

THE BENEFITS OF INTEGRATED FERTILISER MANAGEMENT (IFM) FOR COTTON

Improved Fertiliser Efficiency for Modern Cotton Crops

Authorised for release by:

Dr Hooshang Nassery,
Head of Global Technical Group

What's in this Insight

This IN explains how an Integrated Fertiliser Management program (IFM) enables collaboration and interaction between seed, root and foliage to improve fertiliser efficiency in modern cotton crops.

A Brief Explanation of Modern Cotton

Bt Cotton is a genetically modified cotton crop that has one or two genes of a soil bacterium (*Bacillus thuringiensis*) inserted into the seeds of cotton.

Bt stands for the naturally occurring *Bacillus thuringiensis* that is found all over the world. Some types of Bt produce a protein that is toxic to insects. These protein crystals have been used in organic farming for over 50 years to control insects. The genes producing these proteins are now engineered so that transgenic plants can make the insecticidal protein in their cells protecting the crops against certain insects. In short, the transgene inserted into the plant's genome produces toxin crystals that the plant would not normally produce and when ingested by some insects, dissolves their gut lining, leading to the insect's death.



In Australia, the use of biotechnology in cotton has enabled the cotton industry to substantially reduce the use of environmentally damaging pesticides and herbicides. This has enabled cotton growers to reduce their insecticide use by almost 90% over the past decade.

With transgenic cotton varieties, it has been recorded by the CSIRO that using Bt cotton and Roundup Ready Flex cotton, growers now use over 85% less insecticides, 62% less residual grass herbicides and 33% less residual broadleaf weed herbicides. It is anecdotally reported that some crops have even grown successfully without being sprayed for insects at all.

Today Australia's cotton industry is almost entirely dependent on the growing of Bt cotton varieties. The industry has an annual export value of over \$1.5 billion for the production of fine count cotton yarns and these modern cotton varieties have been used by Australian growers since the late 1990s. Cotton was the first genetically modified crop to be grown in Australia and has delivered considerable economic, social and environmental benefits to Australian farmers.

Using Technology to the Best Advantage

RLF promotes the practice of Integrated Fertiliser Management (IFM) that employs seed and foliage in addition to roots for supplying nutrients to plants. This process allows collaboration and interaction between seed, root and foliage, resulting in improved fertiliser efficiency use that results in higher yield. And with a fertiliser program that utilises the three nutrient pathways available to plants, combined with the benefits of modern cotton varieties, the spraying routines can also be modified to deliver optimum benefit.

It is noted that the priming of cotton seed is not as easy as the priming of cereal seeds due to its impermeable and leathery seed coat, and that ginning may cause cracks in the seed coat to allow limited priming to occur. Most cotton growers therefore have adopted injection at sowing as an alternative to seed priming. Seed scarification can also be used as another means of making cotton seeds suitable for priming.



Priming the cotton seed in China

The priming of seed in Asian countries is still generally done manually, particularly for small-scale and collective farming enterprises, but it does give significant advantage for the grower.



After 40 days the early plant establishment comparison shows the effects of seed priming

What IFM Offers for both Dryland and Irrigated Cotton



An integrated approach can offer the following benefits:

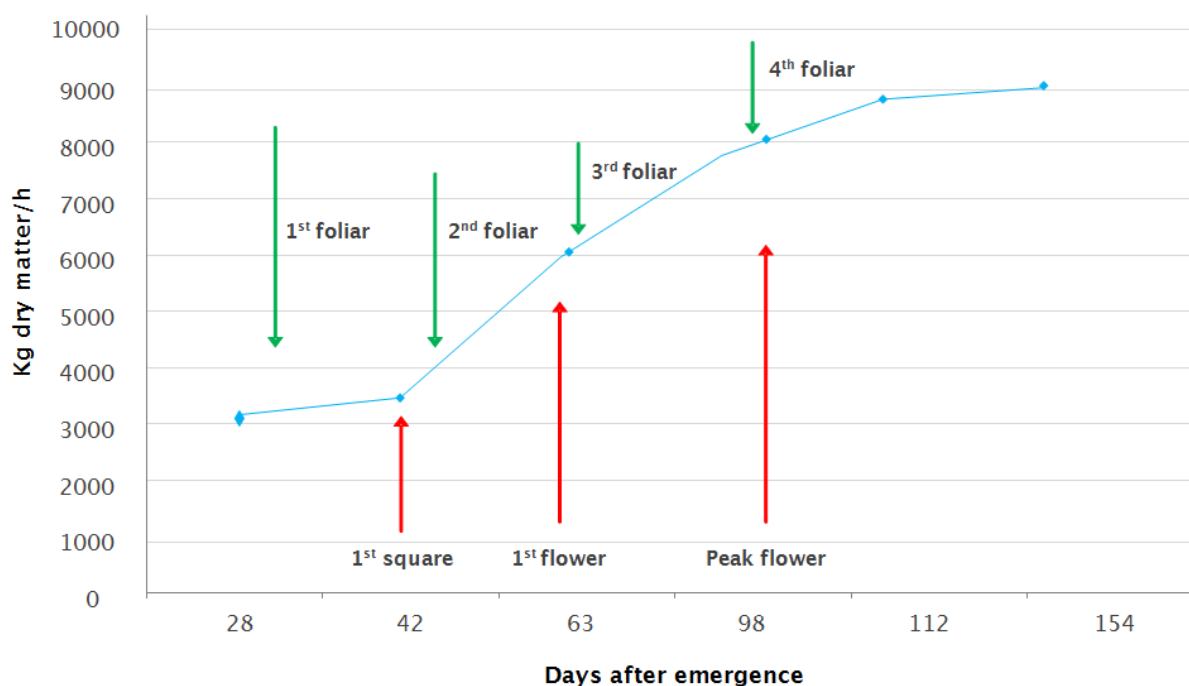
1. Due to the low content of available phosphorus and trace elements in cotton seeds, seed priming or injection results in better germination, vigour and yield potential.
2. Using seed, root and foliage to supply major and trace elements to plants, increases the efficiency of nutrient uptake and maintains crop nutrient balance.
3. Foliar spray and seed priming provides a near complete coverage and absorption, as opposed to soil application of fertiliser that is widely diluted, causing low uptake efficiency in most scenarios.
4. Foliar spraying benefits the crop most when nutrient supply through the soil is reduced, either voluntarily or due to drought or other limitations that reduce availability.
5. Applying a foliar spray such as RLF **Broadacre Max** with low biuret Urea stimulates root exudation of organic acids (e.g. citric acid) leading to the unlocking of phosphorus and trace elements.
6. Stimulated exudation of hydrogen ion results from foliar use of nitrogen, that forces the root system to pump out hydrogen ion in exchange for potassium to maintain the balance with nitrogen. This acidification is also a force for cell wall softening and root growth.
7. Adding potassium supplement such as RLF **KC30** to the tank mix where premature senescence (PMS) occurs prevents the incident of PMS. This is commonly observed in irrigated cotton where high levels of sodium and calcium in soil or irrigation water reduces potassium uptake.
8. The senescence of dryland cotton is more likely the result of suboptimal levels of trace elements and phosphorus, that slows down conversion of light to chemical energy resulting in photo-oxidation of chlorophyll. Therefore, foliar tank mixes having phosphorus, potassium and trace elements delays or prevents yellowing and PMS in dryland cotton.
9. Where premature senescence is known to occur due to low availability of potassium and/or high levels of sodium in soil or water, frequent foliar sprays of a **KC30** or **AcetaK** at 4L/h is required to prevent PMS and yield decline. **KC30** is compatible with **Broadacre Max**, while **AcetaK** is not compatible and it should be used when only potassium is required.
10. Manganese and zinc deficiencies are commonly associated with the yellowing of leaves where Roundup is commonly used, such as in Roundup Ready Flex Cotton (RRF Cotton), therefore foliar sprays with **Broadacre Max** takes care of such trace element deficiencies.
11. Dryland cotton benefits from IFM more than irrigated cotton, since nutrient deficiencies develop faster under dryland conditions.
12. Root mass and root surface area has a greater role in dryland cotton for water and nutrient uptake than irrigated cotton.



Typical Examples of Timings and Fertiliser Program

■ Timing

Projected dry matter production/hectare in a cotton field and timing of foliar spray of Broadacre Max and Potassium sources for prevention of premature senescence



■ Recommended Fertiliser Program

A typical RLF recommendation for irrigated and dry land cotton is shown in the following table

Product	Timing	Irrigated Cotton	Skip-row Dryland Cotton
Power NP+C	Injection at Sowing	10-20L/h	5-10L/h
Broadacre Max	20-30cm tall	2L/h, 30% banding	1L/h with 30% banding
Broadacre Max	First squaring	2L/h, 50% banding	1L/h with 50% banding
Broadacre Max+ KC30	First flower	3L/h, full cover	2L/h with full cover
KC30 or Aceta K	Full flower	3L/h full cover	

*KC30 is required at 3L/h on its own, or with **Broadacre Max** to prevent premature senescence (PMS)

The above timing is selected for best response to foliar fertiliser, however if tank mixing with other chemicals warrants fewer sprays, the spray timing and frequency is at the discretion of the grower.

The timing of the first and second spray has a bigger influence on yield potential, and that of third and fourth sprays has a greater impact in preventing PMS.



More about the Recommended RLF Products



1 specific product with 12 essential nutrients

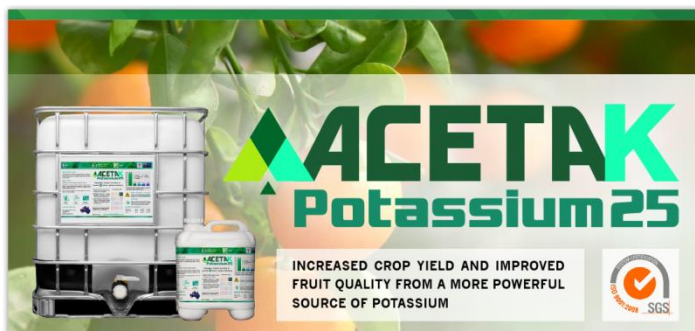
N	P	K	S	Mg	B
Nitrogen	Phosphorus	Potassium	Sulphur	Magnesium	Boron
Cu	Fe	Mn	Mo	Zn	Co
Copper	Iron	Manganese	Molybdenum	Zinc	Cobalt

Broadacre Plus Max Ultra Foliar is a High-analysis Broad-spectrum Solution (HBS) that applies nutrient delivery technology to deliver its nutrient package through the leaf. It is highly concentrated and applies the optimum amount of 12 nutrients with a single application. Because of this Broadacre Plus Max Ultra Foliar endows the plant with the ability to guard against soil nutrient variability and deficiency and ensures greater plant protection, increased growth and improved yield qualities.

Broadacre Plus Max Ultra Foliar is considerably more efficient, as the formulation is absorbed directly through the leaf cell walls and into the plant for immediate use. Unlike other foliar products it is not inhibited by the need to access the plant via the stomata.



[Click here to view this Product Brochure](#)



INCREASED CROP YIELD AND IMPROVED
FRUIT QUALITY FROM A MORE POWERFUL
SOURCE OF POTASSIUM

APPLICATION RATE

ACETA POTASSIUM 25 K

The application of AcetaK25 is calculated based on the volume of water used in foliar spray. This is generally in the range of 100-litres to 500-litres per hectare.

HIGHLY EFFECTIVE

BENEFITS

[Click here to view this Product Brochure](#)



VERSATILE SOURCE OF NUTRIENT WHEN
POTASSIUM DEMAND IS HIGH ESPECIALLY
FOR CEREAL AND FODDER CROPS

APPLICATION RATE

KC30 Potassium Citrate K

FOLIAR APPLICATION

	MIX	WATER	APPLY
Rice (all Cereals)	30x	4 to 6	1 to 2
Corn	with	Litres	times
Canola	water +	per	during
Dryland Pasture	phosphorus	hectare	
Hay			
Fodder Crops			

**EFFICIENT, EFFECTIVE
AND VERSATILE**

BENEFITS

KC30 is a single element liquid solution
delivering potassium to the crop as citrate

VEGETATIVE GROWTH PHASE

✓ Prevents potassium deficiency

[Click here to view this Product Brochure](#)



Fertiliser for Seeds

P	Mn	S	Cu	Zn	Mo
Phosphorus	Manganese	Sulphur	Copper	Zinc	Molybdenum

BSN SuperStrike is a Seed Priming Fertiliser that applies RLF seed delivery system (SDS) technology to imbibe the seed with a multi-nutrient formulation.

BSN SuperStrike is a High-analysis Broad-Spectrum Solution (HBS) that provides the optimum levels of seed nutrient required by the seed in a single application. It is easy to apply, and is fast becoming the new world standard for modern farming practice, where fertilising the seed is every bit as important as fertilising the plant.



[Click here to view this Product Brochure](#)



The content of this media page was accurate and current at the time that it was written. This media release is provided for interested customers and other parties, and will remain a matter of RLF's historical record. Viewed in this context RLF therefore undertakes no obligation to update either material or content.

