CRUCIAL

TECHGUIDE



Stay weed-free with Nufarm CRUCIAL. Offering superior performance all year round, it's Australia's no. 1 on hard to kill weeds.

Tailor-made for hard to kill weeds. 600 gram load & robust surfactant package deliver superior performance.

Most widely registered. No other herbicide comes close to Australia's own, CRUCIAL.

Market leading compatibility. Triple salt formulation creates the perfect backbone for your knockdown tank mix.

nufarm CRUCIAL®

WHAT DO FARMERS AND AGRONOMISTS VALUE IN A GLYPHOSATE FORMULATION?

- Efficacy
- Compatibility
- Registrations and year-round use
- Brownout
- Rainfastness & short spray-to-sow period
- High loading

Building a glyphosate formulation to be good at one task is straightforward. Adding more features into a formulation is difficult and often means compromises. A formulation may be strong for efficacy but struggle with compatibility.

Nufarm dual salt technology, developed in Australia, allowed more features to be built into a glyphosate formulation and overcome some of the challenges associated with traditional single salt products.

With CRUCIAL, we have taken it one step further. To build the most efficacious, compatible and widely registered glyphosate formulation, we have developed triple salt technology. No one salt or surfactant is the best, its how you combine them that matters.

Don't settle for less, CRUCIAL is Australia's number one on hard to kill weeds.

GLYPHOSATE - SALTS AND SURFACTANTS

Different glyphosate salts have different inherent characteristics, as do different surfactant systems. There is no one best salt or surfactant.

The performance of a glyphosate formulation is always a function of the salt overlayed with a partner surfactant system.

Getting one or a few attributes from a formulation is easy; Getting many attributes in a single formulation is extremely difficult. Hence the need for CRUCIAL's triple salt formulation.

WHAT IS CRUCIAL?

- Australian developed and field tested, world first triple salt formulation
- 600 g/L fully loaded formulation
- Potassium, monomethylamine, mono-ammonium salts
- Outstanding efficacy
- Excellent compatibility
- Widest registrations
- Year round use



EFFICACY MATTERS, FORMULATIONS MAKE THE DIFFERENCE.

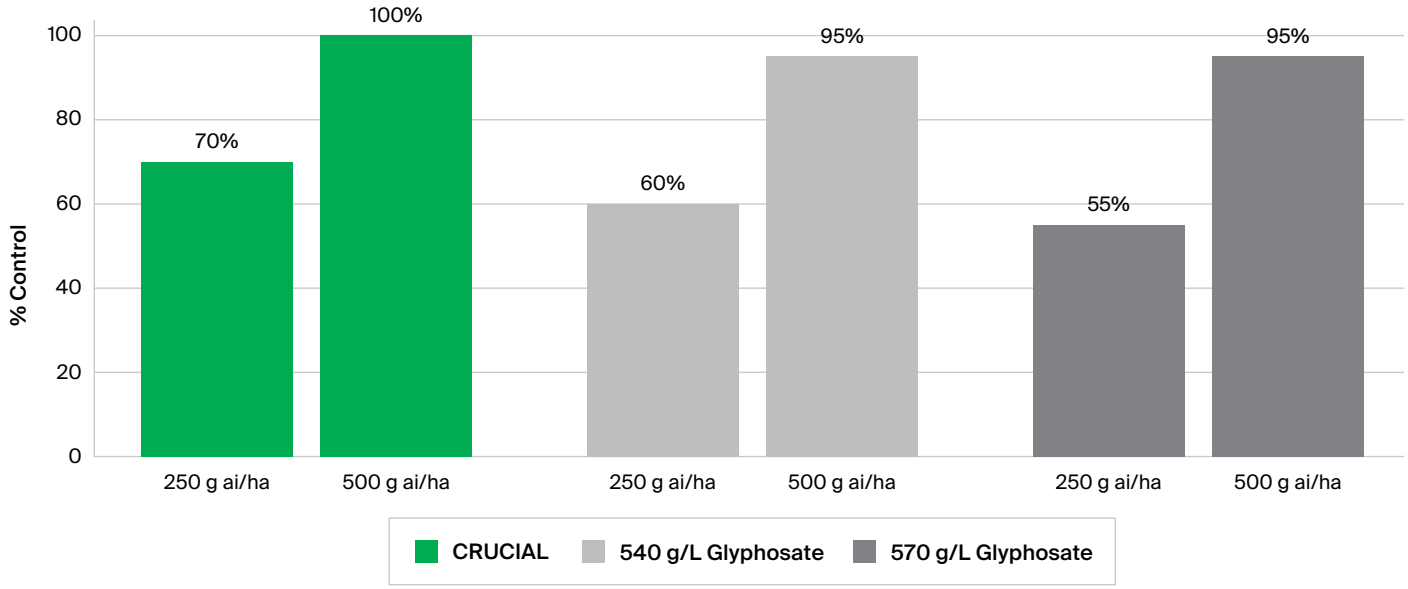
The combination of glyphosate salts and surfactants plays a key role in field performance. Formulations that are rapidly absorbed and effectively translocated within the plant generally provide superior weed control. In stressed weeds or weeds developing resistance, glyphosate movement is often reduced, limiting the amount that reaches the target site. Under these challenging conditions, differences in formulation performance become more pronounced.

Dr Peter Boutsalis and Dr Sam Kleeman from Plant Science Consulting tested CRUCIAL against other high load glyphosates, and compared the efficacy in controlling glyphosate resistant ryegrass.

"CRUCIAL was more effective on the strong resistant ryegrass biotype" **Dr Peter Boutsalis**

CRUCIAL EFFICACY

% Control resistant ryegrass (28 days after treatment)



HOW DOES GLYPHOSATE 450 COMPARE?

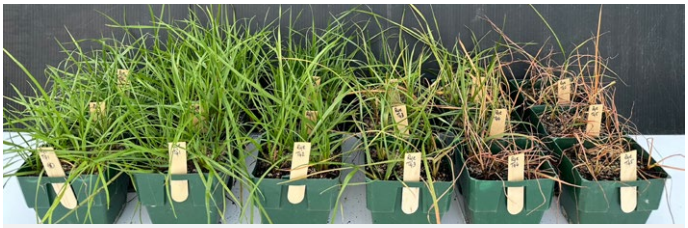
Using a good quality glyphosate 450 and a registered adjuvant can deliver great weed control. However when weeds get harder to kill, we can see differences. Stressed weeds, larger weeds and weeds developing glyphosate resistance can be tough. This is where CRUCIAL can offer improved control. The photo below compares the efficacy of CRUCIAL to Nufarm glyphosate 450 and Collide 700 adjuvant at equal rates on annual ryegrass with developing glyphosate resistance. Under these conditions, CRUCIAL has delivered improved efficacy. No adjuvant to worry about, less drums to shift and year round use. CRUCIAL is Australia's no.1 on hard to kill weeds.

CRUCIAL vs Glyphosate 450 + Collide 700

13 DAA, Gly R ARG, Z21-22 application, rates in g ai/ha



CRUCIAL



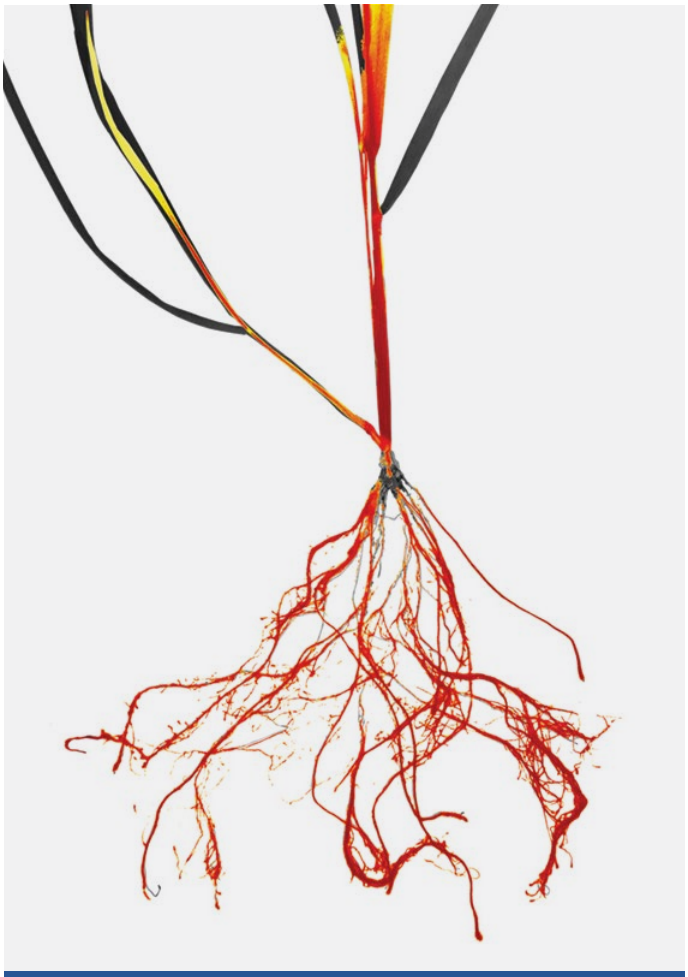
Nufarm Glyphosate 450SL

UPTAKE AND TRANSLOCATION DRIVES EFFICACY

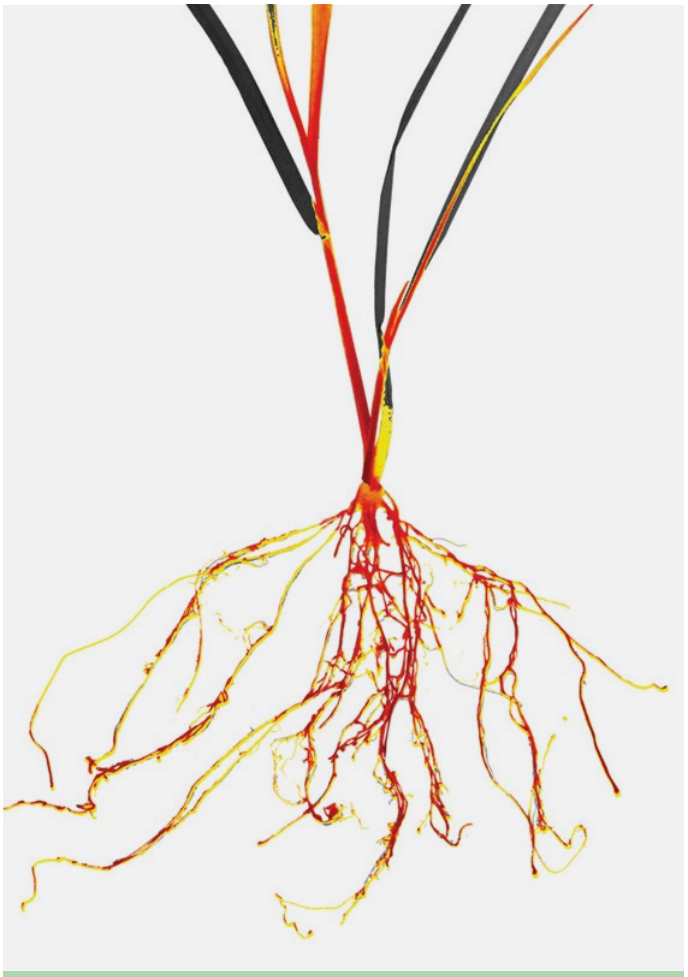
CRUCIAL penetrates the leaf and translocates fast, meaning fast brownout, short rainfastness, 1 hour spray-to-sow and the confidence of a great knockdown job – even with showers forecast or the seeder close behind.

A comparison of glyphosate formulations

Radio labeled glyphosate formulations applied to ryegrass and measured 24 hours later.



CRUCIAL



540 g/L Glyphosate

Concentration of glyphosate	Low → High

Both ryegrass plants were treated with radio labeled glyphosate at the same grams active. When X-rayed 24 hours later, we can see how fast the glyphosate formulations have entered the ryegrass and how far they translocated. Red colour indicates higher concentrations of glyphosate.

As can be seen, the CRUCIAL treated ryegrass shows much more red in the root system, demonstrating faster penetration, translocation and accumulation of glyphosate into the root system. Better translocation of CRUCIAL through the main leaf and tiller is also evident.

COMPATIBILITY

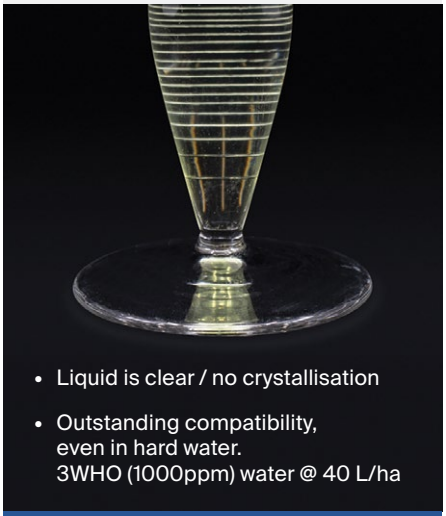
CRUCIAL features outstanding compatibility, with a wide range of tank-mix partners, supported by Nufarm lab testing.

CRUCIAL compatibility gives confidence across key knockdown and pre emergent herbicides, especially when compared to other high load glyphosate formulations. Single K salts can be challenging for tank mix compatibility. CRUCIAL'S unique triple salt formulation ensures good compatibility where other high loads struggle. CRUCIAL'S compatibility is unique, don't treat it as a single K salt formulation. Always follow the label for tank mix guidance.

CRUCIAL is fully loaded. No further adjuvant is required unless specified by a tank mix partners label.

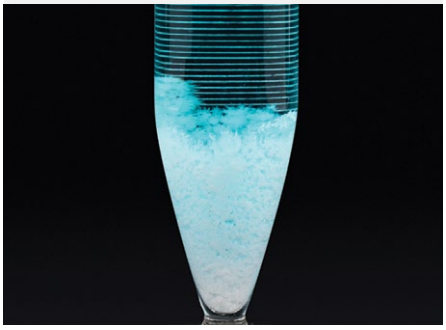
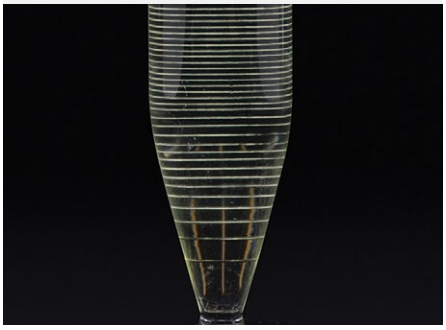
Compatibility testing

CRUCIAL demonstrated outstanding compatibility compared to other market-leading high-load glyphosate products. The compatibility lab trial below is just a small sample of the huge number of trials undertaken.

15 minutes	15 minutes	15 minutes
		
• Significant crystallisation	• Liquid is clear / no crystallisation • Outstanding compatibility, even in hard water. 3WHO (1000ppm) water @ 40 L/ha	• Significant crystallisation
540 Single K-salt glyphosate (1.5 L/ha) + Commonly used 625 2,4-D (1.34 L/ha)	**CRUCIAL (1.35 L/ha) + Amicide Advance 700 (1.2 L/ha)**	**Roundup UltraMAX K-salt glyphosate (1.43 L/ha) + Commonly used 625 2,4-D (1.34 L/ha)**

Fast forward 24 hours and the superior compatibility of CRUCIAL and Amicide Advance 700 is evident, with no change since agitation.

This highlights the compatibility advantage of CRUCIAL over other high load glyphosates, particularly single K salt 540 or 570 formulations. Both have continued to crystallise and salt out.

24 hours	24 hours	24 hours
		

CRUCIAL PHYSICAL COMPATIBILITY TESTING RESULTS

The below tests are conducted at low water rates to highlight compatibility. Always follow the label for water rates and tank mix compatibility. Higher water rates can improve compatibility.

- Products are listed in order of mixing
- All tested at 50L water per ha
- All water is hard water (3WHO - 1000ppm)

Products by name	Rate		Result
CRUCIAL	1.5	L/ha	✓✓
DROPZONE	1.7	L/ha	
Boxer Gold®	2.5	L/ha	✓
CRUCIAL	1.3	L/ha	
Sakura®	118	g/ha	✓
CRUCIAL	1.3	L/ha	
Triflur X®	3.0	L/ha	✓
CRUCIAL	1.3	L/ha	
Avadex Xtra®	3.2	L/ha	✓✓
CRUCIAL	1.3	L/ha	
Balance®	100	g/ha	✓
CRUCIAL	1.3	L/ha	
2,4-D Ester 680	800	mL/ha	✓
CRUCIAL	1.3	L/ha	
Rustler®	1	L/ha	✓
CRUCIAL	1.3	L/ha	
CRUCIAL	1.3	L/ha	✓✓
Kamba® 750	160	mL/ha	
Bromoxynil 200	1.5	L/ha	✓✓
CRUCIAL	1.3	L/ha	
Picloram 2,4-D	1.0	L/ha	✓✓
CRUCIAL	1.3	L/ha	
CRUCIAL	1.3	L/ha	✓✓
Amicide Advance® 700	1.2	L/ha	
Sentry®	50	g/ha	✓✓
CRUCIAL	1.3	L/ha	
Associate®	7	g/ha	✓✓
CRUCIAL	1.3	L/ha	
CRUCIAL	1.3	L/ha	✓✓
2,4-D Amine 475	1.7	L/ha	
Liase	2.0	% v/v	✓✓
CRUCIAL	1.3	L/ha	
Sakura	118	g/ha	✓✓
Avadex Xtra	3.2	L/ha	
CRUCIAL	1.3	L/ha	
Oxyfluorfen 240	150	mL/ha	✓✓
CRUCIAL	1.3	L/ha	
Collide® 700	0.1	% v/v	
Terrad'or	40	g/ha	✓✓
CRUCIAL	1.3	L/ha	
CanDo	0.5	% v/v	

Products by name	Rate		Result
Carfentrazone 600	32	mL/ha	✓✓
CRUCIAL	1.3	L/ha	
CanDo	0.5	% v/v	
Terrain Flow	730	mL/ha	✓
CRUCIAL	1.3	L/ha	
CanDo	0.5	% v/v	

✓✓ **Compatible with constant agitation**
- Tank mix good

✓ **Compatible with constant agitation**
- Tank mix may fail at high loads
- May have issues on standing (no agitation)

Guidelines for good tank mixing

1. Higher water rates (80 - 100L/ha) can improve tank mix compatibly.
2. Fill spray to tank to 70% before adding products. Flush probes or fill lines with clean water between products. Low mixing volumes and neat on neat product can cause compatibility issues.
3. Use Liase or if using granulated AMS, allow to dissolve fully (this may take up to 15 minutes). Undissolved granules often cause compatibility problems.
4. **Follow correct mixing order.**
5. Always maintain adequate agitation during application and use the tank mix promptly.
6. Batch tanks increase the risk of compatibility problems, due to some having variable agitation, low dilution of water and mix not being used immediately.
7. **DO NOT** use adjuvants or surfactants other than those recommended on the product label.
8. **Not all brands with the same active are compatible due to variations in formulations, only the brands listed have been tested.** Nufarm compatibility results have been undertaken with 1.3 L/ha CRUCIAL and the mix partner brands and rates on this page. Changing the ratio of this may affect compatibility.
9. **Mesh size – Do not use primary filters finer than 50 mesh or inline filters finer than 80 mesh. Nozzle filters should be removed and not used.**
10. Filters should be checked and cleaned after each tank load.

Due to variability in the compatibility and quality of WG/WDG herbicide formulations commonly used in Australia, Nufarm recommends undertaking a compatibility test prior to mixing high application rates of WG/WDG herbicide formulations with CRUCIAL. This testing should be undertaken with all products planned to be tank mixed. Most compatibility issues arise in mixes of 3 or more products. Nufarm does not support compatibility with brands other than those documented on the label and other marketing material.

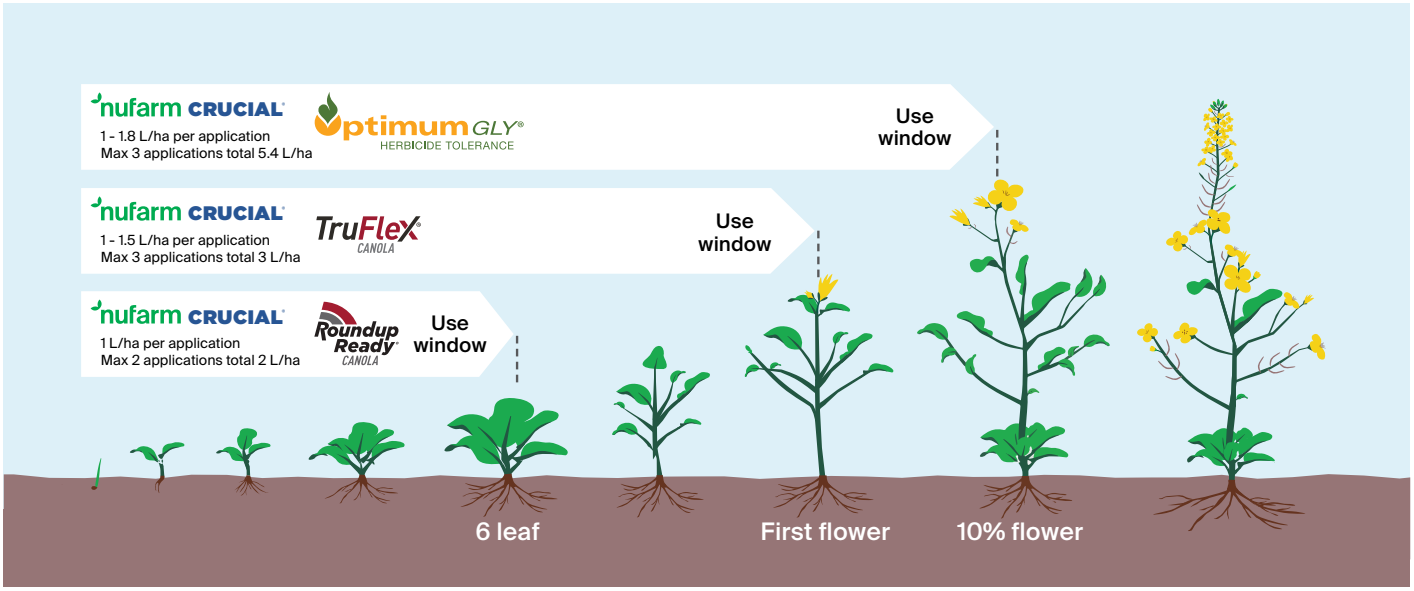
REGISTRATIONS

CRUCIAL has the widest range of registered label use patterns meaning you can have a simple, effective one drum solution for year round use.

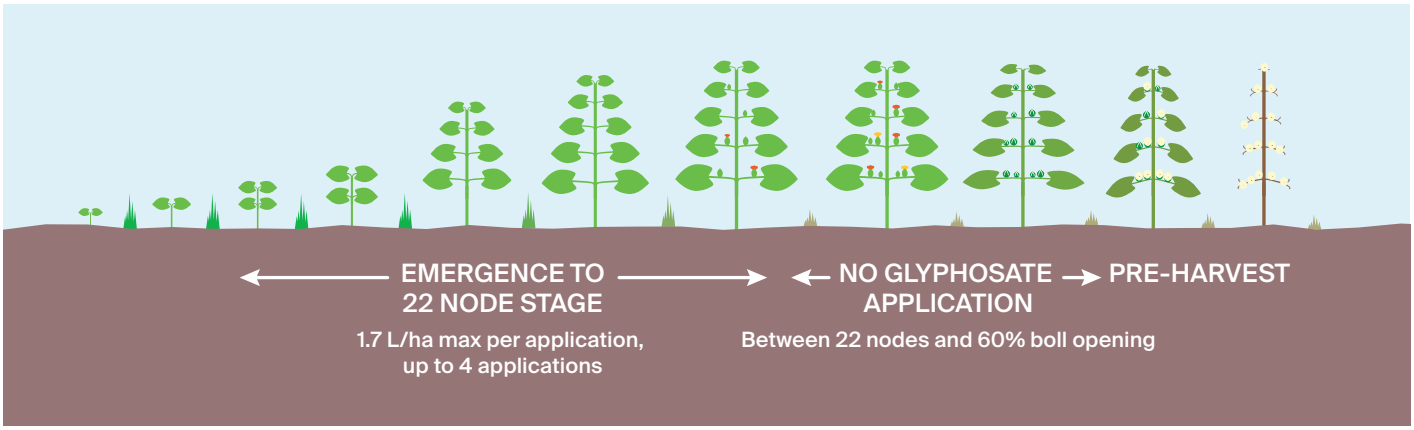
Key registrations include:

- Fallow and pre sow use
- Fleabane and sowthistle double knock's
- Roundup Ready, TruFlex and Optimum GLY canola
- Roundup Ready Flex cotton
- Pre harvest canola, wheat, barley, pulses, sorghum
- Optical spot spray technology
- Hay and silage
- Plus clear, simple label and compatibility section

APPLICATION ON GLYPHOSATE TOLERANT CANOLA



APPLICATION ON GLYPHOSATE TOLERANT COTTON



CRUCIAL. AUSTRALIA'S NO. 1 ON HARD TO KILL WEEDS.

CRUCIAL makes glyphosate simple, get all the features you need in a single formulation for year round use.

- Tailor-made for hard to kill weeds
- 600 gram load
- Triple salt and optimised surfactant package delivers superior performance
- Fully loaded, CRUCIAL needs no added adjuvant
- Most widely registered
- Market leading compatibility
- CRUCIAL is the perfect partner for year round use



For more information, contact your local Nufarm Business Development Manager

The information and recommendations set out in this brochure are no substitute for professional or expert advice and are based on tests and data believed to be reliable at the time of publication. Results may vary, as the use and application of the products is beyond our control and may be subject to climatic, geographical or biological variables, and/or developed resistance. To the maximum extent permitted by law, Nufarm Australia Limited disclaims all warranties of any kind, whether express or implied, including but not limited to any warranty that the information is up-to-date, complete, true, legally compliant, accurate, non-misleading or suitable.

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