



Optimising  
Irrigated Grains

**Optimising Irrigated Grains (FAR1906-003RTX)**  
A Grains Research & Development Corporation (GRDC) investment

**PROVISIONAL HARVEST RESULTS:**

**Irrigated Chickpea Trials**



Released: 24 February 2021

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:



Irrigation Research & Extension Committee



## Finley Irrigated Research Centre NSW

*Irrigated trials conducted at the Finley irrigated research centre 2020 were managed by FAR Australia, hosted by Southern Growers.*

### Trial 1 April Sown Chickpeas Under Overhead Irrigation

**Protocol objective:** Assess the performance of chickpeas sown in late April at different plant populations. *(note the intention had been to irrigate for emergence compared to Trial 2 where chickpeas under flood would be evaluated. Instead chickpeas were sown under overhead irrigation on 27 April (Trial 1) and the identical trial sown on 19 May)*

**Location:** Finley IRC

**FAR Code:** CP20-01-1

**Sown:** 27 April 2020

**Cultivar:** Genesis 090 and PBA Royal

**Harvested:** 11<sup>th</sup> December 2020

**Rotation position:** Wheat (2019), Faba beans (2018), Fallow after Rice (2017)

**Soil Management:** Cultivation with speed disc to incorporate stubble in Autumn

**Irrigation:** Overhead lateral Irrigation 6 x 25mm in spring. Total applied 150mm (1.5 Ml/ha)

**GSR:** April-October 244mm. Total water available (GSR+Irr) 394mm

### Key Messages:

- Chickpeas sown 27 April under overhead irrigation gave yields of between 3.1 – 3.58t/ha (cv Genesis 090) and 3.0 – 3.35t/ha (cv PBA Royal).
- Neither plant populations (11- 38 plants/m<sup>2</sup>) or cultivar had a significant impact on chickpea grain yield at this early sowing date, although with both cultivars the lowest yields were recorded at the lowest plant populations (11 – 13 plants/m<sup>2</sup>).
- There were no significant differences in pod number due to cultivar or plant population and in the height of the first pods due to plant population, although a trend suggested lower height to first pod at lower plant populations.
- Significant interactions were observed between plant population and cultivar on dry matter (DM) production at early flowering; Genesis 090 maximised DM production at 38 plants/m<sup>2</sup> whilst PBA Royal maximised DM production at a lower plant population (28 plants/m<sup>2</sup>).
- There were no significant differences in DM at harvest (PBA Royal) with an average of 8.22t/ha and a harvest index of 38.8% (data not shown).
- The WUE for Genesis 090 based on average yield of 3.45t/ha was 12.1kg/mm.

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**Table 1.** Influence of seed rates (plant populations) on grain yield (t/ha) with two different varieties grown under overhead irrigation.

Plants/m <sup>2</sup> (actual)		Grain Yield		
		Genesis 090	PBA Royal	Mean
Genesis 090	PBA Royal	Yield t/ha	Yield t/ha	Yield t/ha
11	13	3.10 -	3.00 -	<b>3.05</b> -
22	19	3.53 -	3.24 -	<b>3.39</b> -
25	28	3.57 -	3.35 -	<b>3.46</b> -
38	34	3.58 -	3.18 -	<b>3.38</b> -
<b>Mean</b>		<b>3.45</b> -	<b>3.19</b> -	
<b>LSD Cultivar p=0.05</b>		ns	<b>P val</b>	0.211
<b>LSD Seed Rate p = 0.05</b>		ns	<b>P val</b>	0.197
<b>LSD Seed Rate x Cultivar.</b>		ns	<b>P val</b>	0.901

**Table 2.** Influence of seed rate and cultivar on plant population – assessed V6, 12-June.

Treatment			
	Genesis 090	PBA Royal	Mean
Seed Rate	Plants/m <sup>2</sup>	Plants/m <sup>2</sup>	Plants/m <sup>2</sup>
15seeds/m <sup>2</sup>	11 -	13 -	<b>12 d</b>
25 seeds/m <sup>2</sup>	22 -	19 -	<b>20 c</b>
35 seeds/m <sup>2</sup>	25 -	28 -	<b>27 b</b>
45 seeds/m <sup>2</sup>	38 -	34 -	<b>36 a</b>
<b>Mean</b>	<b>24</b> -	<b>23</b> -	
<b>Cultivar LSD</b>	ns	<b>P val</b>	0.652
<b>Seed Rate LSD</b>	4.6	<b>P val</b>	<0.001
<b>Cultivar x seed rate LSD</b>	ns	<b>P val</b>	0.371

**Table 3.** Influence of plant population and cultivar on canopy composition, pods/m<sup>2</sup>, height to first pod (cm), and harvest dry matter (t/ha) – assessed at harvest, 2-December.

Treatment	Canopy composition		Harvest Dry Matter
	Pods/m <sup>2</sup>	1 <sup>st</sup> Pod Height (cm)	t/ha
<b>Genesis 090</b>			
25 plants/m <sup>2</sup>	1209 -	40 a	7.80 -
<b>PBA Royal</b>			
13 plants /m <sup>2</sup>	1115 -	34 b	8.41 -
19 plants /m <sup>2</sup>	1169 -	37 ab	8.62 -
28 plants /m <sup>2</sup>	1073 -	39 a	8.10 -
34 plants /m <sup>2</sup>	1111 -	39 a	7.74 -
<b>Mean</b>	<b>1135</b>	<b>38</b>	<b>8.13</b>
<b>LSD Seed rate x cultivar</b>	ns	3.5	ns
<b>P val</b>	0.927	0.036	0.755

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**Table 4.** Influence of plant population and cultivar on dry matter production at early flowering (R2) – assessed 28 September.

Dry Matter Production Early Flowering (GS62)				
Plants/m <sup>2</sup> (actual)		Plants/m <sup>2</sup> (actual)		Mean
Genesis 090	PBA Royal	t/ha	PBA Royal	t/ha
11	13	3.04 cd	2.38 d	<b>2.71 b</b>
22	19	3.24 cd	2.68 d	<b>2.96 b</b>
25	28	3.74 bc	5.08 a	<b>4.41 a</b>
38	34	4.47 ab	4.82 a	<b>4.64 a</b>
<b>Mean</b>		<b>3.62 b</b>	<b>3.74 a</b>	
<b>LSD Cultivar p=0.05</b>		0.11	<b>P val</b>	0.039
<b>LSD Seed Rate p = 0.05</b>		0.64	<b>P val</b>	<0.001
<b>LSD Seed Rate x Cultivar.</b>		0.90	<b>P val</b>	0.015

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### Trial 2 May Sown Chickpeas Under Overhead Irrigation

**Protocol objective:** Assess the performance of later sown chickpeas grown at different plant populations (*note this was set up to assess the performance of chickpeas that it was thought that would be established on natural rainfall, however in 2020 both April and May sowings were established with natural rainfall*).

**Location:** Finley IRC

**FAR Code:** FAR CP20-01-2

**Sown:** 19 May

**Cultivar:** Genesis 090 and PBA Royal

**Harvested:** 11<sup>th</sup> December 2020

**Rotation position:** Wheat (2019), Faba beans (2018), Fallow after Rice (2017)

**Soil Management:** Cultivation with speed disc to incorporate stubble in Autumn

**Irrigation:** Overhead lateral irrigation 6 x 25mm in spring Total applied 150mm (1.5 ML/ha)

**GSR:** April-October 244mm. Total water available (GSR + Irr) 394mm

#### Key Messages:

- *Though not statistically comparable the later sown identical trial gave lower yields than the earlier sowing (27 April – Trial 1), 2.39 – 3.41t/ha (cv Genesis 090) and 2.48 – 3.04t/ha (cv PBA Royal).*
- *Plant population had a significant effect on grain yield in chickpeas sown in mid-May, the highest yields being achieved with populations of approximately 30-34 plants/m<sup>2</sup> (35-45 seeds/m<sup>2</sup>)*
- *There were no significant yield differences between the two cultivars, although as observed in the earlier sowing the mean yield of Genesis 090 was higher than PBA Royal.*
- *The highest plant populations of 32 – 37 plants/m<sup>2</sup> (based on 45 seeds/m<sup>2</sup>) had significantly higher flowering dry matter than the lower populations (10 and 21 plants/m<sup>2</sup>).*
- *The higher dry matters associated with higher populations correlated to faster ground cover and greater crop reflectance (recorded as NDVI) with significantly higher NDVIs up to mid flowering at which point there was no difference.*
- *Cultivar and plant population had a significant impact on crop lodging; Genesis 090 recorded almost no lodging while PBA Royal recorded significantly more lodging, particularly at higher populations (28 and 32 plants/m<sup>2</sup>).*
- *The WUE of Genesis090 sown in May based on an average yield of 2.92t/ha was 10.3kg/mm.*

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**Table 1.** Influence of seed rates (plant populations) on grain yield (t/ha) with two different varieties grown under overhead irrigation.

Plants/m <sup>2</sup> (actual)		Yield t/ha		
		Genesis 090	PBA Royal	Mean
Genesis 090	PBA royal	Yield t/ha	Yield t/ha	Yield t/ha
10	12	2.39 -	2.48 -	<b>2.44 c</b>
22	21	2.82 -	2.83 -	<b>2.82 b</b>
32	28	3.41 -	3.04 -	<b>3.22 a</b>
37	32	3.07 -	2.98 -	<b>3.02 ab</b>
<b>Mean</b>		<b>2.92 -</b>	<b>2.83 -</b>	
<b>LSD Cultivar p=0.05</b>		ns	<b>P val</b>	0.598
<b>LSD Seed Rate p = 0.05</b>		0.32	<b>P val</b>	<0.001
<b>LSD Seed Rate x Cultivar.</b>		ns	<b>P val</b>	0.482

**Table 2.** Influence of seed rate and cultivar on plant population – assessed at V7, 17-July.

Treatment	Plant Population		
	Genesis 090	PBA Royal	Mean
Seed Rate	Plants/m <sup>2</sup>	Plants/m <sup>2</sup>	Plants/m <sup>2</sup>
15seeds/m <sup>2</sup>	10 -	12 -	<b>11 c</b>
25 seeds/m <sup>2</sup>	22 -	21 -	<b>21 b</b>
35 seeds/m <sup>2</sup>	32 -	28 -	<b>30 a</b>
45 seeds/m <sup>2</sup>	37 -	32 -	<b>34 a</b>
<b>Mean</b>	25 -	23 -	
<b>Cultivar LSD</b>	ns	<b>P val</b>	0.351
<b>Seed Rate LSD</b>	5.9	<b>P val</b>	<0.001
<b>LSD</b>	ns	<b>P val</b>	0.533

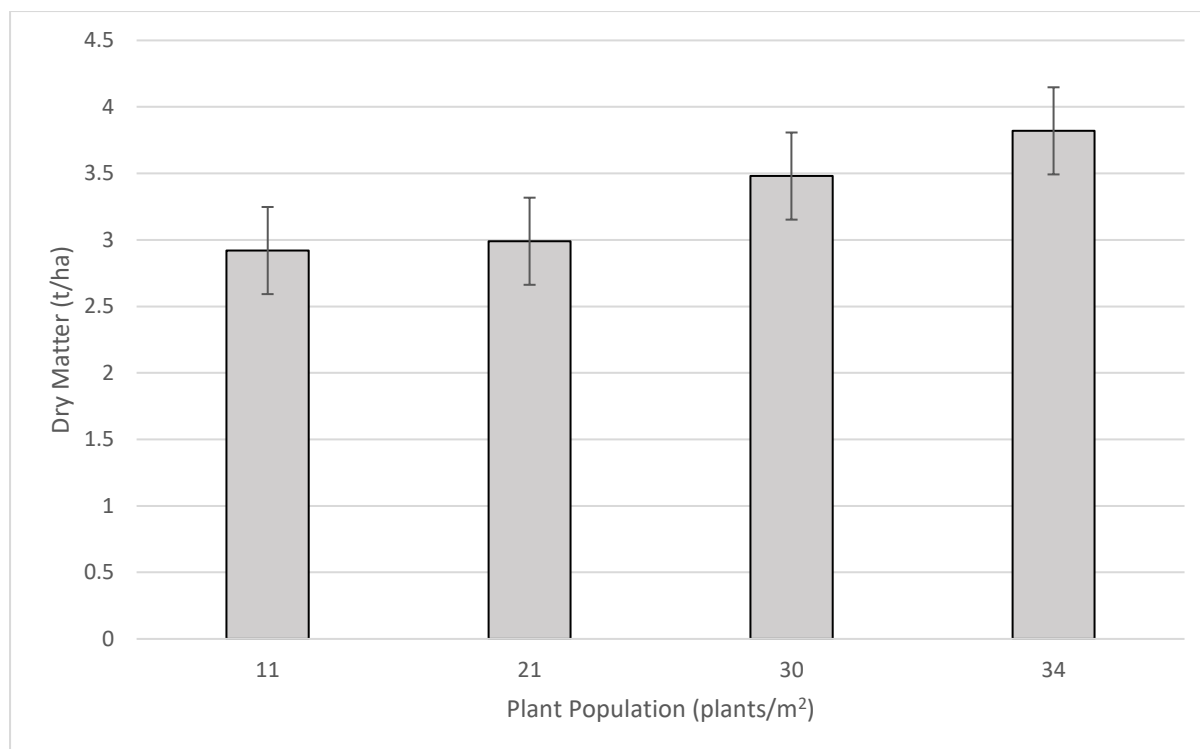
**Table 3.** Influence of plant population and cultivar on canopy composition, pods/m<sup>2</sup> and height to first pod (cm) – assessed at harvest, 2-Dec.

Treatment	Canopy composition	
	Pods/m <sup>2</sup>	1st Pod Height (cm)
<b>Cultivar and Population</b>		
<b>Genesis 090</b>		
32 plants/m <sup>2</sup>	1320 -	48 ab
<b>PBA Royal</b>		
12 plants/m <sup>2</sup>	1019 -	44 bc
21 plants/m <sup>2</sup>	1184 -	41 c
28 plants/m <sup>2</sup>	1050 -	49 a
32 plants/m <sup>2</sup>	1133 -	47 ab
<b>Mean</b>	<b>1141</b>	<b>46</b>
<b>LSD</b>	ns	5.1
<b>P val</b>	0.263	0.026

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**Figure 1.** Influence of plant population (mean of two cultivars) on dry matter (t/ha) production at early flowering (R2) – Assessed 28-Sep.

**Table 3.** Influence of plant population (mean of two cultivars) on crop reflectance measured as normalised differential vegetation index (NDVI) (0-1) – assessed 28 July, 14 & 29 September and 15 October.

Treatment Plant Population	Normalised differential vegetation index (NDVI)			
	V9 28-Jul NDVI (0-1)	V20 14- Sep NDVI (0-1)	R2 29- Sep NDVI (0-1)	R4 15- Oct NDVI (0-1)
11 plants/m <sup>2</sup>	0.16 c	0.49 c	0.70 b	0.79 -
21 plants /m <sup>2</sup>	0.17 c	0.61 b	0.76 a	0.79 -
30 plants /m <sup>2</sup>	0.19 b	0.69 a	0.77 a	0.78 -
34 plants /m <sup>2</sup>	0.21 a	0.71 a	0.78 a	0.79 -
<b>Mean</b>	<b>0.18</b>	<b>0.63</b>	<b>0.75</b>	<b>0.79</b>
<b>LSD</b>	0.014	0.04	0.022	ns
<b>P val</b>	<0.001	<0.001	<0.001	0.208

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**Table 4.** Influence of cultivar and plant population on crop lodging index score (0-500) (assessed RH 2-Dec).

Seedrate (Plants/m <sup>2</sup> )	Lodging Score		
	Genesis 090 Score (0-500)	PBA Royal Score (0-500)	Mean Score (0-500)
15seeds/m <sup>2</sup> (10,12)	0.0 b	18.8 b	9.4 b
25 seeds/m <sup>2</sup> (22,21)	0.0 b	18.8 b	9.4 b
35 seeds/m <sup>2</sup> (32,28)	2.5 b	93.8 a	48.1 a
45 seeds/m <sup>2</sup> (37,32)	0.0 b	93.8 a	46.9 a
Mean	0.6 b	56.3 a	
LSD Cultivar p=0.05	47.1	P val	0.033
LSD Seed Rate p = 0.05	14.0	P val	<0.001
LSD Seed Rate x Cultivar.	19.8	P val	<0.001

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### Trial 3 Disease Management Strategies for Chickpeas Grown Under Irrigation

**Project objective:** To assess the relative importance of fungicide input for Genesis 090 and PBA Monarch under overhead irrigation.

**Location:** Finley IRC

**FAR Code:** FAR CP20-07-1

**Sown:** 27 April

**Cultivar:** Genesis 090 and PBA Monarch

**Harvested:** 11<sup>th</sup> December 2020

**Rotation position:** Wheat (2019), Faba beans (2018), Fallow after Rice (2017)

**Soil Management:** Cultivation with speed disc to incorporate stubble in Autumn

**Irrigation:** Overhead lateral irrigation 6 x 25mm in spring. Total applied 150mm (1.5 ML/ha)

**GSR:** April-October 244mm. Total water available (GSR + Irr) 394mm

#### Key Messages:

- Fungicide strategies for April sown chickpeas (mean of two cultivars) gave significant yield increases of 0.66t/ha (cheaper programme) and 0.98t/ha (more expensive programme) (mean of both cultivars) which represented a 26 & 38% increase in yield over the untreated.
- Disease levels, principally *Ascochyta* (*Ascochyta rabiei*) up to and including mid-flower were quite low (<1% leaf area infected LAI) and there were no differences due to cultivar or fungicide strategy.
- Genesis 090 had significantly more ascochyta infection 14 days after the last application of the 3rd fungicide at mid-flower than PBA Monarch, however this difference became insignificant 28 DAA.
- Both fungicide strategies gave significant improvements in control of ascochyta at 14 and 28 after the final application compared to nil control treatment and produced significant improvements in grain yield.
- There was no significant difference in ascochyta control however there was a significant difference in the subsequent grain yield between the 'cheap' and 'expensive' fungicide strategies.
- There was an increase in margin over input cost as a result of applying fungicide with the expensive fungicide treatment resulting in a higher return on investment compared to the cheap strategy.
- The WUE of the highest yielding Genesis 090 treated with an expensive fungicide strategy was 12.9kg/mm.

**Table 1.** Fungicide treatment list.

Strategy	Treatment mL/ha		
	4-6 Node V6 – 7-Jul	Pre-Flower V18 – 26-Aug	Mid-Flower R3 – 2-Oct
1. Untreated	-	-	-
2. Cheap	Chlorothalonil 720 @ 1.4 L/ha	Chlorothalonil 720 @ 1.4 L/ha	Chlorothalonil 720 @ 1.4 L/ha
3. Expensive	Veritas @ 1 L/ha	Aviator Xpro @ 600mL/ha	Veritas @ 1 L/ha

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**Table 2.** Influence of fungicide strategy (based on three foliar sprays) on chickpea grain yield with 2 varieties.

Treatment	Grain Yield		
	Genesis 090 Yield t/ha	PBA Monarch Yield t/ha	Mean Yield t/ha
1. Untreated	2.51 -	2.29 -	2.40 c
2. Cheap	3.48 -	2.97 -	3.23 b
3. Expensive	3.67 -	3.43 -	3.55 a
Mean	3.22 -	2.90 -	
LSD Cultivar p=0.05	ns	P val	0.095
LSD Fungicide p = 0.05	0.37	P val	<0.001
LSD Fungicide x Cultivar P=0.05	ns	P val	0.620

**Table 3.** Influence of fungicide strategy (based on three foliar sprays) on margin over input cost (\$/ha - value of increased grain production minus cost of inputs and application costs).

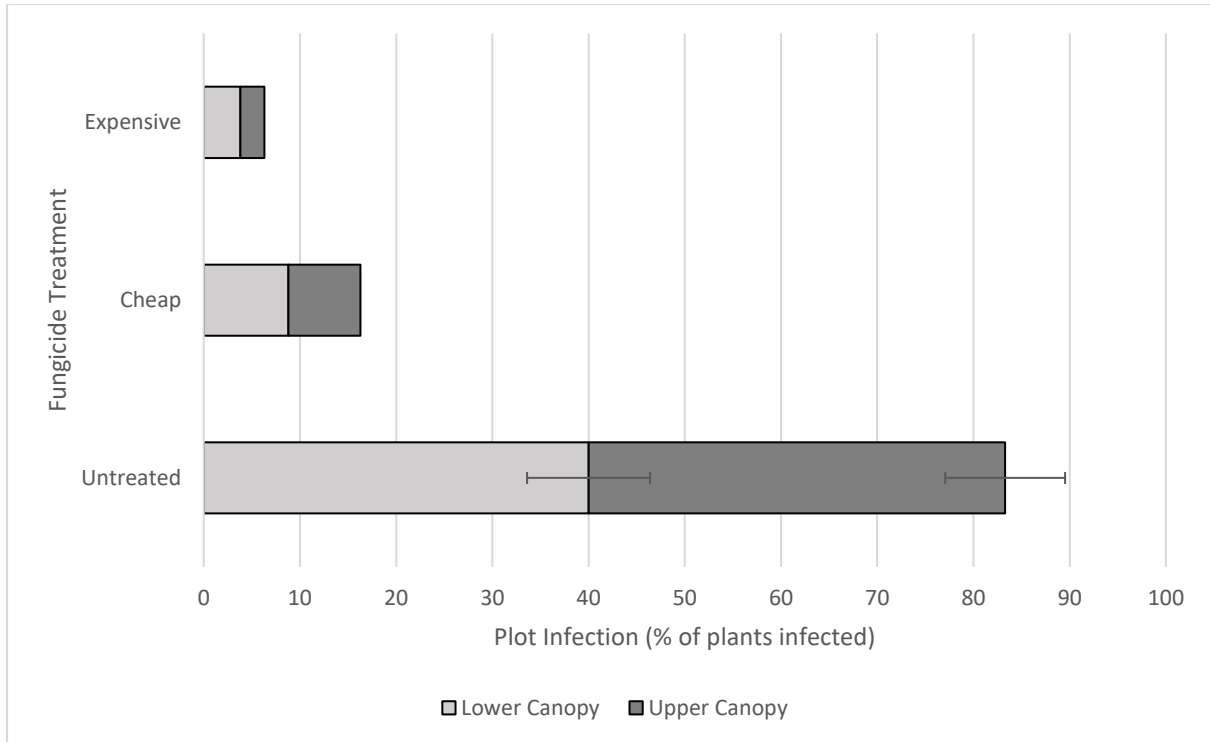
Treatment	Total Fungicide Cost	Yield (t/ha)	Gross Income (\$/ha)	Margin gain (\$/ha)	Return on Investment
Untreated	Nil	2.40	\$1392	-	-
Cheap	\$98	3.23	\$1873	\$384	3.9
Expensive	\$132	3.55	\$2059	\$535	4.1

Input costs based on current chemical prices at 17/2/21 plus an application cost of \$15/ha. Income based on current grain price of \$615/t less \$35 freight as of 17/2/21.

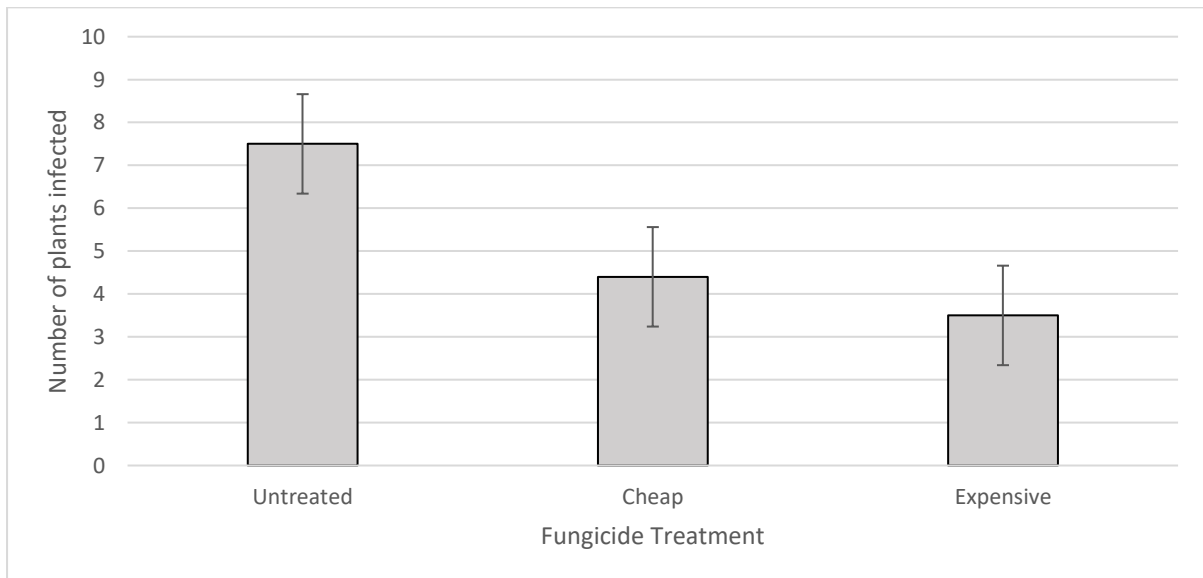
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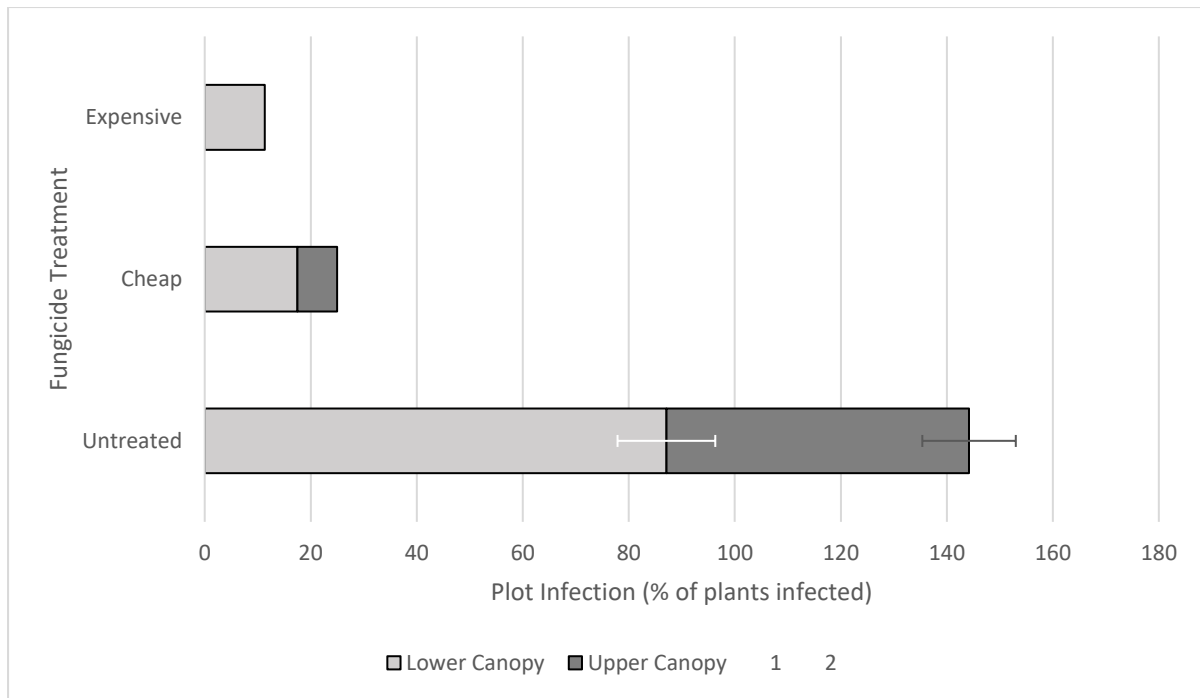
**Figure 1.** Influence of fungicide strategy on % Ascochyta infection (incidence) 14 days after 3rd fungicide application (15-Oct). Lower canopy P value – <0.001 LSD= 12.8, Upper canopy P value – <0.001 LSD= 12.7.



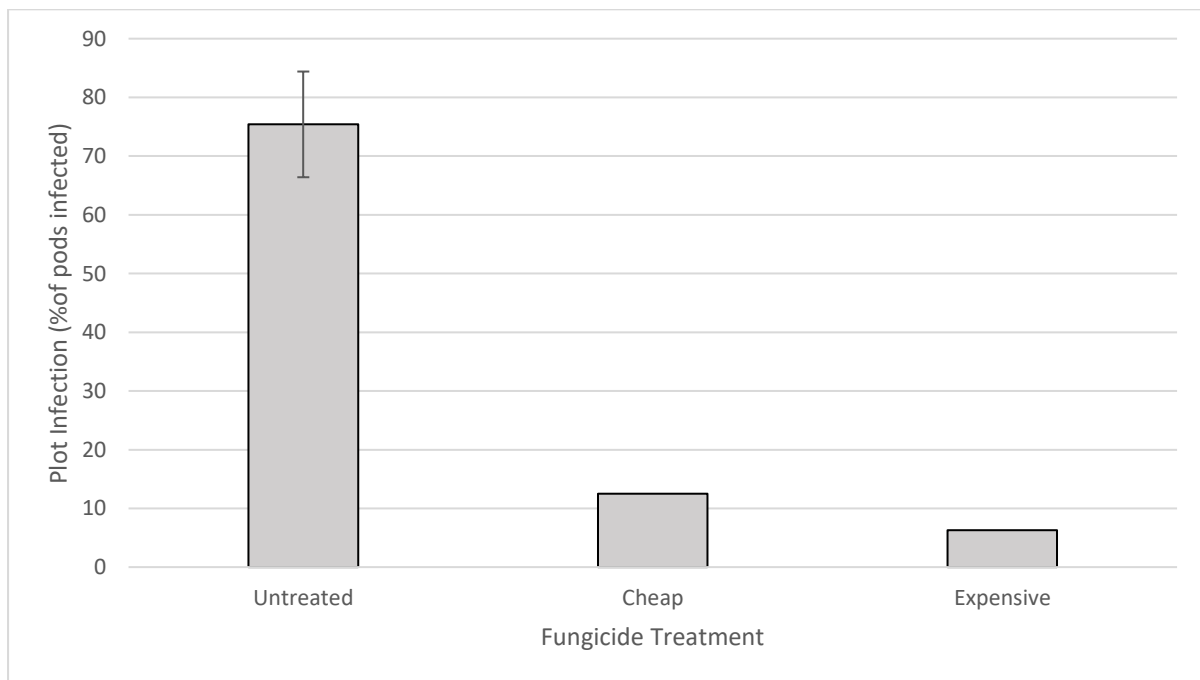
**Figure 2.** Influence of fungicide strategy on Sclerotinia infection (incidence) 14 days after 3rd fungicide application (15-Oct). P value – 0.007 LSD= 2.3.

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**Figure 3.** Influence of fungicide strategy on % Ascochyta infection (incidence) 28 days after 3rd fungicide application (5-Nov). Lower canopy P value <0.001, LSD= 18.4. Upper canopy P value <0.001, LSD= 17.6.



**Figure 4.** Influence of fungicide strategy on % Ascochyta infection of pods (incidence) 28 days after 3rd fungicide application (5-Nov). P value <0.001, LSD= 18.0.

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## Kerang VIC

*Irrigated trials conducted at the Kerang irrigated research centre 2020 were managed by the Irrigated Cropping Council*

### Trial 1 Influence of Rhizobium Inoculation on Chickpea Yield and Profitability

#### **Protocol Objective:**

To evaluate the influence of different rhizobium treatments on chickpea nodulation, dry matter, grain yield and profitability under flood irrigation.

**Location:** Kerang, Victoria

**FAR Code:** ICC CP20-05-1

**Sown:** 18 May 2020

**Cultivar:** PBA Royal

**Harvested:** 24 December 2020

**Rotation position:** Dryland vetch/brown manure 2019

**Soil Type:** Neutral medium grey clay

**Irrigation:** Flood irrigation 2 applications totalling 230mm (2.3 ML/ha)

**GSR:** April-October 250mm. Total water available 480mm

#### **Key Messages:**

- *Starting soil N levels were high (125 kg N/ha) due to the brown manured vetch phase prior to 2020.*
- *Chickpeas had not been grown in the trial location and inoculation did result in better nodulation of the chickpeas.*
- *Nodulation did improve with higher rates of granular inoculum.*
- *Yield and grain size were not influenced by the trial treatments, possibly due to the relatively high soil N and low reliance on fixed N for plant growth.*

**Table 1.** Nodulation Scores 11 weeks post sowing.

Treatment	Nodulation Score
Nil (Control)	0.6 c
ALOSCA granules 10 kg/ha	2.7 b
ALOSCA granules 20 kg/ha	3.0 ab
ALOSCA granules 30 kg/ha	3.3 a
N applied at Sowing 40 kg N/ha	0.7 c
N applied at Podding 40 kg N/ha	0.5 c
p = <0.001, lsd = 0.41, cv% = 15.2	

*Nodulation scoring as per the 2020 trials protocol methodology*

*Nodulation figures followed by different letters are considered to be statistically different (p=0.05)*

There was an improvement in nodulation as the rate of granule was increased.

However the higher rate of nodulation did not result in either higher biomass or grain yield.

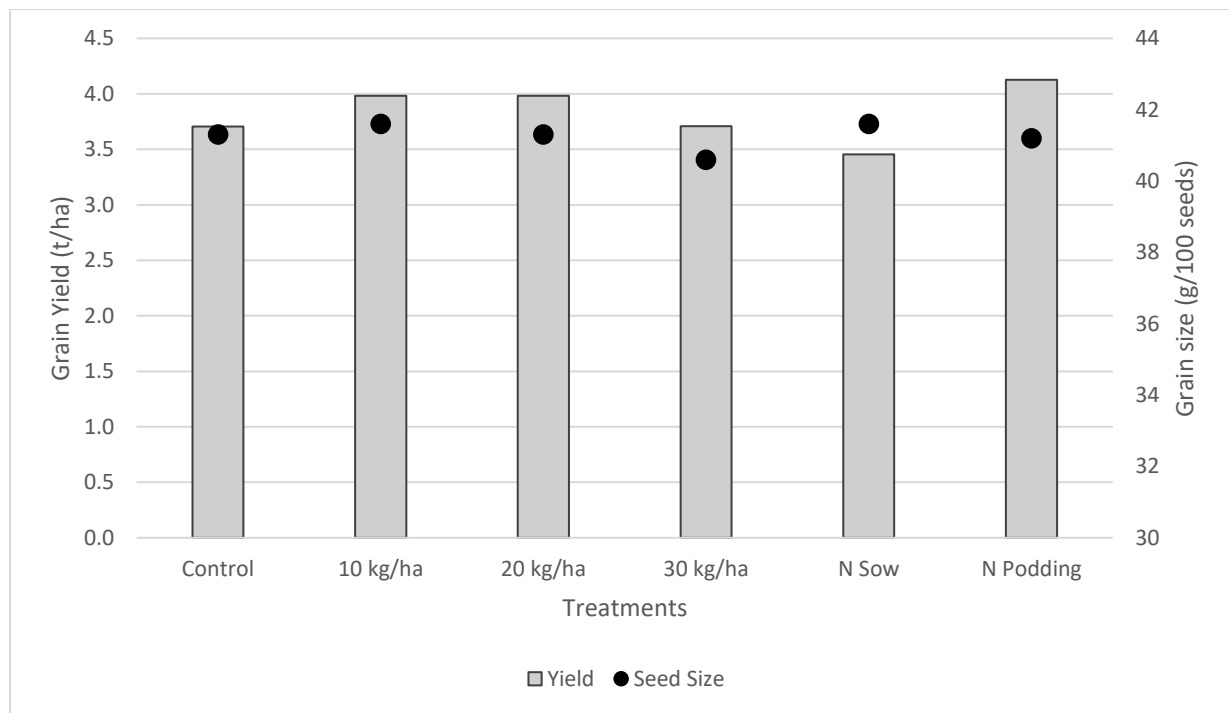
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**Table 2.** Influence of inoculation on dry matter production at early flowering (21/9) and at harvest (24/12)

Treatment	Early Flowering	Harvest
Nil (Control)	4.00	10.97
ALOSCA granules 10 kg/ha	3.88	9.09
ALOSCA granules 20 kg/ha	3.95	11.95
ALOSCA granules 30 kg/ha	3.89	9.05
N applied at Sowing 40 kg N/ha	5.21	8.83
N applied at Podding 40 kg N/ha	4.62	11.5
P val	0.097	0.052
LSD	NS	NS
cv%	16.8	16.1



**Figure 1.** Influence of inoculation and N application on grain yield (t/ha) and grain size (g/100 seeds).  
 Grain Yield:  $p = 0.068$ ,  $l_{sd} = NS$ ,  $cv\% = 8.0$ , trial mean = 3.83 t/ha  
 Grain size:  $p = 0.362$ ,  $l_{sd} = NS$ ,  $cv\% = 1.7$ , trial mean = 41.3 g/100 seeds

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## Trial 2 Influence of Chickpea Cultivation on Durum Wheat Yield and Profitability

### Protocol Objective:

To evaluate the influence of top work cultivation (speed till) in chickpea stubble on durum wheat yield and profitability in 2021. In 2020 the trial evaluated plant population in the previous chickpea crop.

**Location:** Kerang, Victoria

**FAR Code:** ICC CP20-06-1

**Sown:** 12 May 2020

**Cultivar:** Genesis 090

**Harvested:** 24 December 2020

**Rotation position:** Dryland vetch/brown manured 2019

**Soil Type:** Neutral medium red clay, bordercheck.

**Irrigation:** Flood irrigation 3 applications totalling 290mm (2.9 ML/ha)

**GSR:** April-October 250mm. Total water available 540mm

### Key Messages:

- Chickpea establishment rate was approximately 60% at seedrates between 15 – 45 seeds/m<sup>2</sup>.
- The higher the seeding rate and resultant plant population, the trend was for higher dry matter at harvest and grain yield.
- Harvest index averaged 0.35 and was not affected by seeding rate/plant population.
- Based on the highest yields achieved at 27plants/m<sup>2</sup> (4.56t/ha) WUE was 10.6kg/mm.

**Table 1.** Trial treatment summary.

Trt.	Cultivation (2021)	Seed rate (Seeds/m <sup>2</sup> ) (2020)
1	Direct drill	15 seeds/m <sup>2</sup>
2	Direct drill	25 seeds/m <sup>2</sup>
3	Direct drill	35 seeds/m <sup>2</sup>
4	Direct drill	45 seeds/m <sup>2</sup>
5	Speed Till	15 seeds/m <sup>2</sup>
6	Speed Till	25 seeds/m <sup>2</sup>
7	Speed Till	35 seeds/m <sup>2</sup>
8	Speed Till	45 seeds/m <sup>2</sup>

**Table 2.** Canopy measurements – plant populations (plants/m<sup>2</sup>) and harvest dry matter (t/ha).

Seeding rate	Plant population	Dry matter
15 seeds/m <sup>2</sup>	8.8 d	9.13 c
25 seeds/m <sup>2</sup>	15.0 c	10.03 bc
35 seeds/m <sup>2</sup>	21.5 b	10.92 ab
45 seeds/m <sup>2</sup>	26.8 a	11.66 a
P val	<0.001	0.019
LSD	1.68	1.617
cv%	11.2	18.6

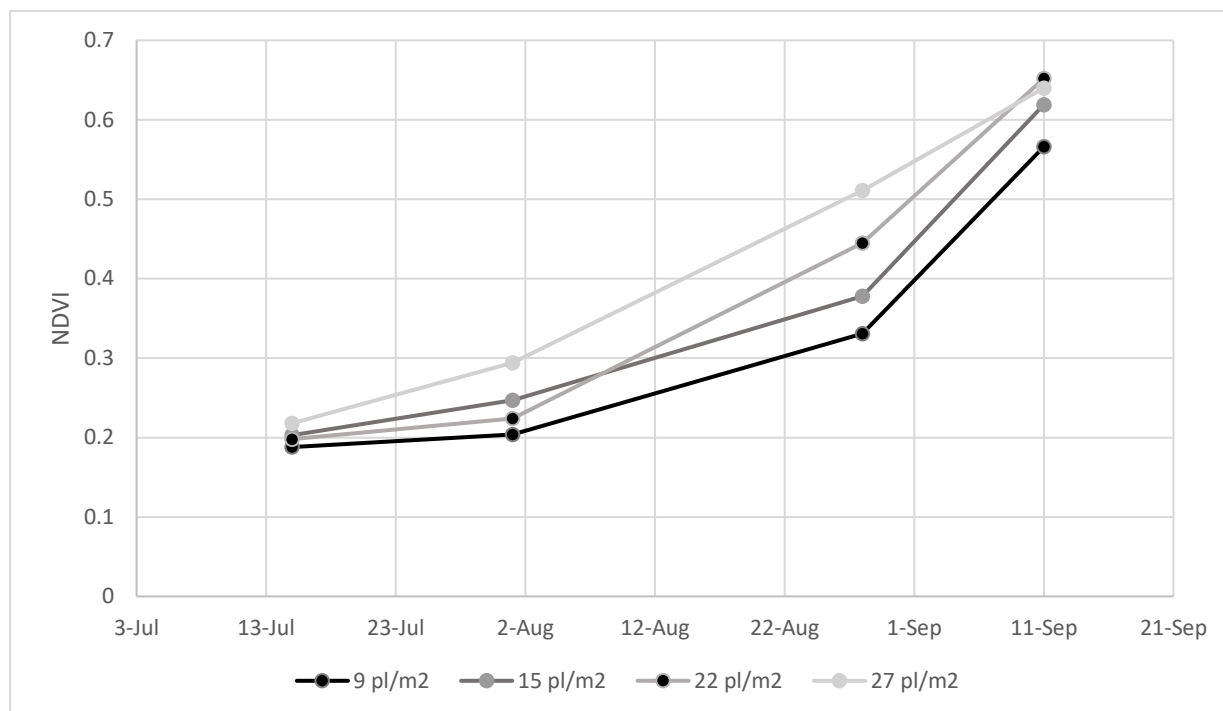
Plant establishment was approximately 60% across the four seedrates evaluated (Table 2). Dry matter was highest in the high seeding rate treatments that established 27plants/m<sup>2</sup>.

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NDVI measurement during the season revealed differences between the canopies of each treatment, but there was no significant difference when measured on 11 September.



**Figure 1.** Influence of plant population on crop reflectance measured as NDVI (0 – 1 scale).

**Table 3.** Chickpea yield (t/ha) and grain size (g/100 seeds) and harvest index.

Seeding rate	Yield (t/ha)	Seed size	Harvest Index
15 seeds/m <sup>2</sup>	3.44 c	30.5	0.35
25 seeds/m <sup>2</sup>	3.76 bc	30.8	0.34
35 seeds/m <sup>2</sup>	4.05 b	30.9	0.34
45 seeds/m <sup>2</sup>	4.56 a	31.2	0.36
P val	<0.001	0.637	0.508
LSD	0.47	NS	NS
cv%	14.4	4.5	10.1

Grain yield mirrored seeding rate/plant population, with the highest yields achieved by the 45 seeds/m<sup>2</sup> seeding rate treatment which established 27 plants/m<sup>2</sup>.

Plant population between 9 – 27 plants/m<sup>2</sup> did not influence either seed size or harvest index.

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### Trial 3 Disease Management Strategies for Chickpeas Grown Under Irrigation

#### **Protocol Objective:**

To evaluate the economics of disease management strategies of different costs in irrigated chickpea production.

**Location:** Kerang, Victoria

**FAR Code:** ICC CP20-07-2

**Sown:** 18 May 2020

**Cultivar:** PBA Monarch and Genesis 090

**Harvested:** 24 December 2020

**Rotation position:** Dryland vetch/brown manured 2019

**Soil Type:** Neutral medium grey clay, bordercheck.

**Irrigation:** Flood irrigation 2 applications totalling 210mm (2.1 ML/ha)

**GSR:** April-October 250mm. Total water available 460mm

#### **Key Messages:**

- *Yield of each variety was not influenced by the fungicide strategy.*
- *Seed size was increased in PBA Monarch only as a result of the 'cheap' strategy.*
- *Variety selection did result in differences in grain yield and size.*
- *Although the growing season was above average, much of this rainfall was prior to sowing. The winter period tended to be drier than average, resulting in conditions that did not favour disease. Coupled with the relatively few local crops, disease pressure was low and very little disease was evident in the trial.*
- *Neither the older Genesis 090 nor the new release PBA Monarch showed any differences in foliar disease expression given there was minimal disease pressure.*
- *Random plants across the trial did succumb to root rot prior to flowering.*

**Table 1.** Trial treatment summary.

TRT	Variety	Management Strategy	4-5 weeks post emergence	Pre-Flower	Late Flower
1	Genesis 090	Untreated*	-	-	-
2	Genesis 090	Cheap	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha
3	Genesis 090	Expensive	Veritas 1l/ha	Aviator Xpro 600ml/ha	Veritas 1l/ha
4	PBA Monarch	Untreated*	-	-	-
5	PBA Monarch	Cheap	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha
6	PBA Monarch	Expensive	Veritas 1l/ha	Aviator Xpro 600ml/ha	Veritas 1l/ha

The plant canopy was assessed for disease prior to each fungicide application. Very low levels of foliar disease was recorded at the early podding stage of the trial in the lower canopy irrespective of fungicide treatment. Disease did not progress up the canopy as the season continued.

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**Table 2.** Chickpea yield (t/ha) and grain size (g/100 seeds).

Treatment	Grain Yield		Grain Size	
	PBA Monarch	Genesis 090	PBA Monarch	Genesis 090
Untreated (Control)	3.37 -	4.17 -	40.3 -	30.9 -
'Cheap'	3.52 -	4.88 -	41.8 -	31.5 -
Expensive	3.60 -	4.53 -	40.7 -	31.8 -
<b>Mean</b>	<b>3.50 b</b>	<b>4.53 a</b>	<b>40.9 a</b>	<b>31.4 b</b>
Yield: $p_{var} = <0.001$ , $p_{fung} = 0.256$ , $p_{vxf} = 0.516$ , $lsd_{var} = 0.441$ , $lsd_{fung} = NS$ , $lsd_{vxf} = 0.76$ , $cv\% = 12.6$				
Grain size: $p_{var} = <0.001$ , $p_{fung} = 0.089$ , $p_{vxf} = 0.516$ , $lsd_{var} = 0.783$ , $lsd_{fung} = NS$ , $lsd_{vxf} = 1.36$ , $cv\% = 2.5$				

The trial mean yield was 3.8 t/ha. WUE was 9.3 kg/mm.

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## Griffith NSW

*Irrigated trials conducted at the Griffith irrigated research centre 2020 were managed by the Irrigated Cropping Council in collaboration with IREC*

### Trial 1 Influence of Rhizobium Inoculation on Chickpea Yield and Profitability

#### **Protocol Objective:**

To evaluate the influence of different rhizobium treatments on chickpea nodulation, dry matter, grain yield and profitability under irrigation.

**Location:** Whitton, NSW

**FAR Code:** ICC CP20-05-2

**Sown:** 29 May 2020

**Cultivar:** PBA Royal

**Harvested:** 22 December 2020

**Rotation position:** Cotton 19/20

**Soil Type:** Neutral red clay loam, 150 cm beds

**Irrigation:** Nil

**GSR:** April-October 297mm

#### **Key Messages:**

- Starting soil N levels were 85 kg N/ha (0-60 cm) at sowing.
- Chickpeas had been grown in the trial location 5 years prior, and all treatments did have nodules when assessed 10 weeks after sowing.
- The higher inoculum rates of 20 and 30 kg/ha did result in higher nodulation scores than that of the untreated control.
- Yield and grain size were not influenced by the trial treatments.

**Table 1.** Nodulation Scores 10 weeks post sowing.

Treatment	Nodulation Score
Nil (Control)	2.15 b
ALOSCA granules 10 kg/ha	2.65 ab
ALOSCA granules 20 kg/ha	2.80 a
ALOSCA granules 30 kg/ha	3.0 a
N applied at Sowing 40 kg N/ha	1.85 b
N applied at Podding 40 kg N/ha	1.93 b
p = 0.004, lsd = 0.61, cv% = 16.9	

*Nodulation scoring as per the 2020 trials protocol methodology*

*Nodulation figures followed by different letters are considered to be statistically different ( $p=0.05$ )*

There was an improvement in nodulation as the rate of granule was increased. However the higher rate of nodulation did not result in either higher biomass or grain yield.

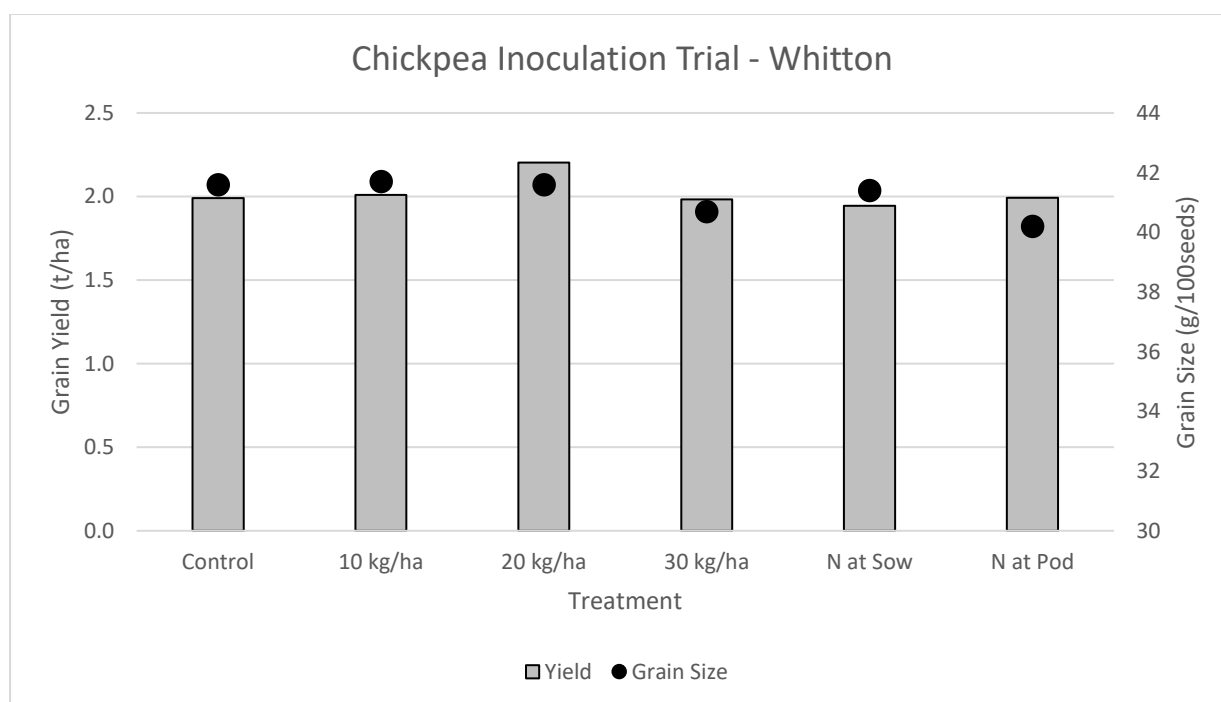
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**Table 2.** Influence of inoculation on dry matter production at early flowering (21/9) and at harvest (24/12).

Treatment	Early Flowering	Harvest
Nil (Control)	2.15 b	5.05
ALOSCA granules 10 kg/ha	2.65 ab	5.07
ALOSCA granules 20 kg/ha	2.80 a	5.40
ALOSCA granules 30 kg/ha	3.00 a	5.40
N applied at Sowing 40 kg N/ha	1.85 b	4.79
N applied at Podding 40 kg N/ha	1.93 b	5.18
P val	0.004	0.614
LSD	0.612	NS
cv%	16.9	10.6

**Figure 1.** Grain yield (t/ha) and grain size (g/100 seeds).

Grain Yield: p = 0.795, lsd = NS, cv% = 13.3, trial mean = 2.02 t/ha

Grain size: p = 0.770, lsd = NS, cv% = 4.1, trial mean = 41.2 g/100 seeds

The trial was planned to be irrigated but well-above average April rainfall (106mm) on the back of a summer crop and predictions of a wetter season discouraged the co-operator from pre-irrigation. He decided the spring rainfall was sufficient, therefore unnecessary for any spring irrigation.

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## Trial 2 Disease Management Strategies for Chickpea Growth Under Irrigation

### Protocol Objective:

To evaluate the economics of disease management strategies of different costs in irrigated chickpea production.

**Location:** Whitton, NSW

**FAR Code:** ICC CP20-07-3

**Sown:** 29 May 2020 PBA Monarch and Genesis 090

**Cultivar:** PBA Monarch and Genesis 090

**Harvested:** 22 December 2020

**Rotation position:** Cotton 19/20

**Soil Type:** Neutral red clay loam, 150 cm beds

**Irrigation:** Nil

**GSR:** April-October 297mm

### Key Messages:

- Yield and was not influenced by the trial treatments, neither fungicide strategy nor variety selection.
- Variety selection did result in a larger grain size.
- Although the growing season was above average, much of this rainfall was prior to sowing. The winter period tended to be drier than average, resulting in conditions that did not favour disease. Coupled with the relatively few local crops, disease pressure was low and very little disease was evident in the trial.
- Neither the older Genesis 090 nor the new release PBA Monarch showed any differences in disease expression given there was minimal disease pressure.
- Overall yields were suppressed by the co-operators decision to not irrigate in early spring.

**Table 1:** Trial treatment summary.

TRT	Variety	Management Strategy	4-5 weeks post emergence	Pre-Flower	Late Flower
1	Genesis 090	Untreated*	-	-	-
2	Genesis 090	Cheap	Chlorothalonil 720 l/ha	Chlorothalonil 720 l/ha	Chlorothalonil 720 l/ha
3	Genesis 090	Expensive	Veritas 1l/ha	Aviator Xpro 600ml/ha	Veritas 1l/ha
4	PBA Monarch	Untreated*	-	-	-
5	PBA Monarch	Cheap	Chlorothalonil 720 l/ha	Chlorothalonil 720 l/ha	Chlorothalonil 720 l/ha
6	PBA Monarch	Expensive	Veritas 1l/ha	Aviator Xpro 600ml/ha	Veritas 1l/ha

\* Untreated received a fungicide application as part of a herbicide application on July 15 by the co-operator

The plant canopy was assessed for disease prior to each fungicide application. No foliar disease was recorded at any stage of the trial.

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**Table 2.** Chickpea yield (t/ha) and grain size (g/100 seeds).

Treatment	Grain Yield		Grain Size	
	PBA Monarch	Genesis 090	PBA Monarch	Genesis 090
Untreated (Control)	1.82	1.90	40.5 a	32.7 b
'Cheap'	1.96	1.96	40.8 a	33.2 b
Expensive	2.11	1.84	40.5 a	32.5 b
Mean	1.9 -	1.90 -	40.6 a	32.8 b
Yield: $p_{\text{var}} = 0.427$ , $p_{\text{fung}} = 0.458$ , $p_{\text{vxf}} = 0.207$ , $\text{lsd}_{\text{vxf}} = \text{NS}$ , $\text{cv}\% = 10.1$				
Grain size: $p_{\text{var}} = <0.001$ , $p_{\text{fung}} = 0.784$ , $p_{\text{vxf}} = 0.570$ , $\text{lsd}_{\text{vxf}} = 2.45$ , $\text{cv}\% = 10.1$				

Trial mean yield was 1.9 t/ha. WUE was 6.5 kg/mm (excluding soil moisture at sowing).

The trial was planned to be irrigated but well-above average April rainfall (106mm) on the back of a summer crop and predictions of a wetter season discouraged the co-operator from pre-irrigation. He decided the spring rainfall was sufficient, therefore unnecessary for any spring irrigation.

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