CHICKPEA HARVEST AND SEED STORAGE

INCLUDING DESICCATION TIMING GUIDELINES

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Greatly improved crop management and harvest timing has meant that chickpea can be harvested earlier with associated yield and marketing benefits. The tradition of delaying the harvest of chickpea until after wheat can result in considerable chickpea losses.

MAJOR LOSSES FROM LATE HARVEST INCLUDE:

Loss of yield

- Losses due to pod drop can be severe as weathering weakens the hinge attaching the pod to the stem.
- Weathered pods become more difficult to thresh, resulting in grain loss from unthreshed pods passing out the back of the header, increased cracked grains and a slower harvest.
- Increased lodging, especially in higher yielding crops that are planted on wide rows.
- Harvesting at 8% moisture instead of 14% results in a harvest weight loss equivalent to $35/tonne.

Farmer experience has shown yield losses of up to 30% if harvest is delayed 2-4 weeks

Loss of quality

- Weathered or very dry grain is more likely to crack when handled, increasing the amount of split grain in the sample.
- The number of unthreshed pods in the sample will increase, as they become harder to thresh with weathering.

Both of these can result in rejection or the need for grading to meet market requirements.

- The germination rate and vigour of planting seed will be reduced by weathering.
- Chickpea grain discolours and darkens with weathering, reducing its marketability, particularly in the container market.

Lost marketing opportunities

- Chickpea prices can reach peaks during harvest to meet shipping schedules. Earlier harvesting may allow access to these opportunities.
- Darker, weathered seed may be discriminated against in the market.

Increased disease and insect risk to pods and seed

- Weathering of seed due to delays in harvest can greatly increase levels of mould infections.
- Ascochyta can infect senescing pods under wet conditions, leading to infected and discoloured seed (and possible rejection).
- Late harvested crops, particularly where there is regrowth, can be a major source of Helicoverpa migration into neighbouring summer crops by providing a refuge for Helicoverpa armigera pupae.

PULSE AUSTRALIA

Queensland Government Department of Primary Industries

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GRDC Grains Research & Development Corporation

PLANNING FOR EARLY HARVEST

Early, or timely, harvest of the chickpea crop has the potential to increase returns by up to 50%. Management to ensure even crop maturity and timely harvest consists of a combination of factors including:

- Paddock selection and agronomy
- Disease and insect control
- Desiccation
- Harvest timing and technique
- Handling and storage

SUMMARY OF RECEIVAL STANDARDS FOR FARMER DRESSED DESI CHICKPEA

Maximum Moisture - 14%
Impurities - 3%
Poor Colour - 2% (including ascochyta lesions)
Ascochyta - 1% (on the seed kernel)

Full details of the Pulse Australia receival standards are available from receival depots and chickpea industry marketers and buyers and the Pulse Australia web site www.pulseaus.com.au

PADDOCK SELECTION AND AGRONOMY

Planning before and at sowing will reduce harvest difficulties. Paddock selection aids in assessing the risk of disease, waterlogging, weeds and poor establishment, which ultimately influence crop maturity. Tillage practices, variety selection and row spacing will affect plant population and eveness, crop height and lodging potential. All of these factors can affect the ease and timeliness of harvest.

DISEASE AND INSECT CONTROL

Botrytis Grey Mould. Can be a common disease at flowering, particularly in crops that have canopied over. Botrytis causes flower and pod abortion resulting in delayed maturity by up to 6 weeks. Crops need to be monitored closely at flowering.

Ascochyta Blight. Lack of effective control during grain filling can lead to high levels of lesions on the seed. Harvest may not be delayed but downgrading and marketing difficulties can result. (Refer to "Chickpea Disease Management Strategy".)

Helicoverpa. May cause delays to harvest by attacking pods and extending the flowering period as the plant will attempt to compensate for lost pods. This is unlikely to be a problem under normal conditions where good insect control is practised. (Refer to "Helicoverpa Management in Chickpea")

Chickpea plants are indeterminate and the period of flowering can extend anywhere from 20 - 50 days depending on levels of flower abortion and the impact of moisture availability to the plant.

Effect of Desiccants on Immature Seeds

Desiccants shouldn't be applied too early as they can affect green seeds. The result can be a reduction in grain size and yield, an increase in immature seeds, and a reduction in seed viability. Refer to the last page of this brochure for details on Desiccation.

HARVEST TIMING & TECHNIQUE

Chickpea harvest can often clash with wheat harvest and traditionally wheat has been given priority due to potential quality premiums. However, this needs to be balanced with the relatively higher value and potential losses that can result from a late chickpea harvest. The use of specialised headers and separate storage facilities for chickpea may alleviate the competition with wheat for time, labour and equipment usage.

Harvest timing will depend on the moisture content that is acceptable for delivery or storage. This will depend on who is buying the grain, or whether aeration is available in the storage.

Harvesters should be set up to operate efficiently at 14-15% grain moisture content. This effectively doubles the harvest period available on any one day compared to harvesting at 12%.

Research in 1997 and 1998 at Tamworth showed that average harvest losses increased as harvest was delayed (and seed moisture decreased).

Table 1 - Yield and moisture loss with delayed harvest.

Harvest Timing	*Av Moisture*	*% Harvest Loss*
On Time	12.7	10%
Late	10.3	23%

Lodging can increase the longer chickpea are left in the field. The risk is higher if the crop is high yielding and has been planted on wide rows of 70 - 100 cm.

Harvesting at moisture levels below the intake standard of 14% can also be costly. Delaying harvest from 14% to 8% for a 500 tonne crop equates to a 32 tonne weight reduction and a loss of $17,500 (at $550/t). This is in addition to any harvest losses that occur due to low moisture at harvesting.

Crops intended for seed are best harvested at 14% to 16% moisture and dried or aerated back to 12% moisture to maximise both germination and vigour when held in storage.

HEADER MODIFICATIONS AND SETTINGS

Draper Fronts

Draper fronts (i.e. MacDon or Honeybee) have become increasingly popular.

The centre feed draper platform provides uniform crop flow into the header, with minimal crop loss, and little damage to the seed.

The cutter bar design allows for both vertical and end table flotation.

While their contour following ability is not quite as good as a floating cutter bar, they have performed very well, provided the paddock is relatively level.

Operators claim they can be operated at higher travel speeds than a conventional front in chickpea.

Preferred Air Front Setups

- Harvest-Aire or other air fronts are generally considered better than batt reels as they minimise the risk of pods detaching from the plant.
- They also improve feed in over the knife section, and reduce soil and stubble contamination and allow the operator a clearer view of the cutting platform, and any rocks or sticks in the paddock. Adjustment of the angle and height of the air nozzles is critical, and may need adjustment as crop conditions change.
- Fit a Vibra-Mat to improve the flow of material over the knife-section and along the platform. They are relatively cheap with a low maintenance cost.
- Fit cast, short crop fingers. If using a closed front the fingers will need to be spaced 19mm or more apart.
- Fitting double density Kwik-cut knife guards will help reduce plant 'vibration' and the risk of pods detaching from the plant. This method may be unsuitable if there are a lot of green weeds in crops that are not desiccated causing blockages.
- Check that the header front is level, and not higher at one end than the other. Set the knife at the correct angle for short crops, and install a simple depth gauge.
- In crops with a short height to lowest pod, soil contamination is likely to be a problem, so it is advisable to fit perforated screens under the platform auger and/or broad elevator. Fit screens to repeat and clean-grain cross augers.
- Floating or flexible cutter bars can be useful in short crops.

Conventional Headers

- Aim to harvest at 300-500 rpm where possible to minimise cracking. Adjust upwards if 'jamming' occurs in crops that are not desiccated.
- Concave clearance 10-30 mm depending on seed size. Check the concave for uneven clearance. Standard concaves tend to bow in the centre when fully loaded, and may need strengthening or replacement (i.e. with a 'Loewen' concave). Removing alternate wires and the blank-off plates from the concave will also help reduce cracking. If possible cover the rasp bars with plate.
- Beater. Reduce speed to 100% of drum speed. Wheat is usually set at 150%.
- Set fan speed at 80-100% of maximum. The relatively heavy weight of individual chickpea grains allows the use of high air flow.

Sieves

Set sieves to suit the grain size of the chickpea being harvested. This is more critical than for wheat.

Top Sieve 20 - 25 mm

A "B & D Airfoil" non-adjustable top sieve is reported to work well in chickpea, and increases overall sieving capacity.

Bottom Sieve 12 - 16 mm

The bottom sieves can be altered so that the front 400 mm can be adjusted separately from the rear section. This allows the front section to be left open, and more air can be directed through onto the top sieve if required.

Header Speeds

Relatively slow ground speeds are considered essential when harvesting chickpea to minimise excessive losses at the front of the header and the amount of dirt entering the machine.

- A maximum speed of 8 km per hour is recommended.
- If using a batt reel, it should be set at the same speed as the header.

HANDLING AND STORAGE OF CHICKPEA SEED

Planting Seed Selection

Special attention should be given to the harvest, handling and storage of planting seed retained on-farm. Seed should be:

- Sourced from the cleanest paddocks, where Ascochyta was not detected.
- Harvested at minimum of 13-14% moisture content to minimise mechanical damage to the seed.
- Any heat drying of chickpea planting seed should be limited to temperatures below 40^{0}C.
- Stored at approximately 13% moisture content.
- Kept at a grain temperature below 30^{0}C.
- Graded to remove split, damaged and small seeds.

Table 2 - Effect of moisture content and temperature on storage life of chickpea seed

Storage moisture (%)	Storage temperature (^{0}C)	Longevity of seed (days)
12	20 30 40	>2000 500-650 110-130
15	20 30 40	700-850 180-210 30-50

Note: most planting seed will need to be stored for a period of 180 days or more.

Handling

Grain may be handled (augered) up to six times before delivery to receival points or planting. It is important that growers minimise the number of handling operations wherever possible and use efficient handling techniques that minimise damage, such as belt conveyors rather than spiral augers.

If using augers:

- Operate slow and full
- Use large diameter augers
- Length of the auger should be no longer than is necessary.
- Keep auger incline low
- Check flight casing clearance. Optimal clearance is typically 50% of grain size to minimise grain being wedged between the auger spiral and the casing.

Storage

Growers contemplating medium to long term storage (6-12 months) need to be aware that chickpea seed continues to age, and that quality deteriorates over time.

Desi chickpea will darken considerably and seed germination and vigour will decline in storage, with the rate being accelerated by:

- High seed moisture content
- High temperatures
- High relative humidity
- Condition of the seed at harvest (weathering).

Seed subject to field weathering prior to harvest will deteriorate quicker in storage, even when stored under 'acceptable' conditions of temperature and relative humidity.

Table 3 - Maximum moisture content (% wet basis) to minimise deterioration of seed colour in storage (CSIRO Stored Grains Reasearch Laboratory).

20℃	20℃	30℃	30℃
3 months	9 months	3 months	9 months
14%	13%	13%	12%

To maintain colour and minimise darkening of seed, any grain stored above 12% moisture will require cooling.

Insect Pests in Storage

Insects are not considered a major problem in stored chickpea.

The exceptions appear to be where chickpea is loaded into storages containing residues of cereal grains that are already infested.

Good hygiene by ensuring that all handling equipment and storages are clean prior to handling chickpea should prevent infestations from developing.

If insects are found in stored chickpea the only registered treatment is phosphine fumigation.

Bruchids

Growers in Central Queensland need to be aware of the potential risk of bruchid infestation if storing chickpea over the summer period. (i.e. planting seed).

Hygiene is the most cost effective methods of managing the Bruchid problem.

Growers need to thoroughly clean all residues of other grain legumes from headers, planting equipment, shed floors, augers and empty trucks and storages after each harvest, and whenever legume seeds are handled on the farm.

Bruchid devlopment will cease at temperatures below 20℃.

DESICCATION

While desiccation is often not necessary under very hot conditions where the crop is under terminal moisture stress, it can be a very useful harvest management tool in situations where:

- There has been rain during grain fill and the crop is uneven in maturity. Chickpea are very indeterminate and will continue to flower and set up pods late in the season. Crop maturity tends to be very uneven and slow in situations of reasonable moisture supply.
- Where pod-set has been very uneven due to agronomic factors such as low plant population, poor heliothis management, uneven plant establishment in some deep-sown crops, wheel tracks through crops etc.
- Where there is a problem with actively growing weeds in the crop.

In these situations, desiccation is a valuable management tool for maximising yield and quality through early harvesting. It also improves harvest efficiency by eliminating many of the problems associated with putting green, sappy plant material through the header, ie uneven intake and drum chokes. Minimising these problems enables drum speeds to be reduced, with less likelihood of cracking grain.

Products for the desiccation of chickpea:

1. Reglone® is registered at 2-3 L/ha
   Reglone® provides quick leaf drydown but the chickpea plant and weeds can quickly regrow if moisture is available.
2. Roundup PowerMAX® is the only glyphosate registered for chickpea desiccation.
   a) For chickpea desiccation:
   Roundup PowerMAX® at 0.68 to 1.8 L/ha.
   b) For additional weed and chickpea desiccation:
   Roundup MAX® at 0.5 to 1.1 L/ha plus Ally® at 5 g/ha.
   Roundup PowerMAX® and Roundup PowerMAX®/Ally® will kill the plants reducing the likelihood of regrowth.

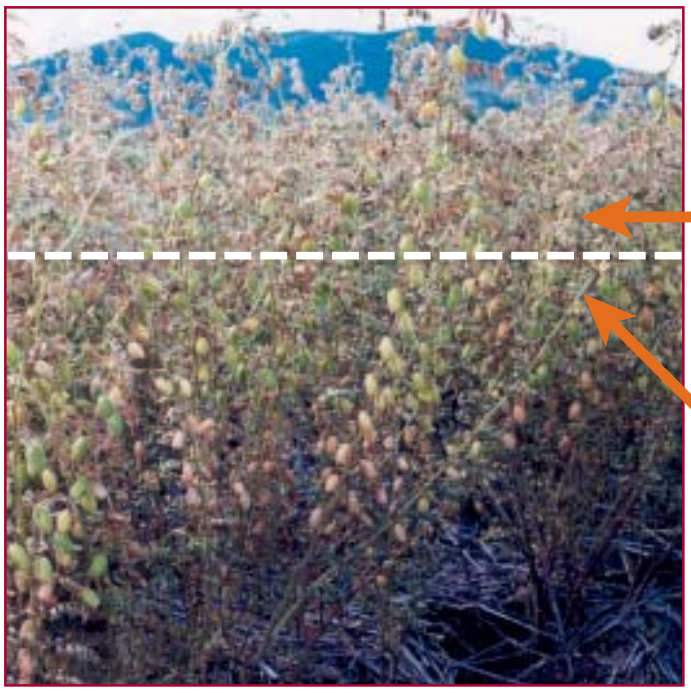
Timing of Desiccation

Chickpea are an indeterminate plant with flowering commencing in the lower canopy, and gradually progressing up the branches (towards the top of the plant) over a 20 - 30 day period.

The problem growers and agronomists are confronted with in the paddock, is how to maximise yield and quality through the optimal timing of the desiccant spray. This can be difficult when you have various stages of seed maturity present on individual plants as well as variability across the paddock.

The optimal stage to desiccate the crop is when the majority (90-95%) of seeds have reached physiological maturity (seeds are below 35% moisture content). Our best guide at the present time is to base this on a visual inspection of seeds by cracking open pods on each main fruiting branch.

Maximum harvest yield is normally reached when 75% of seeds on each main fruiting branch have turned totally yellow and in various stages of drying down (turning yellow to brown).



Ted Knights

Chickpea seeds mature progressively from the bottom to the top of the plant.

Damien White

Desiccation should occur when...

Pods in the top 25% of the canopy should mainly be in the final stages of grain fill, ie where the yellow colouring is moving from the "beak" down through the seed.

Damien White

And...

The bottom 75% of pods should have all reached, or dried down below, this stage of maturity (Seeds have turned totally yellow, and the pod has been bleached to a very light green-yellow colour).

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