PULSE AUSTRALIA
Southern Pulse BULLETIN
PA 2010 #17

IRRIGATED CHICKPEA MANAGEMENT

Trevor Bray, Pulse Australia South-East, 0428 606 886

Summary

- Select fields with good layout and tail water drainage.
- Avoid high bulk density or high clay content soils that do not internally drain quickly.
- Avoid acid, saline or sodic soils (see levels below).
- Pre-irrigate or water-up to fill the soil profile wherever possible.
- Irrigate early at 60-70% of field capacity to avoid crop stress and soil cracking open.

Irrigated chickpea crops can be very profitable and rewarding with well managed crops yielding in excess of 3.5 t/ha. High yields have occurred across a wide range of soil types and irrigation layouts through a combination of correct paddock selection, precise irrigation scheduling and close attention to chickpea agronomy. In addition, chickpeas can contribute to crop rotations because of their ability to fix nitrogen and provide a disease and weed break for following cereal crops.

It is important for growers and agronomists to base yield expectations on the total water supply available. This includes a combination of the amount of soil water in the profile, likely in-crop rainfall and irrigation water supply. A general rule of thumb for chickpeas can be based on *1 tonne grain per megalitre water supply (per hectare).*

To offset the good performances there are growers who have only achieved yields of 1.0-1.5 t/ha and some of the common causes have been:

- Problems with poor crop establishment and vigour (seed quality, seedbed, herbicides)
- Unsuitable soils limiting water extraction (sodic or saline subsoils)
- Poor scheduling of in-crop irrigation
- Restricted water supply limiting yield

Pulse Australia has a number of chickpea management publications to assist growers and advisors on their website www.pulseaus.com.au starting with the Southern Bulletin "Chickpea Checklist – For Southern Growers" which gives an overview of the basic requirements needed to grow and manage a chickpea crop. Most points are also relevant to irrigated chickpeas with this bulletin discussing the more specific issues for irrigated crops.

Chickpeas are very sensitive to waterlogging and even if waterlogged for a short period of time, crop losses can be severe. This has particularly occurred where crops have been moisture stressed allowing soils to dry out to depth and often crack open (figure1).

Waterlogging is a stress on a chickpea crop and when combined with other stresses such as moisture stress, damaged root systems, disease, herbicide injury, or sodic and saline soils can be a disaster. Watering during flowering or podfill when the crop is more sensitive further increases the risk of yield loss.

Figure 1. Chickpea on the left received a very late irrigation

As chickpea is more sensitive to waterlogging than other pulses such as faba beans, paddock selection and irrigation management is more important as chickpeas are not as forgiving as faba beans and other crops such as winter cereals.

Paddock selection

- Select fields with good irrigation layout and tail water drainage (figure 2). Beds or hills with relatively good grades (avoid flat grades). Border-check layouts with steeper than 1:800 grades are a possibility provided they have short runs for quick watering (< 8 hours) but may pose a higher risk if watered during flowering and podfill.

Chickpeas perform well on loams and self-mulching clay loams but avoid heavy clay or dense soil types (bulk density >1.5) and compacted soils, or areas where free water does not drain quickly and soil remains saturated.

- Many irrigation soils have become more acid over time particularly where rice has been grown. A pH_{Ca} below 5.2 will begin to impact on crop vigour and yield, particularly if acidity increases at depth.
- Avoid growing chickpeas in fields that are strongly sodic or saline in the top 0-60cm. Chickpeas are extremely sensitive to salinity and unable to access water and nutrients from saline layers in the soil. Saline soils with ECe >1.5 ds/m will cause a yield reduction and ECe >3.0 ds/m has been shown to cause a yield reduction of up to 50%.
- Avoid sodic soils with an exchangeable sodium percentage (ESP) >1.0 at the surface or >5.0 in the subsoil as this can limit yield. Saline or sodic layers in the top 0-90 cm will severely limit root development and water extraction. Crops affected by sodicity and salinity may often appear to be growing normally through winter when there is low water demand per day, but will stress severely in spring when exposed to higher temperatures or heatwave conditions (high daily water demand).
- High boron and soil chloride levels >600 mg/kg in subsoil layers will also severely limit root growth.

Irrigation management

- Filling the soil moisture profile at sowing time is important and it has been a recommended practice to pre-irrigate. However in recent dry seasons growers have chosen to water up enabling them to incorporate pre-emergent herbicides. Ensure that seed placement allows at least 7 cm of soil above the seed if using Balance® or simazine and the soil surface is left flat to prevent herbicide leaching into the plant furrow.
- As a general rule, in-crop irrigation should start early when there is a soil moisture deficit of between 30 mm and 40 mm (or 60 to 70% of field capacity). Soil moisture deficit is more important in scheduling irrigations than the plant growth stage.
- Irrigations should also commence prior to flowering to prevent moisture stress and high temperatures impacting on grain size, quality and yield. This is particularly important with kabuli types where premiums are paid for larger seed sizes.
- The higher clay content or soil bulk density, the higher the risk of waterlogging from slow water infiltration and subsequent slow draining. It is a greater risk to irrigate these soils once flowering and podding has commenced. **If in doubt do not water.**

Major projects funded by

GRDC Grains Research & Development Corporation

Pulse Australia gratefully acknowledges the valuable financial support from our industry members.

These are listed on our website under the index heading "Members".

- Problems with poor vigour from poor seed quality (figure 4) or stress from herbicides, disease, poor nodulation and nutrition can also make irrigation decisions more difficult.

Figure 2. Irrigated beds with damage from water remaining in the tail drain

Irrigation techniques to reduce the period of waterlogging include:

- For furrow irrigation water every second row.
- Doubling up siphons to speed up water flow.
- Do not irrigate if there is likelihood of rain.
- Ensure that tail water drains away quickly.

Spray irrigation

The risk of waterlogging is significantly reduced when using lateral move or centre pivot irrigators compared to flood as the amount and timing of water application can be better controlled. However wet foliage from more frequent irrigations can increase the risk of fungal diseases particularly ascochyta blight and botrytis grey mould. Greater attention to disease management, monitoring variety chosen in relation to disease resistance is important. The Variety Management Package (VMP) will show the resistance rating and bulletins titled “Chickpea disease management strategy - Southern region” and “Pulse Seed Treatments & Foliar Fungicides” can be accessed on the Pulse Australia website.

Figure 3. Chickpea under sprinkler irrigation at Mathoura 2009

Major projects funded by

GRDC Grains Research & Development Corporation

Pulse Australia gratefully acknowledges the valuable financial support from our industry members.

These are listed on our website under the index heading “Members".

Sowing rate and row spacing

In southern NSW the target density is 35–45 plants/m^2. Adjust sowing rates to take account of seed size, germination percentage and establishment conditions. In southern NSW irrigation growers have sown at up to 90 cm row spacing on beds (figure 4) without a significant yield penalty and has also allowed the use of shielded sprayers. See "Wide Row Pulses and Stubble Systems" on the Pulse Aust web.

Figure 4. Chickpea on beds with 90 cm row spacing.

Key tips for success

- **Drainage:** Ensure the layout allows irrigation and drainage within eight hours.
- **Soil structure:** Good soil structure ensures good water infiltration, root penetration and internal drainage.
- **Subsoil moisture:** Pre-irrigate or water-up to achieve adequate soil moisture for uniform emergence and during the vegetative stage. Irrigate prior to flowering to ensure a good profile of moisture during flowering and pod fill.
- **Sown on time:** Sow recommended varieties within the preferred sowing window for your location. Trials conducted at Cowra by NSW I&I over several years have shown that sowing after mid May resulted in slower emergence, low seedling vigour and a yield penalty.
- **Crop establishment:** Use good quality seed and germination test retained seed (figure 5). Aim for a plant population of 35 to 40 plants per square metre.
- **Adequate nutrition:** While chickpeas are efficient at extracting soil phosphorus it is wise to apply adequate phosphorus relative to the paddock history and soil test results. Approximately 40 kg of P per hectare is required for a 4 tonne crop. Good inoculation procedures with the appropriate *rhizobium* should meet the N requirements of chickpeas however low zinc and sulfur levels should also be addressed.
- **Control weeds, pests and diseases:** Chickpea do not compete well against weeds so choose a field that has a low broadleaf weed burden or weeds that are difficult to control. Use pre- and post-emergent herbicides relative to the weed problem and regularly monitor for insects, disease, and weed escapes from sowing through to maturity. Be prepared to respond in a very timely manner as delays can be costly. If you cannot monitor or don't have the experience on what to look for then obtain the services of an experienced advisor or agronomist.
- **Soil moisture:** Check soil moisture regularly to ensure timely irrigations to avoid stress or possible crop damage. Moisture monitoring equipment is now available at reasonable prices and can assist in more precise measuring, particularly at depth. Ensure plants do not stress during the reproductive stage and have adequate available soil water for the entire growing season.
- **Harvest:** Chickpea is relatively easy to harvest as they are erect, do not lodge and rarely shatter unless harvest is delayed. As chickpeas are indeterminate, desiccants can be very useful for advancing harvest and evening up maturity. Receival moisture content for chickpea is 14% and storage above this will require aeration. Harvesting at low moisture can result in physical damage and quality issues. See "Chickpea Harvest & Storage" also available on the Pulse Australia website www.pulseaus.com.au

Figure 5. Poor quality seed on left, all sown the same day.

SOURCE:
Information for this Southern Pulse Bulletin is drawn from
Irrigated Chickpea Management - Field Experiences in 2002 (Mike Lucy & John Slatter)
Irrigation Management of Chickpeas - Australian Cotton Grower March-April 2002

Major projects funded by
GRDC Grains Research & Development Corporation
Pulse Australia gratefully acknowledges the valuable financial support from our industry members.
These are listed on our website under the index heading "Members".