

New chemistry – what's new, what's coming and how to keep them for longer

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Key words

herbicides, herbicide resistance, mix and rotate, mode of action, WeedSmart – The Big 6

Take home messages

- A range of new pre- and post-emergent herbicides will be available in the coming seasons which will broaden weed control options and use patterns
- Key releases include pre-emergent herbicides for cereals, pulses and canola from Groups E, G, O, Q as well as Group G options for knockdowns and fallows
- Mix and rotate herbicide modes of action to delay resistance and maximise weed control
- Herbicide resistance remains an ongoing threat. Non-chemical tools such as crop competition and harvest weed seed control are vital to complement and protect the longevity of new and existing chemistry.

Background

Herbicides remain an essential component of cost-effective weed control in Australian grain production systems. Growers spend over \$1 billion per year on herbicides, with additional investment in crop monitoring, application technology and logistics to support their use. Therefore, it is critical for new modes of action and herbicide reformulations to be developed, so growers can manage shifts in weed populations, herbicide resistance and changing use patterns.

In recent years, manufacturers have been expanding the range of pre-emergent herbicides which complement no-till farming systems across a diverse range of soil types and seeding configurations. Older products such as trifluralin and triallate have provided early season weed control when applied in no-till seeding systems prior to sowing. Newer generation herbicides such as prosulfocarb + S-metolachlor (Boxer Gold®) or pyroxasulfone (Sakura®) have demonstrated greater flexibility with longer incorporation times prior to sowing and improved crop safety.

There are several new herbicides (Tables 1 and 2) that will provide further diversity in weed control options at various stages of the crop growth cycle. These include knockdown and fallow spikes, as well as pre-emergent broadleaf and grass weed herbicides. These will also reduce pressure on herbicide resistant populations when used in combination with non-chemical tools such as harvest weed seed control and increased crop competition.

New herbicides

Note: as several of the products listed below are at the time of writing not yet covered by registered product labels, the information supplied should not be relied on and a registered product label must be read and followed before products are used.

Table 1. New pre-emergent herbicides

Company	Trade name	Active & formulation	Group	Proposed crops	Rate/ha	Likely Cost \$/ha	Proposed weeds	Proposed application
Adama	Ultro	900g/kg Carbetamide WG	E	most pulses (see label); winter fallow	tba	tba	barleygrass, brome, ryegrass, wild oats	IBS – knife points & press wheels only. PSPE – chickpeas
Comments: Registration planned for 2020, full launch 2021. 12 weeks grazing WHP. Likely: 7 days incorporation window. Lower rate for sandy soils and where lower weed densities are expected.								
BASF	Luximax®	750g/L Cinmethylin EC	Z	wheat (not durum)	500mL/ha	\$39	ryegrass suppression. wild oats, brome	IBS – knife point & press wheels only
Comments: Registered. Ensure seed is sown below the treated band, targeting a minimum of 3cm consistent sowing depth; 7 weeks grazing WHP. 3 days incorporation window. Predominantly root uptake, improved activity with mixing partners e.g. triallate, trifluralin. Target <50% stubble cover to reduce losses from binding.								
Bayer	Mateno® Complete (formally Bayer 167)	Acinofen + others SC	new MOA	wheat, barley	tba	tba	tba - various grass and broadleaf weeds	IBS – knife point & press wheels or early post emergent
Comments: Registration expected for ~2022. New mode of action suited to stubble retained systems. Likely: Flexibility to apply IBS or early post emergent with activity on a range of grass and broadleaf weeds.								
Corteva Agriscience	Gallery®	750g/kg Isoxaben DF	O	wheat, barley, triticale, fallow, fencelines	IBS & PSPE 70-140g/ha early post em, 70-100g/ha	\$17-30	wild radish	IBS, PSPE or early post emergent
Comments: Broadacre use patterns added in 2017. 6-week grazing WHP. Option to apply IBS, PSPE or early post emergent with a mix partner. Requires moist soil to remain active, needs 12-15mm to activate. Be wary of plantbacks, canola 22 months, pulses 9 months, cereals nil.								
FMC	Overwatch™	400g/L Bixolone SC	Q	wheat, barley, canola	tba	\$43	tba - various grass and broadleaf weeds	IBS – knife points & press wheels only
Comments: Registration expected early 2020, full launch 2021. Aiming to register in a range of pulses by 2022. Likely: 12 weeks grazing WHP. Group Q bleacher, grass weeds emerge then bleach out. Can cause transient crop bleaching, barley is more sensitive, but recovery expected. Predominantly root uptake, improved activity with mixing partners e.g.: triallate, trifluralin. Low volatility suited to dry sowing. 3 days incorporation window.								

Syngenta	Callisto™	480g/L Mesotrione SC	H	wheat, barley	tba	\$7.80- \$15.60	see label when available - wide range of broadleaf weeds	IBS – knife points & press wheels only
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Comments: Registration expected early 2020. Up to 10 weeks residual weed control on broadleaf weeds resistant to groups B,C,D,F & I. Likely: 10 weeks grazing WHP. IBS within 3 days, no-till systems only – do not use if soil has been cultivated. Can mix with knockdown and pre-emergent grass herbicide. A light activated herbicide, can observe a bleaching effect on crop and weed leaves.

Syngenta	Reflex®	240g/L Fomesafen SL	G	Range of pulses	tba	tba	see label when available - wide range of broadleaf weeds	IBS – knife points & press wheels only
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Comments: Registration planned for 2021. Pre-emergent option in pulses controlling resistant broadleaf weeds. Extended residual period compared to Group C chemistry. Root absorbed, no leaf uptake. Likely: IBS and PSPE. IBS only for lentils. IBS within 10 days. PSPE rainfall within 17 days.

Table 2. New group G knockdown spikes and residual herbicides

Company	Trade name	Active & formulation	Group	Proposed crops	Rate	Likely cost \$/ha	Proposed weeds	Proposed application
BASF	Voraxor®	250g/L Saflufenacil + 125g/L Trifludimoxazin	G	wheat, durum, barley	tba	\$12.50- 30	see label when available- wide range of grass and broadleaf weeds	IBS – knife points & press wheels only

Comments: Registration expected for 2020, full launch 2021. Likely: 5 weeks grazing WHP. Knockdown and residual control of broadleaf weeds plus suppression of ryegrass. Broadleaf residual control for 8-12 weeks (at higher application rates). Partner with glyphosate as a knockdown spike or mix with paraquat for double knock applications. Do not mix with pre-emergent herbicides such as Boxer Gold®, Luximax®, trifluralin or Sakura® as increased crop damage may occur.

Nufarm	Terrador	700g/kg Tiafenacil WG	G	knockdown spike	tba	tba	see label when available - wide range of grass and broadleaf weeds	
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Comments: Comments: Registration and commercial launch planned for early 2021. Likely: Partner with glyphosate as a knockdown spike or mix with paraquat for double knock applications. Expected suppression of grasses as a knockdown partner with glyphosate or paraquat. 1 hour plant back for cereals and pulses, anticipate 7 – 14 days for canola depending on use rate.

Always consult the label for further information regarding any of these herbicides.

IBS – incorporated by sowing.

PSPE – post sowing pre-emergent

Test, mix and rotate

With new herbicides coming to the market, testing your resistance (or susceptibility) status is a logical first step when planning a weed control program. Growers and advisers can utilise the data from resistance testing services to develop an understanding of what works and what doesn't. Further value is gained by testing herbicide mixtures as well as single modes of action to aid planning product combinations.

Resistance testing services are available nationally through three providers: Peter Boutsalis, Plant Science Consulting, Adelaide; John Broster, Charles Sturt University, Wagga Wagga; Roberto Busi, AHRI, University of Western Australia, Perth.

An expanded range of herbicides creates opportunities for the rotation of herbicide modes of action and the ability to mix with existing chemistry. Research by Dr. Pat Tranel from the University of Illinois, USA found that resistance can be mitigated by mixing herbicides at full rates. Pat is quoted saying "Rotating buys you time, mixing buys you shots". Peter Newman from AHRI expanded on the concept to recommend that we mix herbicides and rotate modes of action so that we can "buy time and shots."

Modelling by Roberto Busi from AHRI and Michael Renton from UWA has also shown the benefits of mixing and rotating herbicides for ryegrass. The modelling highlighted that rotating groups alone doesn't work. Herbicide resistance evolution needs to be managed through the mixing and rotation of herbicides along with non-chemical tools to keep seedbanks low.

The mix and rotate strategy will not only provide improved weed control but more importantly aids in resistance management where unpredictable patterns of cross-resistance are evolving. Even the best pre-emergent herbicides can be broken by resistance if not managed wisely.

Populations of ryegrass from the Eyre Peninsula in South Australia have recently been confirmed as resistant to all the pre-emergent herbicides – triallate (Avadex®), prosulfocarb (Arcade®), trifluralin, propyzamide and pyroxasulfone (Sakura®). These findings by the University of Adelaide have huge implications for an industry now heavily dependent on pre-emergent herbicides in no-till systems, showing they can quickly break down in the face of metabolic cross-resistance.

Repeated applications of the same herbicides in simple canola-wheat rotations have allowed ryegrass to develop metabolic cross resistance. This is in the absence of alternative tactics such as croptopping, hay, harvest weed seed control or diverse rotations which create opportunities to run down the weed seedbank.

Protecting the chemistry – WeedSmart - The Big 6

The Australian grains industry leads the world in the development and communication of integrated weed management tactics. WeedSmart provides a portal where growers and advisers can source a broad range of information on managing weeds. It brings together information from research groups, leading growers, agronomists and industry to promote best practice agronomy and weed management.

As new chemistry becomes available it is crucial for all involved to protect the longevity of any new products and minimise the risk of resistance. The WeedSmart Big 6 combines weed research data with grower experiences to create a set of practical guidelines focused on minimising the weed seedbank without compromising profit.

The WeedSmart Big 6:

1. Rotate crops and pastures
2. Double knock – to preserve glyphosate
3. Mix and rotate herbicides

4. Stop weed seed set
5. Increase crop competition
6. Adopt harvest weed seed control

Tactics such as harvest weed seed control, crop competition, hay and diverse rotations complement herbicide options including mix and rotate, double knock, pre-emergent herbicides and late season crop-topping. Site specific applications using optical spray technology enhance double knocks in fallow, reducing herbicide inputs by increasing options to introduce diverse chemistry.

Grower success in reducing seedbanks but staying profitable has been achieved through stacking Big 6 tactics over an extended period of time. For example, a diverse rotation with pulses, competitive barley and hybrid canola combined with robust pre-emergents, croptopping and chaff decks is an achievable system where five of the Big 6 tactics are stacked together.

The Big 6 is based around practical weed control tactics, used in conjunction with best practice agronomy to reduce the risk of resistance and drive weed seedbank numbers to zero.

Conclusion

New chemistry creates opportunities for targeting resistant weeds or managing resistance through alternative use patterns. Crop protection companies invest significant capital into the research and development of new or reformulated herbicides. In order to protect this investment, the industry needs to continue working together to ensure farming practices include both chemical and non-chemical weed control options to keep seedbanks low and minimise the risk of resistance.

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Useful resources

<https://csu.edu.au/plantinteractionsgroup/herbicide-resistance>
<http://plantscienceconsulting.com.au>

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