Grains Research
UPDATE
Research Information for Farm Advisers from the
Grains Research and Development Corporation (GRDC)
Northern Region

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Chickpeas and P

Adequate phosphorus (P) availability is essential if chickpeas are to reach their full yield potential. Issues to consider when determining appropriate P fertiliser strategies include the fact that chickpeas are a tap rooted crop, they are often deep sown, and soil sampling at a range of depths will improve reliability of results.

As a tap rooted plant, chickpeas are not as good at thoroughly exploring soil volumes as some of the cereals which have more dense root systems. They do however, seem to be able to capitalise on a P source like a fertiliser band very efficiently, by concentrating root activity in/along the band.

Additionally, chickpeas are able to be sown quite deep (up to 25cm), which adds enormous sowing flexibility in environments where topsoils can be dry at the desired planting date. However, it often means that we are sowing chickpeas at depths with lower, and often completely unknown, soil fertility status.

In work conducted under the GRDC-supported Southern Queensland Farming Systems (SQFS) project, it was shown that sampling for phosphorus at two depths (0-10cm and at 10-30cm) using both the Colwell and BSES extraction methods, provides a far better indication of soil phosphorus status that the plant may have access to. "The Colwell P result (combined with the Phosphorus Buffer Index (PBI)) provides an indication of the easily available pool of soil P in each depth, while the BSES P (measured using a weak acid extract) provides additional information about the size of slower release reserves that may be available for the crop to access", said DEEDI's Dr Mike Bell and Bede O'Mara (formally DEEDI, now with Incitec Pivot Fertilisers).

"More intensive sampling such as this is only warranted every 4-6 years, as the presence of slow release reserves will not change as quickly – especially in the deeper soil layers.

"This work comes from experiences on the black and grey cracking clays of northern NSW and Queensland, where unpredictable responses to applied phosphorus fertiliser in wheat, grain sorghum and chickpeas were being recorded.

"As we slowly erode the native soil fertility reserves, especially in deeper soil layers where roots are active in drier periods, phosphorus is becoming a more common yield limiting factor. Chickpeas remove around 3.5kg P in each tonne of grain produced, with many fertiliser programs not reaching levels of P required for a replacement strategy. The same applies to the P budgets of many other crops in the region (Figure 1), except when seasons are unexpectedly poor.

"The next question is where to place this P fertiliser? The traditional approach has been to apply P as a starter fertiliser in the seeding row at planting. Our work has shown that chickpea has been a consistent responder to these starter P applications in low P soils – more consistent than wheat in many cases. However, under tough seasonal conditions that may not convert to grain yield (Figure 2)".

Figure 1. Crop P budgets (P applied in fertiliser – P removed in grain) across the northern cropping region in 2006-2008 (Project DAQ00084).

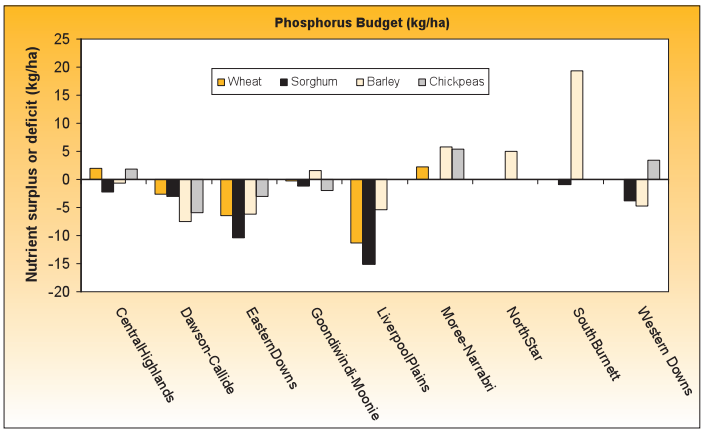
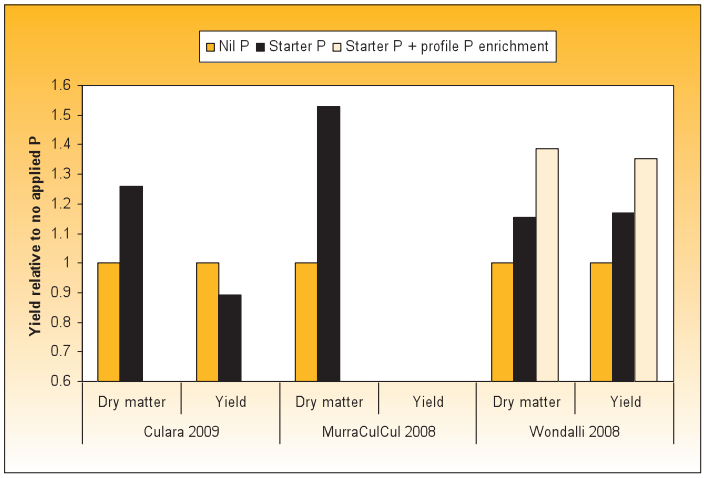


Figure 2. Relative dry matter production and grain yields in response to P fertiliser application at 3 sites in the Goondiwindi area in 2008 and 2009 seasons. The 2008 season produced better growth and higher yields due to more favourable rainfall conditions with a mild finish. Conversely, 2009 had a good start followed by virtually no in-crop rainfall and a harsh finish.



Wheat or sorghum generally don't respond to increasing rates of starter P (above a threshold needed to get uniform distribution along the seeding trench), while chickpea often

has. This could be due to most chickpea crops being deep sown, often into very low P subsoils where access to banded P is even more critical.

However, while chickpea is good at accessing P from these bands, the crop will also need P supplied from the greater soil volume to actually achieve a high yield. Typically starter P fertiliser applied at planting only supplies 1-2 kg P/ha to the crop, even when the top soil moisture conditions are favourable. While this is critical for early vigour and establishing yield potential, it is often only 5-10% of the total crop P requirement.

This is why we need to know what P reserves are below 10cm in our chickpea soils, and if they are low, consider placing more deep (say 15-20cm deep bands) to meet this demand. This is expensive as a one-off operation (in terms of diesel and soil moisture loss), but as part of a longer term fertiliser strategy it is do-able and chickpeas can play a key role. Deep sowing chickpeas is often the deepest tillage operation performed in a zero-till system, so regardless of the chickpea response to P fertiliser in the year of application, it may be the ideal time to apply extra P to recharge depleted deeper layers for coming seasons.

These fertiliser residuals are effectively 'money in the bank' for the cropping system. While higher rates of starter P (i.e. greater than that removed in grain) will be needed to allow enrichment of a low P soil, trial results show significant residual value for at least 4-5 years after the initial P applications. The generally low phosphorus buffer index (PBI) values in our alkaline soils (<150) are a key factor in the high residual value. This residual chickpea P fertiliser will therefore be available for uptake by other grain (or chickpea) crops in the rotation.

Other factors to consider when honing a phosphorus strategy for chickpea should include fallow length and VAM levels. It has long been noted in research literature that chickpeas respond best to P fertiliser when soils have low Colwell P after fallow lengths of greater than 10 months, when VAM levels are probably at their lowest. While the critical soil test level for P is under review (both the test itself, and the critical level, as outlined above), results suggest that if you obtain P responses in wheat you probably will get at least the same, if not greater responses, in chickpeas.

Recommendations:

Response to P in chickpea?

Yes - keep applying and use test strips to find optimum rate

No - do test strips to make sure & measure difference including Nil

Soil test:

Colwell & BSES P tests at 0-10cm & 10-30cm depth increments every 4-5 years (or once per rotation) to capture profile status and level of slow release reserves.

Further information:

Bede O'Mara 0411 074 448
bede.o'mara@incitecpivot.com.au
Mike Bell 0429 600 730 mike.bell@deedi.qld.gov.au

GRDC code: CSA00013

Detailed papers from the P sessions at the Goondiwindi 2010 GRDC Update by Mike Bell, Phil Moody and Guy McMullen can be downloaded from the GRDC website.

Managing paddock variability / PA workshops

GPS (Geographical Positioning System) technology in combination with paddock mapping information enables growers to maximise production by varying the application rate of seed and fertiliser to match a range of in-paddock scenarios.

GRDC supported action learning workshops in the northern grains region aim to help growers and advisers to understand, interpret and manage soil and crop variability to improve business profit and sustainability.

Using the most advanced analytical techniques to manage subsoil constraints will be a workshop feature. Participants will analyse data from precision agriculture tools such as yield maps, satellite images and EM38.

To start applying the workshop benefits immediately to your own property, participants are asked to bring their lot and plan numbers or GPS coordinates for free satellite imagery and biomass assessment.

Six workshops are planned for 2010 in Northern New South Wales and Queensland. Each workshop will be limited to 25 participants and registration is required.

Managing Paddock Variability Using Precision Agriculture Workshops

20 July:
Banana
Contact: Darren Aisthorpe 07 4992 9124
darren.aisthorpe@deedi.qld.gov.au

21 July:
Emerald
Contact: Max Quinlivan 07 4983 7424
max.quinlivan@deedi.qld.gov.au

27 July:
Miles
Contact: Dale Kirby 07 4622 9916
dale.kirby@deedi.qld.gov.au

28 July:
Goondiwindi
Contact: Stuart Pilcher 07 4620 8122
stuart.pilcher@deedi.qld.gov.au

10 August:
Bellata
Contact: Rebecca Byrne 02 6750 6301
rebecca.bryne@industry.nsw.gov.au

11 August:
Bullarah
Contact: Tim Burley 02 6750 6309
timothy.burley@industry.nsw.gov.au

Further information:
Yash Dang 07 4688 1048 Yash.Dang@derm.qld.gov.au

GRDC code: DNR00008

Thrips damage and tip necrosis in faba beans

New insights into the damage caused by thrips in fababeans from I&I NSW entomologist Adrian Nicholas shows that:

- While thrips damage emerging faba beans causing the leaves to become 'crinkly', the plant recovers and no yield loss is incurred so spraying emerging plants is **not** required.
- Thrips are not responsible for the blackened tip necrosis (that appears similar to frost damage) reported in some northern NSW crops in some seasons.

Western flower thrips, onion thrips, plague thrips and tomato thrips all occur in faba bean crops throughout northern NSW and field trials have shown they cause significant visible damage (crinkling) to the newly emerging plant.

Newly emerging plants are damaged prior to and during emergence and this resulted in deformed 'crinkly' leaves in plants up to 50- 60 cm high. Close examination of older affected plants revealed blisters along the leaf mid-rib, and as the plants grew this extends to the stem and becomes brown. Cut open, these blisters often contained young thrips. Where thrips were not present in the blister, an exit hole could usually be found. Blistering and crinkly leaves appear to be associated. Varieties differed in their susceptibility to leaf crinkling with Fiesta and Cairo(I) being less susceptible than Barkool.

Blackened tip necrosis is not caused by thrips or leafhoppers. Glasshouse trials indicated it may be environmental or nutritional but the exact cause remains unknown. Early stems with blackened tip necrosis remain stunted. Secondary stems are not affected and reach normal height. In a survey of commercial crops, plants affected by tip necrosis had up to 30% lower yield. In some crops, 60% of plants were affected which represented an overall loss of 18%. At incidences of tip necrosis up to 4%, no yield loss was detected.

Over 3 seasons (2006-2008) thrips numbers were low during flowering. Thrips are known to cause flower abortion in many other crops but there was no evidence of flower abortion in the field trials or grower crop surveys undertaken.

Based on research and observations of commercial crops over three years, spraying faba beans for thrips control appears to be unnecessary as the damage caused by thrips did not result in significant yield loss.

This recommendation is in the absence of tomato spotted wilt virus (TSWV) which is vectored by thrips and which kills faba beans. While TSWV has been observed in northern NSW at low levels in some seasons, it was not observed during the trial period.

Western flower thrips are very efficient vectors of TSWV, and if incidence of TSWV increased due to mild winters, then controlling thrips would become necessary to prevent the TSWV spreading. Thrips also have the potential to infect faba beans with tobacco streak virus which gives similar symptoms to TSWV.

Weeds are hosts of thrips and TSWV, particularly when thrips are feeding on pollen. Thrips are relatively poor fliers, so maintaining a 10 m weed free area around the crop can reduce their migration into a crop. Spraying weeds with a herbicide may cause thrips to migrate from the dying plant into the crop, so consider including an insecticide with the herbicide.

Further information:

Adrian Nicholas Adrian.Nicholas@industry.nsw.gov.au

GRDC code: DAN0009

Market potential strong for mid-oleic canola's in Australia

"Specialty canola varieties with modified fatty acid profiles have a strong market potential for both domestic and export markets. The desire of both consumers and health professionals to reduce the amount of saturated fat in the average Australian diet is a key driver," said Mr Peter Mac Smith from MSM Milling at the recent Wellington GRDC Update.

"Mid-oleic canola's have a modified fatty acid that makes them more stable for baking and deep frying. The main component of the increased stability is the reduction in linolenic acid levels from around 9%, down to less than 3.5%. Other oils such as palm and cotton seed oil have an equal or better stability, but much higher saturated fat content.

"Mid-oleic canola's have between 7-9% saturated fat compared to 15% or greater for competitive deep frying oils. This keeps the level of saturated fat below the heart foundation target of 10%, while keeping the functionality and stability of oil suitable for deep frying and baking.

"There are two companies with lines being grown in Australia with most crops grown in Victoria and NSW. As varieties develop, the areas these canolas are grown in will increase. The premium paid on the level of linolenic acid in the variety is a benefit driving grower interest.

"Market potential for mid and high oleic acid canolas is large – there is a school of thought that by 2015 some 40% of Canadian crop will be these specialty varieties.

"Australia is currently importing 130-140 000t of palm oil per year and it is this market and the partially hydrogenated oil market where there is potential domestic growth for mid-oleic canolas. There is also strong potential for an export market", said Peter Mac Smith.

Further information:

Peter Mac Smith, 02 6364 5999,
petemacsmith@msmmilling.com.au

GRDC code: ICN000011

Mr Mac Smiths paper from the 2010 Wellington Update can be downloaded from the GRDC's website.

Black layer is still best indicator for pre harvest spray out in sorghum

GRDC-supported research by the Northern Grower Alliance (NGA) and I&I NSW, confirmed that assessing the 'black layer' in sorghum grain is the best method to time sorghum pre-harvest sprays. Additionally according to Richard Daniel from the NGA, "the aggressive or earlier timings were not economic due to yield and quality loss".

Richard said "the project was conducted as growers and advisers were interested in two management aspects. Firstly seeing if earlier pre-harvest timings were feasible, with potential benefits in extra stored soil water and reduced harvest risk, and secondly confirming the best approach to judge spray-out timing. The series of eleven trials over two years showed that aggressively spraying before physiological maturity is far too costly in terms of sorghum returns and is not warranted by the level of soil water saved".

In the same vein, being too conservative and waiting too long can also cost.

Some issues to consider include:

- The high level of yield and quality loss early spray-out timing can have.
- There is little or no advantage from delaying spraying past grain physiological maturity.
- Soil moisture benefits from early timing can be erratic and are not consistent enough to budget on.
- Commence checking for crop maturity at ~ 35 days after flowering.
- Identify the latest heads/tillers that are considered important to take to harvest.
- Check for 'black layer formation' or physiological maturity on grain approximately 1/3 of the way up from bottom of heads you wish to take to harvest and schedule spray timing on this.

Other factors also affect timing of the spray. These include:

- Varieties with stay green traits can take longer to mature from flowering.
- Row configuration can influence maturity.
- The number of late tillers which might be taken successfully to yield.

Crops that are highly moisture stressed or have high levels of stalk rot, may not be suited to spraying out. In some cases spray-out can lead to yield losses due to crop lodging.

Further information:

Richard Daniel 0428 657 782 richard.daniel@nga.org.au

GRDC code: NGA0001

Add your event details to GRDC diary dates on-line

If you are running a field day, workshop, seminar, farm walk or other event of interest to grain producers or advisers, log on to the GRDC's website and add your event details to GRDC Diary Dates on-line.

To add new events, go to: http://www.grdc.com.au/director/events/diarydates/Adddiarydate

To see what's on, go to: http://www.grdc.com.au/director/events/diarydates

May 10	
1-4	**CICILS IPTIC International Pulse convention** - Brisbane Qld Contact: Pulse Australia, http://www.pulseaus.com.au
June 10	
21-24	**Australian Summer Grains Conference (ASGC)** - RACV Royal Pines, Gold Coast, QLD Contact & Further Information: Kate: asgc10@yrd.com.au

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Editor :
John Cameron Ph: (02) 9482 4930,
PO Box 718, HORNSBY NSW 1630
updaten@tpg.com.au http://www.icanrural.com.au

Research writer:
Erica McKay: (02) 9482 4930

Layout and design:
Lightning Designs Ph: (08) 8274 1648