Incitec Pivot Fertilisers

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Nutrition for grazing cereals and canola crops

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Dual purpose crops will be important this year as a source of feed for stock and grain at harvest, but to get the best out of these crops they will need a good start with nutrition, particularly nitrogen (N) and phosphorus (P).

In setting paddocks up for success, there are three simple rules:

1. Fallows should be kept clean to maximise early sowing opportunities. Early establishment and growth are essential to fill the feed gap and allow heavily grazed pastures to recover during winter.
2. Make sure you take a soil test at least three to four weeks prior to planting. This should include both the surface (0-10 cm) and subsoil (0-60 cm) for all the macro nutrients (N, P, K, S).
3. When sowing dual purpose crops (especially canola), it is important to sow into moisture with soil temperatures in the top 10 cm less than 35oC (Acevedo et al, 2002) to maximise early emergence.

The following advice covers the major nutrients for grazing cereals and canola. For micronutrients, confirm any suspected deficiencies or toxicities with tissue testing in crop.

Phosphorus

Early availability of phosphorus is crucial. Phosphorus deficiency limits wheat grain yield principally by depressing early growth, leaf emergence rate and maximum rate of tiller emergence. (Rodriguez et al. 1999)

Remember, with phosphorus, there are no second chances. There is insufficient evidence to recommend foliar applied phosphorus for wheat as a phosphorus management strategy post planting. (Fecelli, et al. 2016)

The right phosphorus rate will depend on the yield expectation for the crop, and the Colwell P level and Phosphorus Buffering Index (PBI) from this season's soil test or a recent soil test.

Interrogation of the Better Fertiliser Decisions for Cropping Systems in Australia (Peverill et al, 2013) suggests a critical Colwell P of 34 mg/kg with a range of 29 to 40 for wheat where a cereal was the previous crop. See Table 1.

In contrast, a critical Colwell P of 49 (range 17 to 140) for wheat following canola is suggested, albeit with a much smaller data set and with a weaker correlation.

Table 1. Critical Colwell P level (95% max yield) 0-10 cm for various rotations across NSW, Vic & SA

Rotation	Colwell P mg/kg 95% reative yield	R value	Number of trials
Wheat on wheat	34 (29-40)	0.47	242
Wheat on canola	49 (17-140)	0.24	34
Wheat on grain legume	30 (17-52)	0.35	26

Source: Better Fertiliser Decisions for Cropping Systems in Australia

In soil tests taken from Central New South Wales and analysed by the Nutrient Advantage® laboratory between January and June 2018, 42% had less than 34 mg/kg of Colwell P. See Table 2.

Table 2. Distribution of results from Colwell P tests in Central NSW, January to June 2018

Colwell P (mg/kg)	<20	20-34	34-50	50-80	>80
% of samples	15%	27%	25%	21%	12%

Source: Nutrient Advantage laboratory, January to June 2018, from 1897 samples at 0-10 cm depth. These soil test values are for wheat and canola in Central NSW, contact your agronomist or adviser to discuss the critical values for your region.

Phosphorus is best banded with the seed at planting to encourage early root development and increase root area so that crops are better able to access soil moisture and soil phosphorus through the growing season.

The safe rate of starter fertilisers with the seed depends on soil moisture levels at planting, fertiliser nitrogen content and the seed bed utilisation percentage.

Also, be aware that canola is more sensitive than cereals to the nitrogen in starter fertilisers when banded with the seed. For more information on safe rates of fertiliser with the seed, Incitec Pivot Fertilisers' safe rates guide is available at https://agronomycommunity.incitecpivotfertilisers.com.au/~/media/SBU.pdf

Nitrogen

The primary objective when growing forage crops is to maximise dry matter production and efficiently use that dry matter. Early nitrogen is the key to getting to that first grazing quickly.

On low nitrogen paddocks (deep soil nitrogen results of less than 60 kg/ha), nitrogen will be required. More than half of the deep N soil test results taken in Central NSW between January and June last year showed less than 60 kg/ha of nitrogen. See Table 3.

If deep N soil test results are showing more than 120 kg/ha of nitrogen, or the paddock is coming out of an early fallowed pasture phase with more than 30% productive legumes or a high biomass grain legume crop, then no additional nitrogen may be required.

Table 3. Distribution of results from deep N tests in Central NSW, January to June 2018

Nitrogen	<30 kg N	30-60 kg N	60-120 kg N	>120 kg N	>80
% of samples	34%	31%	25%	10%	12%

Source: Nutrient Advantage laboratory, January to June 2018, from 769 soil samples at 0-60 cm depth. These soil test values are for wheat and canola in Central NSW, contact your agronomist or adviser to discuss the critical values for your region.

Nitrogen rates will depend on the starting soil nitrogen level, paddock history, organic carbon percentage, rainfall and expected grain yield target. As a guide, for every 1 t/ha grain yield wheat requires 40 kg/ha N while canola needs 80 kg/ha N.

Ensure sufficient nitrogen up-front for good early biomass production. Target 100 to 150 kg/ha of starting nitrogen for winter wheats and canola. (Kirkegaard, 2019)

Where nitrogen is required it can be applied using a variety of placement techniques:

- broadcast in front of the seeder and incorporated at planting, or
- banded at planting below and to the side of the seed
- broadcast post-planting, ideally in front of 10 mm or more of rainfall.

Banding pre-plant is not recommended unless there is good soil moisture because of the potential loss of planting moisture. If broadcasting urea before or after planting, beware of nitrogen losses from volatilisation. In northern soils these losses can be in the range of 5.4 to 19%. (Schwenke et al, 2014)

Additional nitrogen can be applied post grazing through the growing season, depending on seasonal conditions. Nitrogen use efficiency can be improved by delaying topdressed urea post grazing until crop demand increases. (Kirkegaard, pers com 2019)

High nitrite or nitrate levels in forage may be an issue in both canola and wheat if:

- the crop is immature,
- growth has been slow due to frosts,
- the weather has been cold and cloudy, or
- there has been intermittent waterlogging.

Plants will continue to take up and accumulate nitrate during periods of slow growth and most of that plant nitrate is located in the bottom third of the stalk.

You can manage/reduce the risk of stock health issues with controlled grazing, including:

- offering carbohydrate in the diet
- avoiding grazing with hungry stock, and
- only grazing actively growing crops.

If the crop has been topdressed with urea after grazing and stock are to be re-introduced, allow the crop to regain leaf area and be actively growing first.

Lock up time, before DC30 in wheat and bud elongation in canola, can also be managed depending on commodity prices, residual biomass targets and seasonal conditions. (Kirkegaard, 2019)

Potassium

Cropping soils in the Central West NSW generally have more than adequate soil potassium (K) levels. As a result additional potassium is not required in the majority of soils.

Only 8 out of 1930 samples received at the Nutrient Advantage laboratory between January and June 2018 were below the critical 0-10cm soil test level of 64 mg/kg of available soil potassium for wheat and canola. (Brennan et.al, 2013)

Wheat forage has a high potassium (K) content of about three to four percent of dry matter and a very low sodium (Na) content, often less than 0.02 percent. This very high potassium to sodium (K:Na) ratio in wheat forage can reduce the absorption of magnesium in the gut of livestock and limit weight gains. (Dove et al, 2009).

When grazing wheat forages, supplementation with a 1:1 Causmag (magnesium oxide) and sodium chloride mix is recommended. (Dove et al, 2009)

At Incitec Pivot Fertilisers' Millvale grazing wheat trial in 2018, two whole top tissue samples were taken, one from the control plot and the other from an area in the trial where a chaff line was burnt four days pre plant. Table 4 shows the detailed analysis of the nutrient content from those two tissue tests. The K:Na ratio was 460 or 500 to 1, compared with an implied required ratio of 5-7 to 1. (Dove et al, 2009)

Table 4. Nutrients in Kittyhawk wheat tissues, Millvale grazing trial 2018

Total Nitrogen %	Nitrate mg/kg	Phosphorus %	Potassium %	Sulphur %	Calcium %	Magnesium %	Sodium %	Chloride %	K:Na Ratio
4.8	630	0.38	5	0.36	0.36	0.16	0.01	1.8	500
4.6	520	0.33	4.6	0.34	0.39	0.16	0.01	1.2	460

Source: Nutrient Advantage laboratory. Tissues sampled 6/6/2018.

Sulphur

As sulphur (S) is a dynamic nutrient which can come into the soil pool through mineralisation during the season and is mobile in soils, it should be included in the deep N sampling program.

In most areas, 0-10 cm sulphur levels are more than adequate for cereals. The KCl-40 S critical soil test values of 2.4 to 3.2 mg kg-1 can be used widely on soil types where soil sulphate is not leached during the growing season.

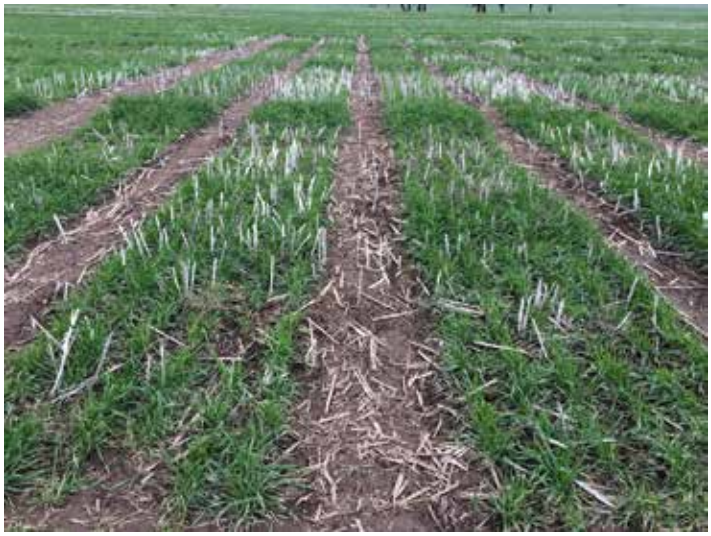
When KCl-40 S critical soil test values are less than 3.9 mg kg-1, or 31.0 kg ha-1 when using a sampling depth of 60 cm, for canola grown in NSW (Geoffrey et al, 2013) canola may respond to the application of sulphate sulphur.

Table 5. Distribution of results from sulphur tests in Central NSW, January to June 2018

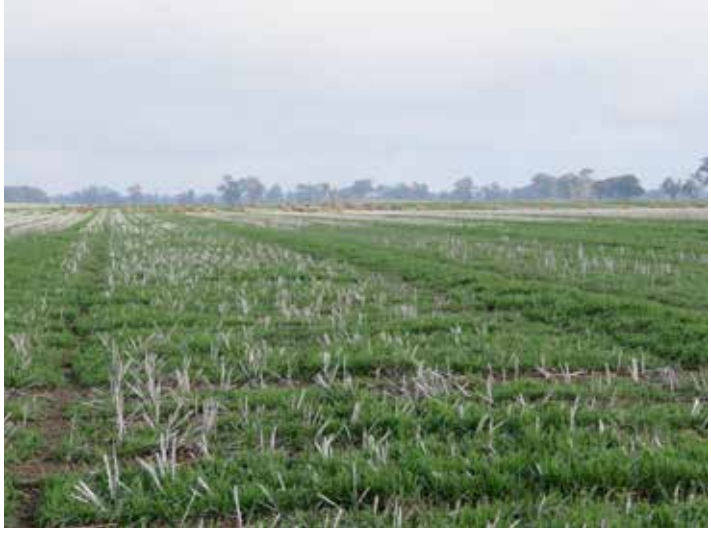
KCL 40S	<4 mg/kg	4-8 mg/kg	>8 mg/kg
% of samples	15%	40%	45%

Source: Nutrient Advantage laboratory, January to June 2018, from 1786 soil samples at 0-10 cm depth. These soil test values are for wheat and canola in Central NSW, contact your agronomist or adviser to discuss the critical values for your region.

For more information and advice about fertiliser programs for grazing cereal and canola crops this season, please contact me on 0427 006 047 or email jim.laycock@incitecpivot.com.au.



To get the best out of dual purpose crops, they need a good start with nutrition, particularly nitrogen and phosphorus.



Sheep grazing on Kittyhawk wheat at Incitec Pivot Fertilisers' trial site at Millvale, New South Wales, last year.

Further reading:

https://www.grdc.com.au/uploads/documents/GRDC_Dual-PurposeCrops.pdf

https://grdc.com.au/resources-and-publications/groundcover/ground-cover-supplements/ground-cover-issue-123-more-profit-from-crop-nutrition-2/foliar-phosphorus-topups-deliver-inconsistent-wheat-growth-responses

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