APVMA final decisions on paraquat and diquat explained

What the decisions mean for Australian horticultural growers

Key messages

The APVMA has completed its reviews of paraquat and diquat. This includes the familiar trade name products:

- GRAMOXONE 250 HERBICIDE (Paraquat 250 g/L)
- GRAMOXONE 360 PRO HERBICIDE (Paraquat 360 g/L)
- SPRAY.SEED 250 HERBICIDE (Paraquat 135 g/L + Diquat 115 g/L)
- REGLONE NON-RESIDUAL HERBICIDE (Diquat 200 g/L)

As well as the many other registered products containing paraquat and diquat.

Paraquat and diquat products have not been completely banned.

However, the final decisions have severely restricted use in horticultural crops:

- Complete removal of use in existing orchards and bananas
- Very significant reduction in use in vegetables
- Removal of use in potato haulm desiccation;
- Substantially reduce maximum rates for some retained uses;
- Restrict some uses to spot spray application only;
- Prohibit or restrict particular application equipment, including removal of backpack style sprayers to reduce exposure to workers to acceptable levels;
- Require closed mixing and loading to reduce exposure to workers;
- Introduce stronger personal protective equipment, re-entry and spray-drift controls; and
- Require new labels to replace existing labels.

For growers, the practical question is not simply whether paraquat or diquat remains registered. It is whether the specific product, crop, weed, rate and application method required by the grower remains on the revised product labels.

See below for the final acceptable use situations that have been approved.

Growers can still use existing products with old labels until 22 June 2028. Growers must only use the products in accordance with the labels on the product they have. Once new products and labels arrive, the new label instructions must be followed.

Contents

1. Summary of APVMA approved label uses for paraquat & diquat products

Very few uses related to the horticultural industry were found acceptable due to the high application rates and associated high risks to the environment and users. **ONLY the following uses remain approved. Always check the label of the product you have and follow those instructions.**

The following label sections are taken from a variety of registered product labels but note the instructions will be consistent across all products with the same active constituent/s and concentrations.

360 g/L PARAQUAT products e.g. Gramoxone 360 Pro

No horticultural uses. The following situations may be useful to growers:

Crop Use or Situation	Weeds	State	Rate/ha	Critical Comments
Crop, Pasture or Fallow Establishment **Aid to Cultivation** to minimise cultivation and prepare a clean bed for sowing	Wild Oats at 2 to 5 leaf stage in autumn/winter	Qld, Vic, Tas, SA, WA, NT only	420 mL to 560 mL plus adjuvant	Apply by ground boom only. Where cultivation follows spraying, it may commence 1 hour after spraying but should be completed within 7 days. Where heavy weed growth is present at spraying, a better seed bed will result if cultivation is delayed 3 to 5 days. **Pasture**: Remains of old pasture should be reduced by continuous heavy grazing. Remove stock 3 to 5 days before spraying to allow weeds to freshen up. Refer to Adjuvant section under GENERAL INSTRUCTIONS.
		NSW, ACT only	420 mL plus adjuvant	

Non-Agricultural situations, around sheds, roadways, paths	Annual weed control	All States	1.1 to 2.78 L/ha OR 140 mL/100 L plus adjuvant	Apply by mechanically pressurised hand wand only. **DO NOT** use more than 10L of undiluted product per day. Spray to thoroughly wet weed growth. QUANTUM PARAQUAT 360 SL HERBICIDE can be combined with soil residual herbicide simazine to give rapid knockdown and prolonged weed control. Use the higher rate for dense weed growth. Refer to Adjuvant section under GENERAL INSTRUCTIONS.
Firebreaks	Annual grasses and broadleaf weeds	All States	1.1 L to 2.78 L plus adjuvant	Apply by mechanically pressurised hand wand only. **DO NOT** use more than 10L of undiluted product per day. Knock down weed growth to eliminate fire hazard or assist firebreak burn. Apply mid-winter to early summer. Use the higher rate for dense weed growth. After desiccation is complete the sprayed area may be burnt (normally 7 to 10 days after spraying). QUANTUM PARAQUAT 360 SL HERBICIDE can be combined with soil residual herbicide simazine to give rapid knockdown and prolonged weed control. Refer to Adjuvant section under GENERAL INSTRUCTIONS.

250 g/L PARAQUAT products e.g. Gramoxone 250

Crop Use or Situation	Weeds	State	Rate/ha	Critical Comments
Crop, Pasture or Fallow Establishment Aid to Cultivation to minimise cultivation and prepare a clean bed for sowing	Wild Oats at 2 to 5 leaf stage in autumn/winter	Qld, Vic, SA, Tas, NT only	600 to 800 mL	Apply by ground boom only. Where cultivation follows spraying, it may commence 1 hour after spraying but should be completed within 7 days. Where heavy weed growth is present at spraying, a better seed bed will result if cultivation is delayed 3 to 5 days. Wild oats must have at least two leaves. Pasture: Remains of old pasture should be reduced by continuous heavy grazing. Remove stock 3 to 5 days before spraying to allow weeds to freshen up.
		NSW, ACT only	600 mL	
Non-Agricultural situations, around sheds, roadways, paths	Annual weed control	All States	* 1.6 to 4 L/ha or 200 mL/100 L	Apply by mechanically pressurised hand wand only. **DO NOT** use more than 15L of undiluted product per day. Spray to thoroughly wet weed growth. FlexAg Paraquat 250 Herbicide can be combined with soil residual herbicides Simazine 900WG or Atrazine 900WG to give rapid knockdown and prolonged weed control. Use the higher rate for dense weed growth.
	Columbus grass	NSW only	*Spot spraying 160 mL/100 L plus 1 L flupropanate (745 g/L)	
Firebreaks	Knock down weed growth to eliminate fire hazard or assist firebreak burn	All States	1.6 to 4 L	Apply by mechanically pressurised hand wand only. **DO NOT** use more than 15L of undiluted product per day. Apply mid-winter to early summer. Use the higher rate for dense weed growth. After desiccation is complete the sprayed area may be burnt (normally 7–10 days after spraying). FlexAg Paraquat 250 Herbicide can be combined with soil residual herbicides Atrazine 900WG or Simazine 900WG to give rapid knockdown and prolonged weed control.

PARAQUAT + DIQUAT products e.g. Spray.Seed

PUBLIC SERVICE AREAS, RIGHTS OF WAY, SPOT SPRAYING

Crop/Situation	Weeds Controlled	Rate/100L High volume or power sprayer	State	Critical Comments
Public Service areas, Rights of Way Market Gardens and Nurseries (spot spray only)	Most annual grasses and broadleaved weeds	240 to 320 mL (a) see below	All States	Thoroughly wet plant foliage. Use the high rate for dense more established weed growth. Repeat treatment on regenerated green perennial weeds (such as paspalum and docks) while plants are weakened from previous treatment. Addition of oxyfluorfen (240g/L) at 250 mL/ha will improve control of small flowered mallow, evening primrose and other weeds sensitive to oxyfluorfen. Refer to the oxyfluorfen label. **Note:** Spot spray rate assumes 1000 L water/ha. For lower water volumes increase dilution rate as below: Water volume 250 L/ha: use 960 to 1280 mL/100L Water volume 500 L/ha: use 480 to 640 mL/100L Water volume 750 L/ha: use 320 to 430 mL/100L
Pre-crop emergence weed control - vegetable crops (spot spray only)				Prepare seed bed as long as possible before sowing to permit maximum weed germination. Spray the weeds, wait until they have dried off and then sow. If further weed germinations occur before crop emerges, spray again but at least 3 days before crop emerges. Spray when weeds are growing vigorously and not covered with soil or dust, or wilting due to dry conditions. When rain follows dry conditions allow 7 days for weed growth to commence before spray application. See Note on Spot spray rate above.
Potatoes – (spot spray only)		240mL (a) see below		After planting and hilling up, wait until 10 to 15% of potato shoots are emerged then spray with Paraquat Diquat 250 Herbicide. Emerged potato shoots will suffer a marginal leaf burn but will quickly recover. See Note on Spot spray rate above.
Wetting agent: (a) Add 100 mL BS 1000 per 100L				

NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION.

200 g/L DIQUAT products e.g. Reglone Non-residual

GENERAL WEED CONTROL

Crop	Weeds	States	Rate Δ	Critical Comments
Asparagus	Broadleaf weeds	All states	1.4 L/ha plus 800 mL Agral in 400 L water	Apply to control seedling weeds before spears have emerged.
Hops	Annual broadleaf and grass weeds	Vic, Tas only	700 mL to 1.4 L/ha Δ may be mixed with 1.1 kg Gesatop® Granules	Apply as a directed inter-row spray prior to crop emerging from winter dormancy, using a minimum of 250 L/ha spray volume to ensure good and even coverage of weeds.
Infested Areas	Cotton Thistle (*Onopordum acanthium*)	Tas only	300 mL/ha plus 150 mL Agral in 100 L water	Spot spray at the rosette stage before the centre shoot is 15 cm tall. The spray should be applied to give complete wetting of the leaf surface. DO NOT use a lower rate or treat at a later growth stage.
	Saffron Thistle	All states	2.8 L/ha plus 1 L Agral in 200 L water	Apply as an overall treatment to prevent seeding.
Lucerne	Capeweed and *Erodium* spp.	All states	350 mL/ha Δ in 200 L water	Early autumn application. Heavy grazing is necessary to reduce Lucerne to 2 cm in height before spraying.
			700 mL/ha Δ in 200 L water	Late winter application. Heavy grazing is necessary to reduce Lucerne to 2 cm in height before spraying.

Berries and other small fruit (except grapes)	Broadleaf weeds	All states	1.4 L/ha[Δ]	Seedling weeds	Apply as a blanket spray prior to crop emergence. Once crops have emerged, or seedlings have been transplanted, apply as a shielded spray between crop rows. Do not allow spray to contact any part of the crop.
Broccoli, head cabbages, cauliflower and Chinese cabbage (type Pe-tsai)					
Bulb onions					
Fruiting Vegetables: other than cucurbits					
Cucumbers					
Leafy vegetables					
Legume vegetables					
Root and tuber vegetables					
Wheat, Oats	Capeweed	Qld, NSW, Vic, Tas, SA only	550 mL/ha in 200 L of water	Small seedlings. **Do not add wetting agent**. Spray when the crop is between the 4 (wheat) or 3 (oats) leaf and early tillering stage.	
NOTE: Use higher rate for dense or weedy crops. [Δ] WETTING AGENT: Add Agral at the rate of 200 mL/100 L or BS1000* at 160 mL/100 L of prepared spray unless otherwise specified.					

OTHER IMPORTANT CHANGES

Please take note of:

- New label restraints relating to safe handling for the user
- New Spray Drift restraints including no-spray buffer zones
- New trade advice regarding export of produce to countries without suitable MRLs
- New re-entry periods for workers entering treated fields
- New Safety Directions for users

Spot spraying and Optical Sprayer rates

There are no specific rates for optical sprayers.

Many label situations are now reduced to SPOT SPRAY ONLY and in this case the APVMA has issued the rates in /100L rather than hectares noting that:

Paraquat 250 - only has spot spraying for non-agricultural areas

Paraquat 360 - has no spot spraying instructions at all

Paraquat + diquat products - has a number of horticultural uses at 240 to 320 mL /100L and

Note: Spot spray rate assumes 1000 L water/ha. For lower water volumes increase dilution rate as below:

Water volume 250 L/ha: use 960 to 1280 mL/100L

Water volume 500 L/ha: use 480 to 640 mL/100L

Water volume 750 L/ha: use 320 to 430 mL/100L

Diquat 200 - Only has spot spraying for cotton thistle infested areas.

2. What did the APVMA review?

The APVMA reviewed paraquat-only products, diquat-only products and products containing both paraquat and diquat.

The review considered whether the active constituents, products and label instructions continued to meet the legal requirements for:

- human health;
- worker safety;
- food residues and dietary exposure;
- international trade;
- environmental safety;
- efficacy; and
- adequate labelling.

The principal matters examined included:

- acute, single exposure and long-term, repeat exposure toxicity;
- the possible relationship between paraquat exposure and Parkinson's disease;
- worker exposure during mixing, loading and application;
- exposure when workers re-enter treated areas;
- residues in food and animal feed;
- effects on birds, native mammals, aquatic organisms and other non-target species;
- spray drift;
- whether existing rates and uses remained acceptable; and
- whether identified risks could be managed through revised label directions.

3. What did public submissions say?

The APVMA received **171 submissions** following publication of its proposed decisions in July 2024.

Agricultural industry submissions

Growers, registrants, agronomists and agricultural organisations emphasised the importance of paraquat and diquat for:

- controlling glyphosate-resistant and other difficult weeds;
- maintaining access to a different herbicide mode of action;
- reducing reliance on cultivation;
- supporting minimum-tillage and no-tillage farming;
- inter-row weed control in orchards and vineyards;
- weed management in nurseries, market gardens and vegetable crops;

- crop establishment;
- precision and optical spot spraying; and
- crop or weed desiccation before harvest.

Industry submissions also questioned whether the APVMA's environmental models adequately reflected:

- Australian farming conditions;
- Australian bird and mammal species;
- the proportion of a paddock or orchard actually sprayed;
- crop interception;
- weed distribution;
- animal feeding behaviour;
- decline of residues after spraying; and
- the lower whole-field exposure resulting from spot spraying.

Health and environmental submissions

Other submissions called for paraquat, and in some cases diquat, to be prohibited because of concerns about:

- poisoning and acute toxicity;
- occupational exposure;
- spray drift;
- environmental effects;
- risks to birds and native mammals; and
- a possible association between paraquat exposure and Parkinson's disease.

For paraquat neurotoxicity, the APVMA considered 49 health-related submissions. It reviewed the scientific studies and international assessments cited by submitters.

4. What did the APVMA conclude from the submissions?

The APVMA accepted some technical arguments and revised parts of its assessments, including matters relating to:

- Australian mammals;
- crop interception;
- residue decline;
- the proportion of an area treated by spot spraying;
- optical spot spraying;
- additional residue studies; and
- some specific crop uses.

However, the APVMA did not accept that the agricultural importance or economic value of a use could override an identified statutory safety concern.

The APVMA explained that the Agvet Code generally requires each use to satisfy the safety, efficacy, trade and labelling criteria. Unlike some overseas regulatory systems, it does not generally provide for an otherwise unacceptable risk to be retained because the agricultural benefits are considered greater than that risk.

The APVMA also concluded that the available evidence did not convincingly establish that occupational or residential exposure arising from approved paraquat use causes Parkinson's disease. Paraquat was therefore not prohibited on that basis.

The main reason for restricting or removing many uses was the predicted exposure of **birds and mammals feeding in recently treated areas**, **together with worker-exposure, residue and trade concerns for particular uses.**

5. What were the final regulatory decisions?

The APVMA decided to:

- vary (change) active constituent approval conditions to ensure active constituents can and will be manufactured to the APVMA standard;
- vary product registrations to minimise risk to Australia's trade with other countries via suitable label changes;
- remove or amend product uses and rates to those remaining acceptable for all matters, i.e. safety, trade and efficacy;
- impose additional worker and environmental controls to reduce exposures to acceptably low levels; and
- replace or vary approved labels to meet above requirements;
- affirm the approvals and registrations after those variations have been made.

This means that the reviewed products remain registered, but only with the revised uses and conditions.

A product remaining registered does not mean that every previous use remains available once the labels are varied.

6. Potential impacts on weed-control efficacy

Paraquat and diquat are contact herbicides. Their performance depends heavily on:

- weed size;
- weed growth stage;
- active growth;
- spray coverage;
- water volume;
- application equipment;
- weather conditions; and
- the susceptibility of the weed species.

The APVMA concluded that the uses remaining on the revised labels would be effective for the weeds and growth stages expressly retained.

Where rates were required to be reduced below current label rates to meet safety requirements, the APVMA could not be satisfied of efficacy and so those uses were considered unsupported.

Potential practical consequences include:

- a narrower treatment window;
- a greater need to treat small, actively growing weeds;
- poorer control of mature weeds;
- more variable control where coverage is incomplete;
- increased risk of regrowth;
- reduced flexibility in mixed weed populations;
- a need for repeat treatment or follow-up control;
- greater reliance on alternative herbicides;
- greater reliance on cultivation or manual control; and
- increased importance of integrated weed-management programs.

7. Worker safety changes

Growers should expect revised labels to require:

- closed mixing and loading;
- compatible sealed containers and transfer fittings;
- protective clothing and gloves;
- respirators and eye or face protection for specified activities;
- enclosed tractor cabs for some broadacre applications;
- restrictions on application equipment;
- revised re-entry periods;

- restrictions on the quantity handled by one worker; and
- stronger spray-drift controls.

Equipment carried on the operator's back

Paraquat and paraquat/diquat products must not be applied using spraying equipment carried on the user's back.

Diquat-only products also have worker-exposure limitations applying to backpack application. Growers should **not** assume that historical knapsack practices remain acceptable for safe use.

Closed mixing and loading

Products containing paraquat, diquat or both must be supplied in containers compatible with closed mixing and loading systems.

Open pouring or decanting into an unsuitable secondary container will not comply with the revised controls.

8. Spray drift and environmental controls

Revised labels will include requirements relating to:

- wind speed;
- temperature inversions;
- droplet size;
- boom height;
- downwind buffer zones;
- protection of aquatic areas;
- bystander exposure;
- pollinator areas;
- vegetation areas; and
- livestock areas.

Buffer distances vary according to:

- active constituent;
- application rate;
- equipment;
- boom height; and
- the sensitive area being protected.

The required buffer may be substantial, particularly near natural aquatic areas.

9. Transition to the new labels

The APVMA has allowed a two-year phase-out period for supply of paraquat products bearing labels approved before the final decision.

For paraquat, this period lasts for two years from **22 June 2026**.

During the transition, growers may encounter both old-label and new-label products. **Growers must follow the directions attached to the particular product container they are using**.

Growers should **not** transfer directions to use:

- from one brand to another;
- from an old label to a new-label product;
- between different concentrations; or
- between paraquat-only, diquat-only and combination products.

10. What growers should do now

Growers should:

1. List every paraquat, diquat and combination product currently used.
2. Record each product's APVMA number, concentration and label version.
3. Identify the crop, weed, growth stage, rate and application method required.
4. For every container used - confirm that each use remains on the revised product label.
5. Pay particular attention to orchard, vineyard, banana, berry, market-garden, nursery and vegetable uses.
6. Do not assume that a numerical rate found acceptable in one part of the assessment automatically remains an approved label use. Different crops & situations have different risks.
7. Review whether existing equipment meets closed mixing and loading requirements.
8. Replace prohibited backpack application practices.
9. Review personal protective equipment, enclosed-cab and re-entry requirements.
10. Assess whether lower retained rates will provide adequate control of the weed species and growth stages encountered.
11. Identify alternative herbicides and non-chemical controls where former uses have been removed.
12. Update weed-management and resistance-management programs before old-label stock is exhausted.