

PRE-HARVEST HERBICIDE USE FACT SHEET

Stewardship for pre-harvest application of herbicides in winter crops

The responsibility to avoid herbicide residues in delivered cereal, pulse and oilseed grains sits squarely with grain growers and their advisers.

KEY POINTS

■ **CORRECT USAGE:** Product labels must be followed and withholding periods adhered to for all herbicides

■ **RESIDUES:**

- Application of herbicides close to harvest often will result in detectable residues present in harvested grain
- Maximum residue limits (MRLs) vary according to herbicide, crop and market. Compliance with Australian MRLs does not guarantee the grain will meet an importing country's MRL. It is important to know the destination of your grain and to check both domestic and importing countries' MRLs to determine what herbicides are permitted on that crop. Breaches of MRLs can lead to rejected grain both domestically and by the importing country
- Grain handlers and marketers regularly conduct surveillance on grain receivals for residues. The National Residue Survey also conducts ongoing residue testing of grain
- Late season herbicide use must strictly comply with the registered label to ensure Australian MRLs are not breached
- Growers should seek advice from their grain buyers before using late applications of herbicides. This is very important for seed that is intended for sprouting

■ **KEY REGISTRATIONS:**

- **Paraquat is not registered for use in cereal or canola crops**
- Barley: Diquat (e.g. Reglone®) and saflufenacil (Sharpen®) are the only herbicides registered for pre-harvest applications in both feed and malting barley. Roundup Ultra® Max is registered for use in barley (except malt barley). Growers must be aware that some barley maltsters have restrictions on all pre-harvest use of herbicides. Consult with buyers before use
- Registrations for glyphosate use on cereals and canola vary across different labels (see Table 2)
- Saflufenacil (Sharpen®) is registered for late-season application in pulses and cereals
- Paraquat (Gramoxone®) is registered for late-season application in winter pulses only.

■ **FOOD SAFETY:** Growers and their advisers need to be aware of the implications of their herbicide applications and the role they play in ensuring food health safety and in protecting the grains industry

■ **BE RESPONSIBLE:** Stewardship must be taken seriously by all sections of the grain value chain



Options for late-season herbicide use in barley are very limited (see Table 3).

Pre-harvest herbicide use

The application of herbicides late in the season to prevent weeds setting seed or to desiccate crops must be carried out with caution and in line with herbicide label recommendations. It is essential to check if these practices are acceptable to buyers, as in some situations markets have extremely low or even zero tolerance to some pesticide and herbicide residues.

There are three reasons to apply non-selective herbicides late in the season:

- to manage late season weeds;
- in-crop spray topping of weeds to prevent seed set; and
- for pre-harvest desiccation of the crop and weeds to accelerate or even-up ripening to assist with harvest.

Given the late timing of these applications, there is an increased risk that such uses may result in breaches of MRLs or impact on grain germination and seed quality if label directions are not completely followed.

In-crop spray-topping with paraquat or glyphosate in **pulse crops and pastures** is an effective strategy for controlling a range of annual grasses. It should be used as a tool with other integrated weed management (IWM) techniques such as cutting crops for hay, break crops and green and brown manuring. Timing of application and rates of product are crucial to maintaining crop yield while reducing seed set.

Aerial spraying

- Paraquat is not registered for aerial application
- Some formulations of glyphosate and diquat may be applied by air pre-harvest
- DO NOT apply treatments where drift onto sensitive crops and pastures is likely to occur.

Pre-harvest herbicide use in cereals

Only certain herbicides and specific formulations are approved for use on wheat, barley (see Tables 1, 2 and 3). For glyphosate, withholding periods and maximum application rates may vary across registered formulations. Always check individual labels before application.

While diquat has some activity on weeds at harvest, it is more suited to crop desiccation. **Even though diquat and saflufenacil are registered for use in all winter cereals, different barley maltsters have different policies on the acceptability of any late-season herbicides. Growers are encouraged to check with their barley buyer before applying any late-season herbicides to their malting barley crop.**

WARNING:

- **Grain handlers and marketers regularly conduct surveillance on grain receipts for residues. The National Residue Survey conducts ongoing surveillance of grain.**
- **It is essential that growers seek advice from their grain buyers before using late applications of herbicides. This is especially important for seed that is intended for sprouting.**
- **The malting barley industry has concerns about pre-harvest applications of herbicides to barley that may be sold as malt grade. Contact your buyer before any pre-harvest applications to malting grade barley.**

Pre-harvest herbicide use in canola

Diquat is registered for over-the-top pre-harvest applications in direct-headed canola (see Table 3). **Certain glyphosate formulations are now registered for use in under-the-cutter-bar spraying during windrowing or swathing operations and for use over the top to standing canola before direct heading or harvest (see Table 2).**

Registered herbicides

Tables 1, 2 and 3 provide details on registered product options for late-season weed control and desiccation in a variety of broadacre crops. Use of herbicides that are not registered for the particular use pattern is likely to be illegal (depending upon individual state law) and may result in growers and their advisers being exposed to the risk that their grain contains residues above the relevant MRL.

Paraquat and Spray.Seed® (paraquat/diquat) are not registered for pre-harvest application in cereal or oilseed crops and should not be used under any circumstances including in-crop spray-topping, pre-harvest canola desiccation or under-the-cutter-bar spraying during swathing or windrowing canola. These uses are illegal. Paraquat/diquat products (e.g. Spray.Seed®) are not registered for pre-harvest use in pulse crops.

Wheat: Glyphosate, diquat and saflufenacil are registered. Registrations for individual glyphosate formulations vary. Always check the label.

TABLE 1: Summary of registrations for pre-harvest herbicide use by selected crop type. Always check product labels before application. See Table 2 for additional details.

	Paraquat	Diquat	Glyphosate	Saflufenacil
Wheat	X	✓	✓	✓
Barley	X	✓	#	✓
Canola	X	✓	✓	X
Chickpea	✓	✓	✓	✓
Faba bean	✓	✓	✓	✓
Field pea	✓	✓	✓	✓
Lentil	✓	✓	✓	✓
Lupin	✓	✓	#	✓

✓ = registered for pre-harvest use; X = not registered for use
= Limited number of products registered, check label prior to use.

Barley: The only products currently registered for use pre-harvest in all barley varieties are diquat and saflufenacil. **Paraquat is not registered for use in any barley varieties and must not be used.**

Glyphosate, there are a limited number of products registered for pre-harvest use on feed barley crops (not malting barley). For example, Roundup Ultra® Max, Crucial® and weedmaster® DST®. Always check the label directions prior to use for rates and withholding periods.

Canola: Diquat and certain glyphosate formulations (see Table 2) are registered for use in canola.

Pulses: Glyphosate, diquat and paraquat are registered for late-season uses in many pulse crops (Table 3). Pulse registrations and withholding periods vary between product labels.

Saflufenacil is also registered for pre-harvest use in a range of pulse crops when applied in a mix with registered rates of glyphosate or paraquat.

TABLE 2: Examples of glyphosate formulations registered for use in wheat, canola and barley.

Example product	Maximum application rate		Withholding period		
	Wheat and canola	Barley	Wheat	Canola*	Barley
Roundup Ultra® Max	3.4L/ha (1938gai/ha)	1.65L/ha (940gai/ha)	5 days	Nil when used as directed	7 days
Crucial®	3.2L/ha (1920gai/ha)	1.54L/ha (924gai/ha)	5 days	5 days (application to standing crops)	7 days
weedmaster® DST®	4.1L/ha (1927gai/ha)	1.9L/ha (893gai/ha)	5 days	5 days (application to standing crops)	7 days
Most other glyphosate formulations	Wheat ONLY: Use rate varies with formulation. (Maximum registered rate is ~975gai/ha)	Not registered	7 days	Not registered	Not registered

*Canola: DO NOT apply after completion of the windrowing process.

Application can also be made at the time of windrowing (windrow equipment fitted with spray booms).

TABLE 3: Product registrations for pre-harvest weed control and desiccation VARY by crop type.

Always check product labels (NOTE: Paraquat/diquat products, for example Spray.Seed®, are not registered for pre-harvest weed control or desiccation).

Crop	Paraquat	Diquat	Glyphosate	Saflufenacil
Wheat	<p>Paraquat is not registered for:</p> <ul style="list-style-type: none"> - in-crop spray topping; - pre-harvest crop desiccation; - pre-harvest weed control. <p>These use patterns are unregistered.</p> <p>DO NOT USE PARAQUAT PRODUCTS FOR THESE USE PATTERNS</p>	<p>Winter cereals – pre-harvest weed control (all states):</p> <p>Spray as soon as the crop is mature and ready for harvesting.</p> <p>Under wet spring conditions crops can periodically become infested with weeds that seriously interfere with harvest operations. Diquat will control these weeds allowing for efficient harvest.</p> <p>WHP: NOT required when used as directed.</p> <p>Wetting agent: Add Agral® at the rate of 200mL/100L or BS1000 (or equivalent) at 160mL/100L of prepared spray unless otherwise specified.</p>	<p>Not all glyphosate formulations are registered for this use</p> <p>Apply to mature crop from late dough stage (28 per cent moisture) onwards. The higher rate will be required when crops are heavy and leaf shading effects may occur.</p> <p>DO NOT use on crops intended for seed or sprouting.</p> <p>Where wheat is grown in rotation with any herbicide-tolerant crop, management should be consistent with implementation of any management plan for herbicide-tolerant crops.</p> <p>WHP: DO NOT harvest within 7 days of application.</p> <p>Certain glyphosate formulations can now be applied at higher-use label rates in wheat with a 5-day harvest withholding period (see Table 2).</p>	<p>DO NOT apply before growth stage Z71 (watery ripe where first grains have reached half their final size) and DO NOT apply after growth Z83 (early dough).</p> <p>In order to guarantee good coverage it is recommended to apply at minimum 100L/ha volume.</p> <p>ALWAYS apply with 1% v/v Hasten® Spray Adjuvant or high-quality methylated seed oil (MSO).</p> <p>WHP: NOT required when used as directed.</p>
Barley	<p>Paraquat is not registered for:</p> <ul style="list-style-type: none"> - in-crop spray topping; - pre-harvest crop desiccation; - pre-harvest weed control. <p>These use patterns are unregistered.</p> <p>DO NOT USE PARAQUAT PRODUCTS FOR THESE USE PATTERNS</p>	<p>Winter cereals – pre-harvest weed control (all states):</p> <p>Spray as soon as the crop is mature and ready for harvesting.</p> <p>Under wet spring conditions crops can periodically become infested with weeds that seriously interfere with harvest operations. Diquat will control these weeds allowing for efficient harvest.</p> <p>WHP: NOT required when used as directed.</p> <p>Wetting agent: Add Agral® at the rate of 200mL/100L or BS1000 (or equivalent) at 160mL/100L of prepared spray unless otherwise specified.</p>	<p>NO glyphosate products are approved for use on malt barley.</p> <p>For all other barley types (except malt):</p> <p>Roundup Ultra® Max, Crucial® and weedmaster® DST®.</p> <p>Apply to mature crops from late dough stage (25% moisture) onwards.</p> <p>DO NOT apply more than one treatment per crop.</p> <p>DO NOT harvest within 7 days after application.</p> <p>DO NOT apply if heavy rains are imminent.</p> <p>DO NOT use on crops intended for seed or sprouting.</p>	<p>DO NOT apply before growth stage Z71 (watery ripe where first grains have reached half their final size) and DO NOT apply after growth Z83 (early dough).</p> <p>In order to guarantee good coverage, it is recommended to apply at minimum 100L/ha volume.</p> <p>ALWAYS apply with 1% v/v Hasten® spray adjuvant or high-quality methylated seed oil.</p> <p>WHP: NOT required when used as directed.</p>
Canola	<p>Paraquat is not registered for:</p> <ul style="list-style-type: none"> - in-crop spray topping; - pre-harvest crop desiccation; - under-the-cutter-bar spraying during swath or windrowing activities; - pre-harvest weed control; - spraying over the top of swaths or windrows <p>These use patterns are unregistered.</p> <p>DO NOT USE PARAQUAT PRODUCTS FOR THESE USE PATTERNS</p>	<p>Pre-harvest crop desiccation (all states):</p> <p>Spray when 70% of the pods are yellow and the seeds are brown or bluish and pliable. Canola ripens unevenly and is prone to pod shatter and seed loss. Direct harvest 4–7 days after spraying.</p> <p>WHP: DO NOT harvest for at least 4 days after application.</p> <p>Wetting agent: Add Agral® at the rate of 200mL/100L or BS1000 (or equivalent) at 160mL/100L of prepared spray unless otherwise specified.</p>	<p>Certain glyphosate formulations are registered for pre-harvest use in canola (see Table 2).</p> <p>Apply to mature standing crop from early senescence (minimum of 20% seed colour change to a dark brown/black colour from within the crop) before windrowing or direct harvest. Use the higher label rate when crops or weeds are dense and/or where faster desiccation is required.</p> <p>DO NOT use on crops intended for seed.</p> <p>Withholding periods may apply. Refer to the label.</p> <p>DO NOT overspray windrows.</p> <p>DO NOT apply to standing crops and again at the time of windrowing.</p> <p>Refer to the complete label and critical comments section.</p>	<p>Saflufenacil is highly damaging to canola and is not registered for any use patterns. DO NOT USE.</p>
Chickpea Faba bean Field pea Lentil Pigeon pea+ Lupin Vetch% Adzuki bean^ Cowpea^ Mungbean~ Soybean	<p>Spray-topping to reduce seed set – annual ryegrass.</p> <p>Chickpea/faba bean/field pea/lentil/lupin/vetch: Spray the crop when the ryegrass is at the optimum stage, that is when the last ryegrass seed heads at the bottom of the plant have emerged and the majority are at or just past flowering (with anthers present or glumes open) but before haying off is evident – usually October to November.</p> <p>Use of the higher registered rate in these crops is usually more reliable and gives a greater reduction in seed set.</p> <p>Reduction in crop yield may occur especially if the crop is less advanced relative to the ryegrass, that is if crops have a majority of green immature pods. The higher rate may also increase any yield reduction. In practice crop losses in excess of 25% may occur.</p> <p>WHP: DO NOT harvest for 7 days after application.</p>	<p>Pre-harvest crop desiccation (all states):</p> <p>Dry bean/dry pea/pigeon pea/lentil/chickpea/faba beans/lupin: Spray as soon as the crop has reached full maturity. Helps overcome slow and uneven ripening and weed problems at harvest.</p> <p>Soybean: Spray when 80% of the pods are yellow/brown and the seeds are ripe – yellow and pliable.</p> <p>Mungbean: Apply when 80% to 90% of pods are black or brown.</p> <p>WHP: NOT required for dry beans, dry peas, mungbeans when used as directed.</p> <p>Lentils/chickpea/faba bean: DO NOT harvest for 2 days after application.</p> <p>Pigeon pea, soybean: DO NOT harvest for 4 days after application.</p> <p>Wetting agent: Add Agral® at the rate of 200mL/100L or BS1000 (or equivalent) at 160mL/100L of prepared spray unless otherwise specified.</p>	<p>Not all glyphosate formulations are registered for these uses.</p> <p>Field pea/faba bean: Pre-harvest application to reduce viable seed set of annual ryegrass.</p> <p>Adzuki bean*/chickpea*/cowpea*/faba bean*/field pea*/lentil*/lupin*/mungbean*/soybean*: Pre-harvest application to desiccate a crop as a harvest aid and weed control – annual weeds.</p> <p>Chickpea*: Glyphosate + metsulfuron tank mix for pre-harvest application as harvest aid and weed control – annual weeds (selected formulations only – check individual labels).</p> <p>WHP: DO NOT harvest within 7 days of application.</p> <p>Refer to label for specific timings.</p> <p>*Application to crops intended for seed production or for sprouting may reduce germination percentage to commercially unacceptable levels.</p>	<p>Desiccation timing:</p> <p>Faba bean: Hilum black in the pods at the top of the canopy (30-80% of pods ripe and dark).</p> <p>Field pea: 30% seed moisture or when lower 75% of pods are brown with firm seeds and leathery pods</p> <p>Chickpea: 80-85% of pods within crop have turned yellow-brown</p> <p>Lentil: just after crop starts to yellow (or senesce)</p> <p>Narrow leaf lupin: at 80% leaf drop.</p> <p>Apply to direct harvested lupins only. Application before windrowing will result in severe loss of grain yield.</p> <p>Early applications other than described above may result in grain yield penalties.</p> <p>In order to guarantee good coverage, it is recommended to apply at minimum 100L/ha volume.</p> <p>May have a negative effect on lentil germination. Do not use on lentil crops for seed production.</p> <p>ALWAYS apply saflufenacil with 1% v/v Hasten® spray adjuvant or high-quality methylated seed oil.</p> <p>WHP: DO NOT harvest for 7 days after application.</p>

% Paraquat only ^ Glyphosate only + Diquat only ~ Glyphosate and diquat only

FREQUENTLY ASKED QUESTIONS

If I can't effectively control ryegrass in cereals – particularly in barley – by in-crop spray-topping, what are the other options?

- Windrowing barley to control ryegrass has been partially successful with up to 60 per cent ryegrass control when carried out when the barley is at firm dough stage (kernel no longer splitting when pinched, but leaving an indent). However, windrowing usually results in some yield loss against the standing crop due to pickup inefficiency.
- Herbicides of alternative modes of action should be considered as part of a grower's IWM strategy, particularly the use of herbicides incorporated by sowing (IBS).
- Baling the crop can offset some of the costs, particularly when demand for hay is high. This can be complemented with a pre-harvest/prior to cutting application of a registered herbicide to stop crop regrowth, improve seed-set control and weed control/regrowth.
- Spray following of areas with the heaviest infestation is another option.
- Use harvest weed seed control such as chaff carts, seed impact mills, narrow windrow burning, bale direct and chaff decks. Growers may need to investigate the use of contractors or hire of machinery for this exercise.
- Well-managed burning of concentrated windrows containing weed seed is another option.
- Grow a pulse or canola crop the following year to provide further options.

What is an MRL?

- In Australia, the Australian Pesticides and Veterinary Medicines Authority (APVMA) sets maximum residue limits (MRL) for use of agricultural and veterinary chemicals in agricultural produce, particularly produce entering the food chain. These MRLs are set at levels that are not likely to be exceeded if the agricultural or veterinary chemicals are used in accordance with an approved label instruction. At the time that the MRLs are set, the APVMA undertakes a dietary exposure evaluation to ensure that the levels do not pose an undue hazard to human health. Keeping an accurate spray diary and adhering to recommended application timing and spray intervals as per the label is crucial. Note that overseas MRLs are set by the relevant country and may differ from Australian MRLs.

What are the responsibilities of agronomists in providing advice on late-season herbicide use?

- This depends on where you are located. Some states have provision to share the liability with the grower. The agronomist providing advice assumes liability for any advice given. Growers, under state laws, also assume liability as they are the actual user.

USEFUL RESOURCES

Information about MRLs and permitted use can be found at:

www.pestgenie.com.au; and
www.apvma.gov.au

Syngenta Australia Customer Service 1800 022 035

BASF Customer Service 1800 558 399

Bayer Customer Service 1800 804 479

Nufarm Customer Service 1800 997 678 / 1800 131 964

Spraywise www.spraywisedecisions.com.au

Syngenta's Agri-CAST Spray Window Forecasting Tool
www.syngenta.com.au/weather

Vendor declarations www.graintrade.org.au/contracts

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