GRDC Canola Establishment in the Low Rainfall Zones of the Western Region Project

2022 Results

living farm

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GRAINS RESEARCH & DEVELOPMENT CORPORATION

GRDC Canola Establishment in the Low Rainfall Zone - Cunderdin 2022

Key Message

In a trial conducted in Cunderdin with the O'Connor Group in 2022, the following key messages have been determined:

1. Increased separation of Urea Ammonium Nitrate (UAN) (42.2 % N) from seed improved plant establishment and canopy cover but did not improve yield.
2. Due to wetter than average seasonal conditions, the application of SE14 soil wetter did not influence canola establishment, canopy cover or yield.
3. The application of the pre-emergent herbicide propyzamide (PPZ) did not influence canola establishment but showed a yield increase at harvest.

Background

Soil water repellence is a common issue within sandy textured soils and can exacerbate poor canola establishment. Similarly, the placement of fertilizer in close proximity to canola seed can also contribute to reduced crop densities.

During 2022, Living Farm ran a GRDC funded small plot trial in conjunction with the O'Connor Research Group to assess the wetter and pre-emergent propyzamide herbicide on canola establishment on a Cunderdin non-wetting grey sand soil type.

Methods

The trial was sown on the 19th April, 7 days post 10 mm of rainfall using knife points and press wheels with the Roundup Ready variety Nuseed Emu canola. At the time of seeding, the soil moisture in the top 10 cm was marginal despite wetter than average conditions experienced in March (Figure 1). The site soil pH and EC were adequate for canola nutrition and 120 kg K-Till (active ingredient Flutriafol) with Impact was applied at seeding. The trial was harvested on the 23rd October.

Treatments

- Placement of 50 L/ha Urea Ammonium Nitrate (21 kg/ha Nitrogen) at 0 cm, 1.5 cm and 3 cm below seed.
- Addition and absence of SE14 soil wetter (3 L/ha).
- Addition and absence of pre-emergent propyzamide herbicide (1L/ha).

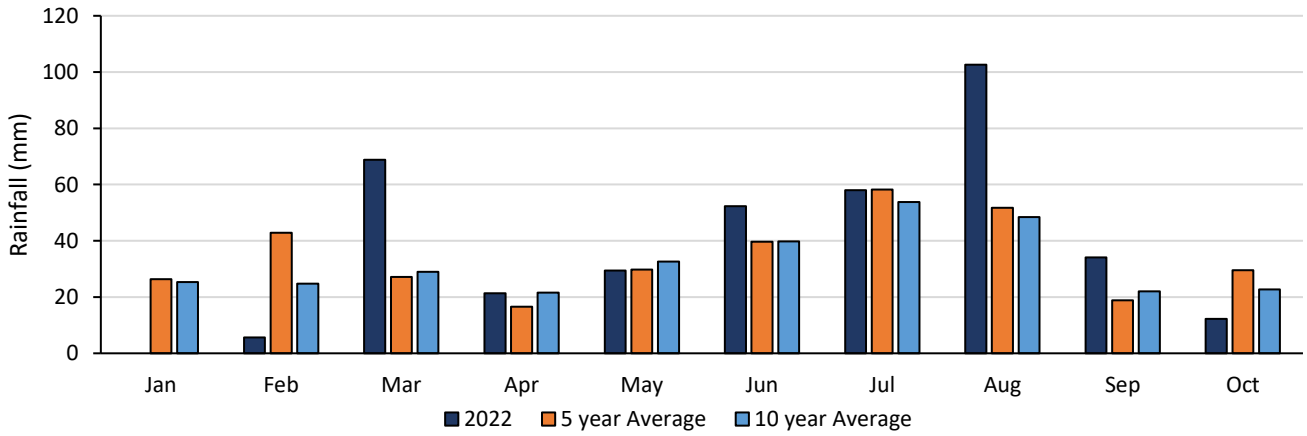

Figure 1. Comparison of 2022 cumulative growing season rainfall with the 5-year and 10-yr average for Cunderdin. The data was taken from the Bureau of Meteorology Ygnattering weather station (10143)

Results

The increased separation of UAN from the seed improved canola establishment and canopy cover (Figure 2). At this site, the pre-emergent application of propyzamide did not significantly influence plant establishment. However, the application of the pre-emergent herbicide did improve canopy cover (Figure 3). Similarly, due to the wet seasonal conditions, the main effect of SE14 was not significant for any assessment (Figure 1).

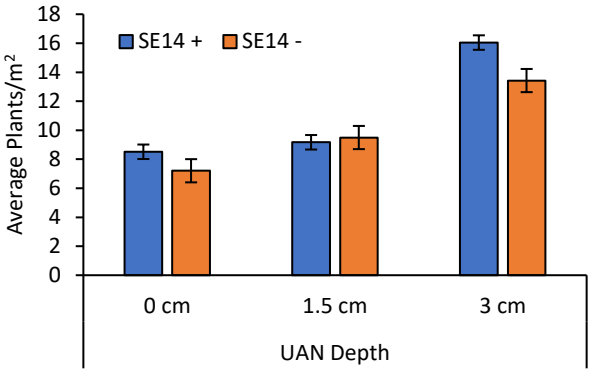

Figure 2. Influence of the separation of UAN from the canola seed and SE14 on canola establishment. Error bars represent standard error.

The maximum and minimum yields achieved was 2.7 t/ha and 2.1 t/ha. Only the effect of propyzamide was significant, with the application of the pre-emergent herbicide attaining higher yields. Seed quality measures such as moisture, oil content and protein were not significantly different between treatments with an overall average of 8% moisture, 46.6% oil and 19.2% protein (Table 1).

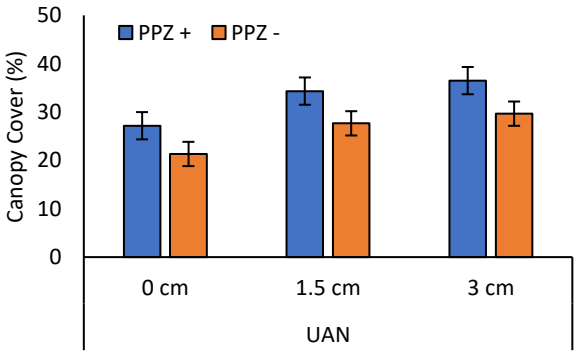

Figure 3. Influence of the separation of UAN from the canola seed and pre-emergent propyzamide on canola canopy coverage at 6-8 leaf. Error bars represent standard error.

Table 1. Summary of the average yield and seed quality measures in response to the presence (+) or absence (-) of SE14, pre-emergent propyzamide herbicide, and the

SE14	PPZ	UAN Depth mm	Yield t/ha	Oil %	Protein %
-	+	30	2.69	46.9	18.9
+	+	15	2.65	46.4	19.6
-	+	15	2.59	46.6	19.3
+	+	30	2.54	46.5	19.4
+	+	0	2.49	47.2	18.9
-	+	0	2.42	46.6	19.3
-	-	30	2.31	47.1	18.9
-	-	15	2.28	46.4	19.2
+	-	15	2.27	46.7	19.1
-	-	0	2.15	46.3	19.4
+	-	0	2.13	46.9	18.8
+	-	30	2.12	47.5	18.7
LSD			0.43	NS	NS

Discussion and Conclusions

The results of this trial suggest that the increased separation of UAN relative to the seed can lead to increased canola establishment and subsequent canopy coverage.

Due to above average rainfall during 2022, the influence of SE14 soil wetter on canola establishment, canopy cover and yield was not observed. However, the effect of soil wetters on canola establishment for a non-wetting soil type should be further investigated, particularly in a drier season.

Anecdotal reports of reduced establishment of canola in sandy soil types where propyzamide has been used as a pre-emergent herbicide have been observed by local farmers. Although no significant results on establishment were found in this trial, there is potential for more work in this space.

Canola Establishment in the Low Rainfall Zones Trial Results - Merredin 2022

Key Message

In a trial conducted in Merredin with the Merredin and Districts Farm Improvement Group in 2022, the following key messages have been determined:

1. Canola establishment was not significantly influenced by the presence or absence of SACOA SE14 soil wetter, seed size (mixed or >2mm) or seed type (hybrid or open pollinated).
2. Canopy cover was generally greater for the hybrid canola in comparison to the open pollinated canola.

Background

Inconsistent results have been presented regarding the influence of seed size and canola seed type (open pollinated or hybrid) on canola establishment. One study by French *et al.,* (2016) found the establishment of hybrid canola was generally greater than open pollinated canola. While in comparison, Brill *et al.,* (2016) observed open pollinated canola seed sieved to >2 mm could achieve similar establishment rates to hybrid canola.

During 2022, Living Farm ran a GRDC funded small plot trial in conjunction with the Merredin Farm Improvement Group to assess the influence of seed size, canola type and SE14 soil wetter on canola establishment on a Merredin sandy loam soil type.

Methods

The trial was dry sown on the 21st of April, 5 days before 15 mm of rainfall with the Triazine Tolerant canola varieties Nuseed Bonito and Nuseed Trident using knife points and press wheels. The top 30 cm of the soil profile was slightly acidic (pH_{CaCl2} of 4.8) and 120 kg K-Till with Impact (active ingredient Flutriafol) was applied at seeding.

Treatments

- Seed size (mixed or graded to >2 mm for both varieties)
- Canola type (hybrid or open pollinated)
- Addition or absence of SE14 soil wetter

Results and Conclusions

Canola establishment did not statistically vary between treatments. Canopy cover was significantly greater for the hybrid canola in comparison to the open pollinated canola treatments, however, was not influenced by seed size or the presence of SE14 soil wetter.

The results of this trial suggest, in a season that experiences higher than average rainfall, falling consistently over the growing season, such as in 2022, the application of SE14 soil wetter and the grading of seed did not improve canola establishment.

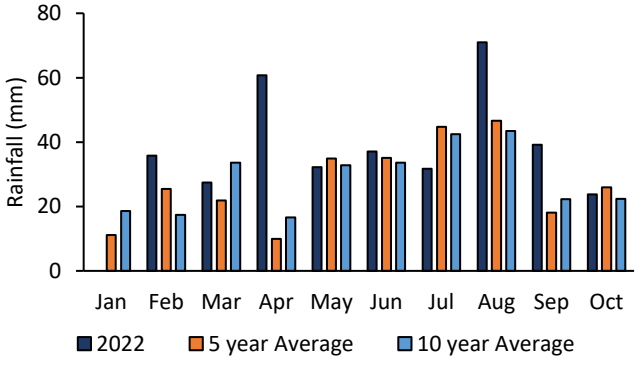

Figure 1. Comparison of the 2022 cumulative rainfall with the 5-year and 10-year average. The rainfall data was taken from the Bureau of Meteorology Merredin weather station (10092).

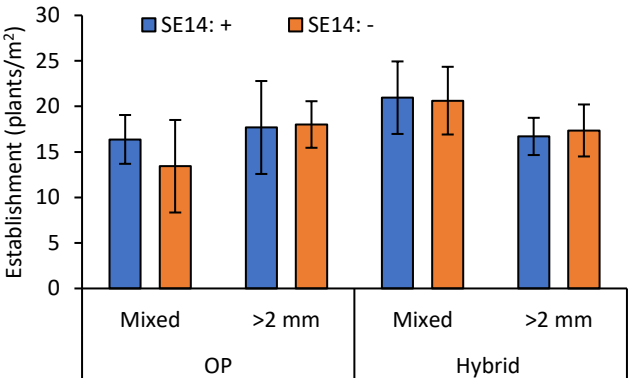

Figure 2. Influence of seed type, seed size and the presence or absence of SE14 on canola establishment. Error bars represent standard error.

Large variation in establishment rate meant that no significant differences were observed between canola seed type (open pollinated or hybrid). However, the influence of canola type on canola establishment should be further investigated, particularly in a dry season.

References

Brill, R. D., Jenkins, M. L., Gardner, M. J., Lilley, J. M., & Orchard, B. A. (2016). Optimising canola establishment and yield in south-eastern Australia with hybrids and large seed. *Crop and Pasture Science*, *67*(4), 409-418.

French, R. J., Seymour, M., & Malik, R. S. (2016). Plant density response and optimum crop densities for canola (Brassica napus L.) in Western Australia. *Crop and Pasture Science*, *67*(4), 397-408.

GRDC Canola Establishment in the Low Rainfall Zone Trial Results - Morawa 2022

Key Message

1. Early sowing into a drying soil profile significantly reduced canola establishment, canopy cover, yield and grain oil content.
2. The influence of seeding rate and sowing depth was dependent on time of sowing due to variability in soil moisture.

Background

Sowing into a drying soil profile can significantly reduce canola germination and field establishment. One method to minimise the exposure of canola seed to a drying soil profile is deep sowing into soil moisture.

During 2022, Living Farm ran a GRDC funded small plot trial in conjunction with the Morawa Farm Improvement Group to assess the influence of time of sowing, sowing depth and seeding rate on canola establishment on a Morawa red loam soil type.

Treatments

- Time of sowing (TOS)
- Seeding depth (10 mm and 30 mm)
- High (30 plants/m^2) and low (15 plants/m^2) seeding rate

Methods

The trial was sown using a small plot seeder fitted with knife points and press wheels at two times of sowing, 6th April and 7th May. The Roundup Ready canola variety Nuseed Emu was used in the trial, and Nuseed Raptor was used in the buffer plots. At the earlier time of sowing, (6th April) the soil moisture was at 20 mm depth and the soil profile was rapidly drying due to high temperatures following a 80 mm rainfall event (Figure 1). The second time of sowing occurred on the 7th May, five days before a 20 mm rainfall event. The depth to soil moisture at the second time of sowing was also 5 mm, however the average temperature was generally cooler leading to a slower drying of the soil profile (Figure 1). The trial was harvested on the 28th October.

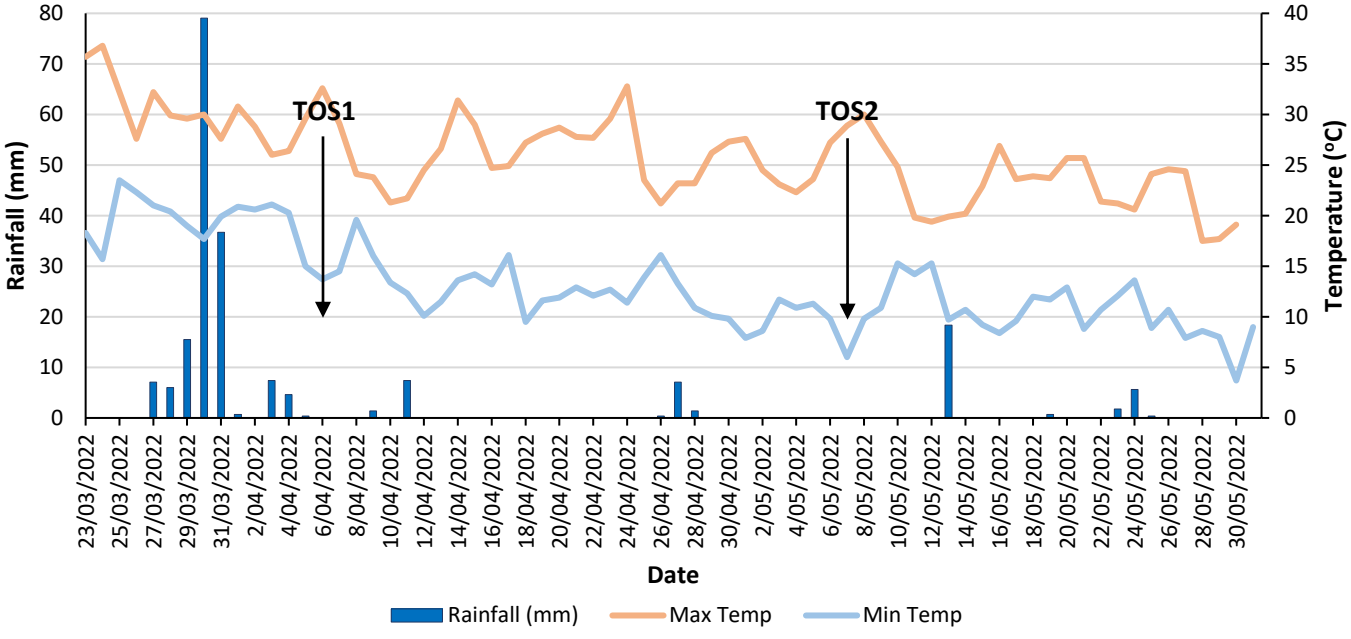

Figure 1. Pre-seeding climatic conditions. The rainfall data was provided by Ben Chapel (trial site property owner), and the temperature data was taken from the Bureau of Meteorology Morawa airport weather station.

Results

Overall, the establishment of the earlier sown crop was significantly less than the later sown crop (Figure 2). Regardless of sowing time, increasing the sowing rate improved establishment (Figure 2). Shallow seeding significantly improved establishment for the TOS1 treatments, however, sowing depth did not influence establishment for the later sown treatments. Additionally, late sowing high plant density crops at shallow depths increased canopy coverage.

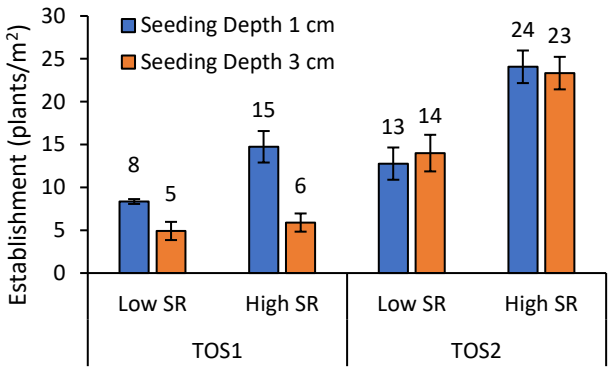

Figure 2. Influence of TOS, seeding depth and seeding rate (SR) on canola establishment. Error bars represent

Yield ranged from 2.82 t/ha to 1.80 t/ha and was significantly influenced by TOS, seeding rate and seeding depth (Table 2). The effect of seeding depth on yield was dependent on time of sowing. Seed oil content varied depending on TOS and was greater for TOS2. In comparison, percent protein was generally higher for TOS1 treatments (Table 2).

Table 2. Summary of the average yield and seed quality measures in response to time of Sowing (TOS), seeding rate (SR) and seeding depth (SD).

TOS	SD	SR	Yield	Oil	Protein
	mm	Plants/m²	t/ha	%	%
2	1	30	2.82	43.4	24.0
2	3	30	2.66	43.4	24.2
2	3	15	2.55	43.5	24.1
1	1	30	2.54	42.8	24.9
2	1	15	2.36	44.1	23.5
1	3	30	2.25	42.5	25.5
1	1	15	2.22	42.5	25.9
1	3	15	1.80	42.2	24.8
		LSD	0.26	0.7	0.9

On average the Nuseed Raptor canola located within the buffer plots yielded 2.71 t/ha with an oil and protein content of 44.9% and 21.8% respectively.

Discussion and Conclusions

The results of this trial suggest that soil temperature and moisture conditions during and following sowing can heavily influence canola establishment.

At TOS1, the deeper sown canola was placed within moist, warm soil, which thereby triggered seed inhibition and germination. However, as the soil profile rapidly dried and maintained a consistently high temperature, the germinated canola seeds likely failed to emerge or emerged and died. In comparison, the shallow sown seeds were placed above the moist subsoil and therefore did not begin germinating until the following rainfall event when the average temperature had begun to cool, subsequently contributing to improved establishment rates.

The second time of sowing was conducted in cooler conditions and prior to a 20 mm rainfall event. Therefore, seeding depth did not significantly affect establishment rates, as seen in TOS1, as the seeds at both depths were exposed to favorable conditions for germination and establishment.

Overall, the results of this trial firstly suggest that growers chasing moisture within a drying soil profile need to consider the temperature at time of sowing and following seeding, in addition to follow up rainfall events. Secondly, this trial also exhibits the benefits of holding off seeding until substantial rainfall is forecast, to limit the exposure of canola seed to unfavorable conditions and subsequent seed death. Finally, treatments with the greatest establishment rates also had the highest yields and oil contents. Therefore, aiming to improve canola establishment can also increase yield potential.