Optimising
Irrigated Grains

CHICKPEAS

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

FAR AUSTRALIA

Irrigated Cropping Council
Promoting irrigated agriculture

GOOD MANAGEMENT GUIDELINES for Irrigated Crops:

2020 to 2022

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SOWING THE SEED FOR A BRIGHTER FUTURE

Introduction

Good management guidelines for irrigated chickpeas

This good management guidelines summary for chickpeas has been taken from the results of the Optimising Irrigated Grain (OIG) research project, a GRDC investment conducted in south-east Australia ((FAR1906-003RTX) from 2019-23. The guidelines are laid out as key points with a small amount of supporting data taken from the trials conducted over these three years. ***Please note these guidelines only cover agronomy topics that were researched during the project (2020 – 2022), it is not intended to be a complete guide to growing irrigated crops. Instead, it carries key points noted to be instrumental in growing productive and profitable irrigated crops.*** These guidelines can be supplemented by reading the *Good Management Guidelines for Irrigated Crops* produced as a result of the project.

What did we do in the GRDC Optimising Irrigated Grains project?

This GRDC investment Optimising Irrigated Grains (OIG) (FAR1906-003RTX) was set up to identify gaps in our knowledge regarding the true economically attainable yield potential of winter and summer crops grown in south-eastern Australian irrigated farming systems. The focus was on crops where there was less knowledge of upper end yield potential, particularly in light of newer germplasm, management advances and innovations in soil amelioration.

The field research team (FAR Australia and Irrigated Cropping Council (ICC)) was charged with conducting over 60 individual trials per annum, in six crops, over a three-year research period (2020 – 2022). To conduct such a large number of trials, field experiments were consolidated into two major Irrigated Research Centres (IRCs) based at Kerang in Victoria and Finley in southern NSW. Most trials focussed on crop agronomy and were conducted on a grey clay soil at Kerang using predominately surface irrigation (flood), and at Finley on a red duplex using overhead and surface irrigation in collaboration with Southern Growers, NSW DPI and the Maize Association of Australia. Three satellite sites carried a smaller number of trials in the north midlands of Tasmania, south-eastern Australia and Griffiths in NSW in collaboration with Irrigation Research and Extension Committee (IREC), Riverine Plains Inc, Southern Farming Systems, South Australian Research and Development Institute (SARDI) and MacKillop Farm Management Group.

The research programmes were uniquely developed to evaluate crop specific agronomic management practices in irrigated environments in order to ascertain their effects on system productivity and profitability.

Crop specific agronomic practices were focussed on maximising system profitability through:

1. Understanding the yield potential of irrigated crops in the principal environments where research was taking place.
2. Understanding how to consistently optimise yield for the crops where gaps in knowledge were most apparent.
3. Optimising the return on nitrogen through improved nitrogen use efficiency (grain maize, canola, barley and durum).

ACKNOWLEDGEMENTS

FAR Australia would like to place on record their grateful thanks to the Grains Research and Development Corporation (GRDC) for providing the investment for this project, in particular, we would like to thank GRDC's Senior Manager Dr Kaara Klepper for her input, guidance and support in the oversight of the project.

In addition, we would like to acknowledge the collaborative support of our principal trials research partner Irrigated Cropping Council (ICC). We would also like to acknowledge all the OIG partners and collaborators in the project, University of Tasmania, Southern Growers, NSW DPI and the Maize Association of Australia, Irrigation Research and Extension Committee (IREC), Riverine Plains Inc, Southern Farming Systems, South Australian Research and Development Institute (SARDI) and MacKillop Farm Management Group.

CHICKPEAS

Crop structure and Plant population

Key point summary

- ***Chickpea yields under irrigation reached yields over 4.0 t/ha.***
- ***35 seeds/m² resulting in plant populations averaging 21-25 plants/m² were the most profitable populations tested under surface and overhead irrigations systems from a late April sowing.***
- ***The influence of lower chickpea populations can result in productivity losses of 1.0 t/ha.***
- ***Higher yields have come from April sowing compared to May sowing. Where sowing is delayed, populations need to be increased to 35 plants/m².***
- ***Yields have not been stable over the three years of trials. Yields in 2021 from the Finley site were approximately half that of 2020, with the overhead irrigation suffering the higher yield reduction. Kerang 2021 yields were similar between seasons.***
- ***Drainage is key to success. No podding was observed at Kerang where the soil was held close to field capacity due to frequent rainfall during the period mid-September to late October 2022.***
- ***Lodging was observed in higher plant populations, but was also influenced by cultivar choice.***

Growing chickpeas under irrigation has demonstrated that there are yield penalties for crops that have reduced biomass and those subject to transient water logging. With early pod set determined by temperature (>15 degree C) and grain fill impacted by high temperatures later in spring, there is a window of opportunity for maximising yield by taking advantage of higher biomass promoted by higher seeding rates or earlier sowing (Figure 1).

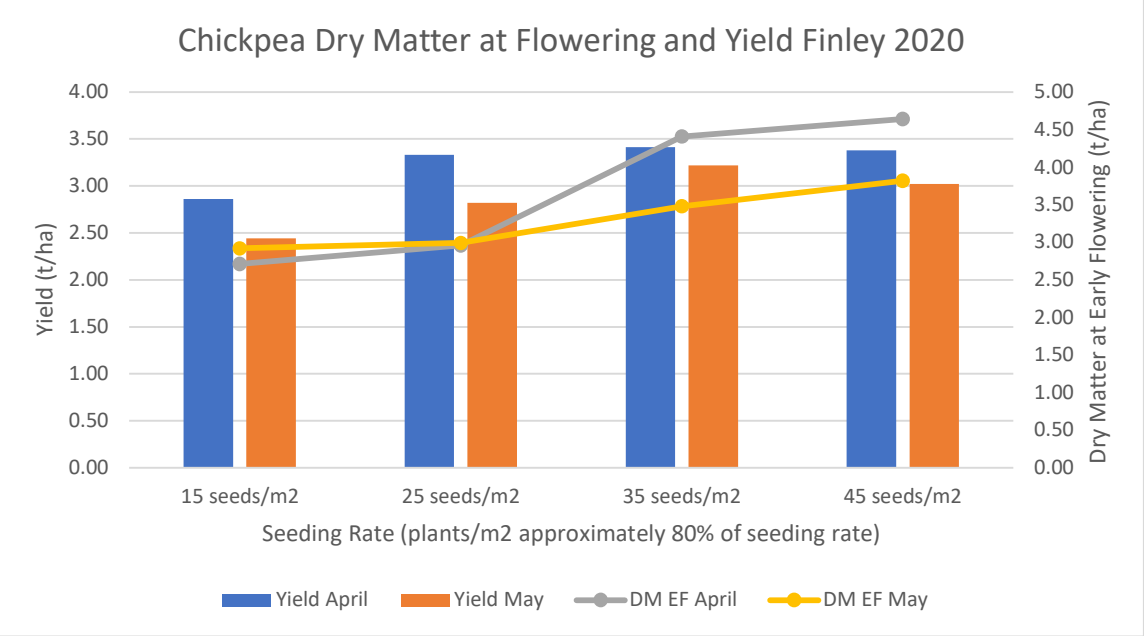

Figure 1*: Chickpea yield and dry matter (DM) at early flower (EF) averaged from two cultivars.*

Inoculation of Chickpeas

Key point summary

- ***As chickpeas require a specific inoculum (Group N), it is highly recommended that seed be inoculated before sowing.***
- ***Using higher rates of Alosca granules resulted in increased nodulation in 2020 but no difference in 2021 or 2022. Untreated plants had few nodules, but the number was increasing over the 3-year period.***
- ***While yields were lower in the untreated plots, they were not statistically significant.***
- ***High soil N at sowing (109 – 117 kg N/ha 0-60cm) may be reducing the reliance on fixed N in the crop.***

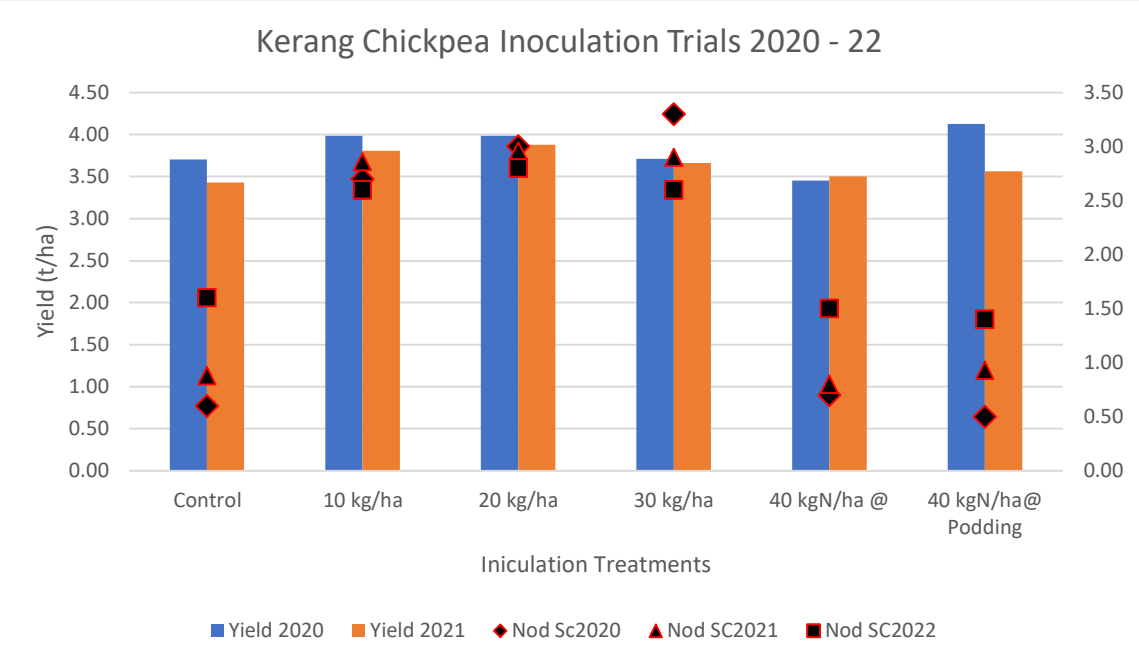

Figure 2*: Yield (t/ha) and Nodulation Score (Nod Sc) from the Kerang 2020 - 2022 trials.*

Inoculation saw significant improvement in nodulation scores assessed nine weeks after sowing. However, the grain yields have not followed a similar trend, with yields regarded as statistically similar.

Disease management in irrigated chickpeas

Key point summary

- ***Chickpeas have been more susceptible to foliar disease, specifically ascochyta, than faba beans at both research sites.***
- ***The disease rating of the cultivar was an important indicator of cultivar yield performance.***
- ***Disease pressure was low in 2020 and extreme in 2022 and was reflected in the level of disease and the cultivar response.***
- ***The benefit of an 'Expensive' strategy using a combination of SDHI (group 7) and QoI (Group 11) chemistry gave significantly better disease control than a 'Cheap' strategy based on chlorothalonil with PBA Monarch at both sites in 2021 and 2022.***
- ***Yield reflected the level of disease control in both cultivars.***

- ***Under extreme disease pressure in 2022, the 'expensive' strategy required treatment every three weeks from late July until October to keep disease suppressed at Kerang.***
- ***While the untreated yields at Kerang in 2021 were approximately 50% of those yields where disease was controlled, the actual grain produced was unlikely to have any commercial value due to the number of small and discoloured chickpeas in the untreated sample.***

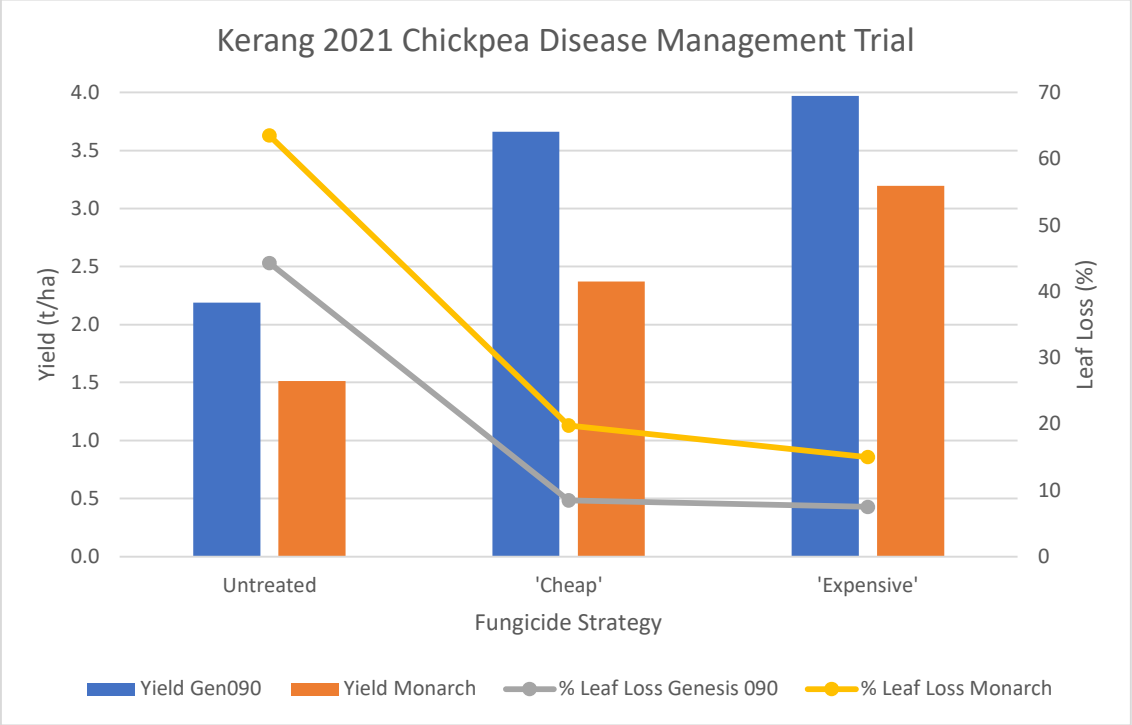

Figure 3a: *Yield (t/ha) and Leaf Loss (% leaf area lost) in two chickpea cultivars at Kerang 2021.*

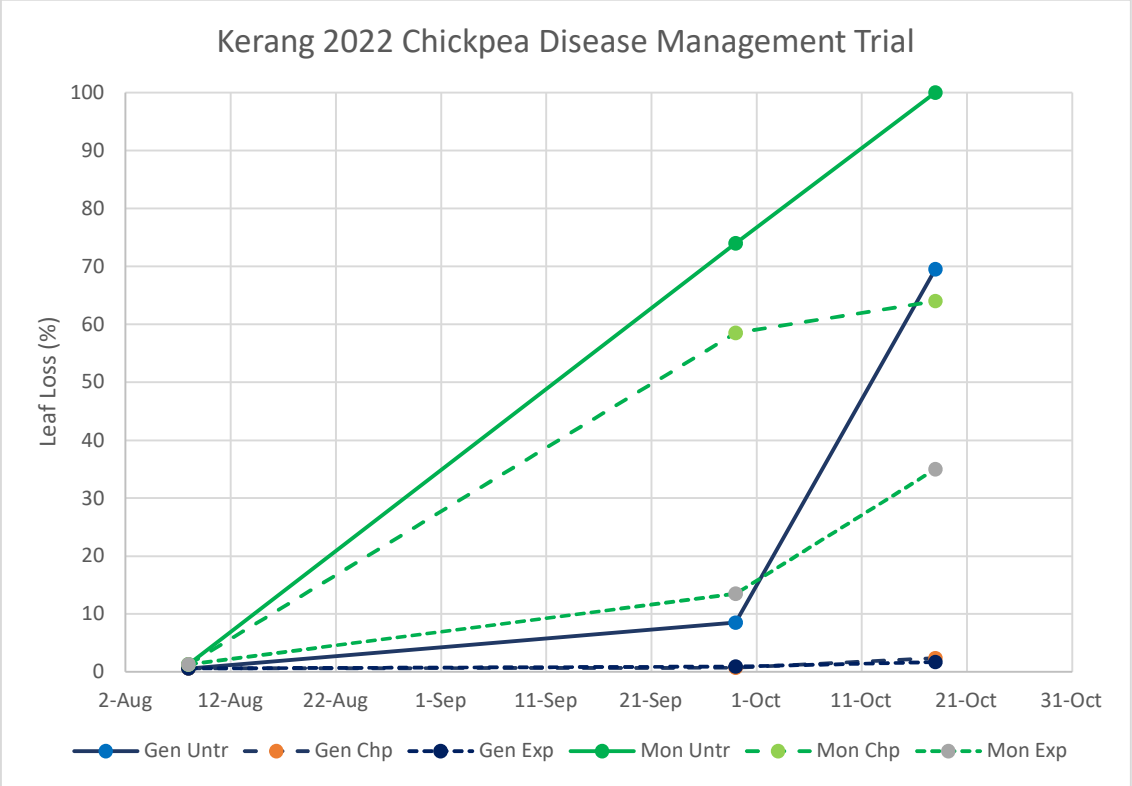

***Figure 3b**: Leaf loss in two chickpea cultivars in a high disease pressure year 2022 (No harvest was possible due to inundation).*

NOTES

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