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Chickpea: Effective Crop Establishment

Sowing Window, Row Spacing, Seeding Depth & Rate

Gordon Cumming[1], Leigh Jenkins[2]
[1] Pulse Australia, [2] Industry & Investment NSW.

Chickpeas are a profitable crop in their own right. In addition, they contribute to crop rotations because of their ability to fix nitrogen and provide a disease and weed break for cereal crops. However, they require systematic monitoring for foliar diseases and insect pests.

Chickpeas are well adapted to the warmer environment of the northern region because they tolerate higher temperatures during and after flowering better than other winter pulses like faba bean, lupin and field pea.

Chickpeas are best suited to loams and self-mulching clay soils which are neutral-alkaline in pH.

Acidic (pH_{Ca} < 5.2), sodic, saline and/or sandy soils are generally unsuitable. Soils which have high chloride levels (> 600 mg/kg) in the subsoil (40-80 cm depth) are best avoided. Chickpeas do not tolerate waterlogging, so avoid poorly drained paddocks and those prone to flooding.

Sowing window

Chickpea shows a marked response to time of sowing, with crops sown earlier or later than recommended often suffering from reduced yields.

Water use efficiency is commonly in the range of 8-12 kg grain/ha/mm for crop sown during the preferred sowing window.

This drops away to 4-6 kg/mm for very late or very early sowings.

Crops sown prior to the recommended sowing window tend to be more vegetative and suffer from:

- Higher risk of botrytis grey mould at flowering and podding.
- Crops are more pre-disposed to lodging.
- Increased frost risk at early podding.
- High water use prior to effective flowering and the earlier onset of moisture stress during podding.
- Increased risk of ascochyta blight.

Late sown crops are more likely to suffer from:

- High temperatures and moisture stress during podding.
- Greater *Helicoverpa* (heliothis) pressure.
- Shorter plants which are more difficult to harvest.

Late sown chickpeas can also provide a host for the next generation of *Helicoverpa*, and allow a continuous build-up of resistant *Helicoverpa armigera* into late spring and early summer.

Table 1: Preferred sowing times for different regions

	April				May				June				July	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Central Qld														
Maranoa / Balonne														
Western Downs														
Darling Downs														
Moree / Narrabri														
Walgett / Coonamble														
Liverpool Plains														
Central NSW (grey soil)														
Central NSW (red soil)														

Marginal sowing time: increased costs and/or lower yields likely.
Preferred sowing window.

Temperature impacts on flowering

The optimum sowing window will always be a compromise between sowing early, to maximise potential yield, and sowing later, to minimise excessive vegetative growth and hence, the risk of foliar diseases.

Choosing the optimum sowing window can also be constrained by the impact of temperatures (and to a lesser extent a photoperiod response as daylength increases) on flowering and pod set. Chickpeas are known to be sensitive to both low temperatures and frost during the flowering period.

The critical mean value for chickpea is 15°C (i.e. as an average of the daily maximum and minimum temperature). Below this critical mean value, flowers may be initiated (in fact, pseudo-flowers are often produced in the transition between vegetative and reproductive phases), but these flowers will be aborted because the pollen is infertile. Flowers will continue to be produced and then aborted until temperatures increase beyond the critical temperature of 15°C.

The average day/night temperature is more critical for flowering and pod set, than any specific effects of maximum or minimum temperatures. Chickpea are also susceptible to very low temperatures (< 5°C) and frost (0°C) which can not only cause flower abortion (due to sterilisation of the pollen) but also pod and seed abortion. Particularly in smaller pods and seeds developed during the previous few days prior to the cold event.

The effects of low temperatures and/or frost can be exacerbated under conditions of extreme moisture stress (as in 2009) or extreme waterlogging (as in 2010). Under “average” conditions of adequate moisture, chickpea plants can compensate for aborted flowers and/or pods by producing new terminal growth or branches (as chickpea have an indeterminate growth pattern), but this will have the effect of delaying crop maturity.

Hence selection of an optimum sowing date can be a trade-off between sowing early to achieve higher yield potential in those years with a warmer spring (running the risk of reduced water use efficiency if the spring turns dry). Versus delayed sowing with lower yield potentials to ensure flowering occurs during temperatures close to the 15°C mean in cooler springs.

Conversely and of particular value in the northern grains region, chickpea plants are more tolerant of heat during flowering than all other winter pulse crops. With an upper temperature limit of 35°C, beyond which flowers again tend to abort and moisture stress reduces the time available for effective grain fill.

Row spacing

Chickpeas are successfully grown using a wide range of sowing equipment and row spacing’s, ranging from 20-100 cm.

In northern New South Wales and Queensland, there is generally no yield difference between crops with row spacing ranging from 25-75 cm.

Wider rows (50-100 cm): are common and offer a number of advantages, including:

- Greater ability to sow into heavy stubble cover. Zero tillage systems have shown a consistent 10-15% yield advantage over cultivated systems.
- Precision planters often provide more accurate seed placement, resulting in better establishment and more even plant stands. This can often result in more even crop maturity.
- Harvestability: Plants are more erect with a higher pod set as a result of ‘within row’ plant competition. This is particularly important in low yielding situations.
- In low yield situations, crops sown on wide rows often ”feed in” better over the knife section due to the concentration of growth within the row.
- Input costs can be reduced by band-spraying fungicides, insecticides and defoliants.
- Under severe moisture stress conditions, the combination of wide rows and heavy stubble cover has often been observed to yield better than narrow rows.
- Easier access when checking for insect pests.
- Improved air circulation in the crop lowers humidity levels and can reduce the severity of foliar fungal diseases.

Photo: Gordon Cumming

Narrow Rows (15-40 cm): are less common but do provide the following advantages:

- Potential yield advantage at yields levels above 1.5 t/ha.
- Greater crop competition against weeds.
- Relatively fewer lodging problems in high yield situations.
- Suits conventional wheat seeding equipment.

Sowing depth

Chickpeas should be sown 5-7 cm deep into good soil moisture.

The seedlings are robust, provided high quality seed is used. There are a number of agronomic advantages in sowing at 5-7 cm.

- Reduces the risk of damage from pre-emergent residual herbicides such as simazine and/or Balance®.
- Promotes the early formation of lateral roots in the top soil.
- Enhances inoculum survival in moist soil.
- Eliminates a significant proportion of ascochyta infected seeds (due to mortality of diseased seed).

Avoid sowing deeper than 7 cm on soils prone to surface sealing and crusting.

Press-wheels can improve establishment, although heavy pressures should be avoided.

V-shaped press-wheels will leave a furrow down the seeding line which can lead to concentration of residual herbicides in the furrow after rainfall and subsequent crop damage.

Deep sowing

Is not only an extremely valuable tool under drought conditions, but can also offer major advantages in most years including:

- Sowing at the optimum time,
- Freeing up valuable time for sowing wheat when suitable seeding rains have fallen,
- Avoidance of residual herbicide damage,
- Better development of lateral roots,
- Improved nodulation by sowing into moist soil.

Many growers have been deep sowing chickpeas for some time. Excellent plant emergence has been achieved from up to 15 cm deep, and sowing depth can be varied from 5 to 20 cm according to seasonal conditions.

There are a few key points that need to be kept in mind:

- Plan ahead when deep sowing. It pays to sow early in the sowing window to allow for any delay in emergence (typically 7-10 days) ensuring that the plant is able to grow tall enough to facilitate harvest.
- Ensure you have high quality seed. Check your germination percentage, vigour and seed count (seeds/kg) and adjust seeding rates accordingly.
- When deep sowing, levelling of the paddock after sowing needs to be planned to reduce the risk of herbicide damage when using a pre-emergent herbicide such as simazine and/or Balance®.
- Decide on a sowing depth that will ensure that all seeds are placed into moist soil. Experience is that you are better to err on the 'deeper side' rather than sowing 'too shallow' into marginal moisture.

To maximise yield potential, paddocks should be selected carefully to avoid any subsoil constraints, such as salinity or sodicity, to ensure that the crop can gain maximum access to all the stored soil moisture and nutrients.

Fungicide seed dressings (Table 2)

All seed, regardless of source should be treated with a registered thiram-based fungicide seed dressing prior to sowing.

These seed treatments will help to minimize the levels of seed-borne ascochyta blight and botrytis grey mould.

Table 2: Seed dressings registered for the control of seed borne ascochyta blight and botrytis grey mould.

Active Ingredient	Example trade name	Rate (per 100 kg seed)
thiram (600 g/L)	Thiraflo®	200 mL
thiram (800 g/kg)	Thiragranz®	150 g
thiram + thiabendazole (360 + 200 g/L)	P-Pickel T®	200 mL

Refer to the current product label for complete 'Direction For Use' prior to application.

Seeding rate

While yields are relatively stable within the range of 20-30 plants/m^2, populations of 25 plants/m^2 will optimise yields in the northern region. Research has shown that slightly higher populations are required in relatively colder production areas in northern NSW.

Higher populations are justified for when sowing late, while lower populations of around 20 plants/m^2 are often recommended for crops grown on wide row spacing's (e.g.100 cm). High populations sown on wide rows often result in thin main stems and a higher risk of lodging.

Calculating seeding rates

Seeding rate for the target plant density can be calculated using germination percentage, 100 seed weight and establishment percentage.

$$\text{Seeding Rate (kg/ha)} = \frac{\text{100 seed weight (grams)}^{\#} \times \text{Target plant population (per m}^2\text{)} \times 1000}{\text{Germination \%} \times \text{Estimated Establishment \%}^{*}}$$

Example

Target plant density	= 25 plants/m^2 (i.e. 250,000 plants/ha)
100 seed weight	= 20 grams
Germination %	= 90%
Estimated establishment %	= 80%

$$\text{Seeding Rate (kg/ha)} = \frac{20 \times 25 \times 1{,}000}{90 \times 80} = 69 \text{ kg/ha}$$

* Establishment percentage – 80% is a reasonable estimate, unless sowing into adverse conditions.
\# To determine your seed weight, weigh 100 seeds in grams.

If you have seeds per kilogram from a laboratory test, this can be easily converted to 100 seed weight, as follows:

$$\text{100 seed weight} = \frac{1000}{\text{seeds per kg}} \times 100$$

Further reading

Pulse Australia – Northern Pulse Bulletins;

- *Chickpea: Sourcing High Quality Seed*
- *A Growers Guide to Deep Planting Chickpea*
- *Chickpea: Integrated Disease Management*
- *Chickpea: Ascochyta Blight Management*
- *Chickpea: Botrytis Grey Mould Management*
- *Chickpea: Phytophthora Root Rot Management*
- *Central & Coastal Qld Ascochyta Management*

Industry & Investment NSW; *Winter Crop Sowing Guide* www.industry.nsw.gov.au

For additional information contact

Gordon Cumming – Pulse Australia, Northern Manager	ph: 0408 923 474	email: pulse.gordon@bigpond.com
Leigh Jenkins – District Agronomist I&I NSW	ph: 0419 277 480	email: leigh.jenkins@industry.nsw.gov.au
Jayne Gentry – Development Officer DEEDI	ph: 0428 459 138	email: jayne.gentry@deedi.qld.gov.au

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