter cost for seed treatment cost is in the order of less than $0.50/ha, making it suitable for use in years when the expression of water repellence constraint is low. In contrast, the wetter cost of the furrow treatment is $7–35/ha. Hence, seed treatment significantly reduced the risk of applying wetter treatments in seasonal and soil types when there is a low water repellence constraint expression.

CONCLUSION

In late May, good germinating rainfall was sufficient to remove the experimental site's water repellence limitation. The economic loss associated with wetter application significantly reduced using seed treatment approach.

ACKNOWLEDGEMENTS

COGGO provided funding, Scott Young for hosting the site and contractors SLR for maintenance at the site throughout the season.

REFERENCES

Anderson G, Erickson T, Davies S, McDonald G, Edwards T (2019) Seed coatings with various surfactants and glues to improve crop establishment on water repellent soils. In "2019 Grains Research Updates", 25-26 February 2019, Perth, Western Australia. www.giwa.org.au/2019researchupdates

Anderson G, Erickson T, Davies S, McDonald G (2018) Seeds coated with wetters improved cereal germination on water repellent soils. In "2018 Grains Research Updates", 26-27 February 2018, Perth, Western Australia. www.giwa.org.au/2018researchupdates

Madsen MD, Fidanza MA, Barney NS, Kostka SJ, Badrakh T, McMillan MF (2016) Low-dose Application of non-ionic alkyl-terminated block copolymer surfactant enhances turfgrass seed germination and plant growth. *HortTechnology* 26, 379-385.

VSN International Genstat for Windows 19th Edition. (2019) VSN International, Hemel Hempstead, UK. Available online: https://www.vsni.co.uk/software/genstat/ (accessed on 1/05/2018).