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e-weed is a regular newsletter providing information on weed management issues throughout the growing season

From the editor:

Welcome to the third edition of e-weed for 2008.

It is the second week of May and we are all hoping for some more rain, especially the Esperance region. Watch out for spraying stressed plants as pointed out in the first article. In this edition we have also included a précis of the changes to the herbicide mode-of-action groupings as well as articles on new wild radish herbicides.

We welcome all feedback and respond as soon as we can. Please send suggestions of additional topics to cover, comments and questions to e-weed@agric.wa.gov.au.

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Watch out for stressed weeds

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Weeds under stress are a lot harder to kill than healthy, actively growing weeds. Many farmers use cut rates to save on costs and in many instances get away with it. This is because the label rate carries a safety margin to account for plant size and some environmental variations. **But** how much stress does a weed need to be under before foliar applied herbicides stop working?

The most obvious stress is moisture. Translocation slows dramatically when plants are moisture stressed, restricting the movement of herbicides like glyphosate and diclofop methyl (Hoegrass®) to their 'site' of action. Photosynthetic rate also slows which is essential for the 'mode' of action of many herbicides including paraquat + diquat (Spray.Seed®), glyphosate and soil applied herbicides such as simazine and atrazine).

Symptoms of moisture stress include wilting, lack of early morning guttation (droplets that form on the tip of the leaf), reddening of leaves (of species such as annual ryegrass, wild radish and canola) and drying of the soil profile. These conditions occur when we have early autumn rains followed by a warm dry spell, such as what we have experienced in some areas this year.

Plants can also be very hard to kill despite looking relatively healthy. Environmental conditions such as mean degree days (the average between the minimum and maximum temperature) and rainfall distribution (days since last decent rainfall) over the life of a weed can have large influences in determining performance.

Plants experiencing high temperatures, low humidity and low moisture conditions tend to have a thicker cuticle (protective cover of the leaf) with more waxy deposits on the surface. This makes absorption of foliar applied herbicides particularly difficult.

Rainfall not only determines the moisture status of the plant but can also cleanse the leaves of dust and hydrate the cuticle, which can be beneficial for absorption. The seasonal conditions during the life of the plant determine the baseline in herbicide performance, that is 200, 500, 1000 or a 2000 mL ha^{-1} of an herbicide, while the conditions on the day of spraying will determine the variation around this baseline. It is also important to note that once a weed has been stressed, kill rates will never return to previously low levels, even if that stress has been alleviated.

Another kind of stress is nutritional stress. Studies have shown that nitrogen deficient annual ryegrass plants are particularly difficult to kill with glyphosate or paraquat/diquat. The addition of ammonium sulphate or applying nitrogen fertiliser does alleviate this to some degree. Look out for yellowing of older leaves, especially in fields that have had lots of leaching rain and are following a wheat or canola crop.

Predicting a dose that will kill stressed weeds is difficult **but if in doubt never 'cut' rates** and consider the use of a double knockdown or a tillage operation as a follow-up. Table 1 shows results from trials carried out by the Department of Agriculture in the wheatbelt in the mid '90s. **Note: This is not a guide to what dose you would apply** but gives an idea as to how stress increases the dose required to kill annual ryegrass under stress.

Table 1 **Dose of Roundup CT® required to kill annual ryegrass under different environmental and agronomic conditions**

Development No. of leaves	Moisture status visual	Mean degree days °C	Days since 5 mm rainfall	Kill dose mL/ha
2– 3	Excellent	16	1	697
4– 8	Excellent	16	7	799
4– 8	Moderate	18	14	1555
4– 8	Poor	18	21	2197
9–14	Excellent	16	1	908

NB: Rates below 800 mL/ha are below label and therefore not recommended.

Big changes to the herbicide mode-of-action groupings

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Croplife have recently made some big changes to the herbicide mode-of-action (MOA) groupings which will affect how we recommend these chemicals to be used for resistance management.

Herbicide groupings (A, B, C, etc.) were introduced in 1995 in Australia to give growers clarity as to herbicide mode of action and to help with herbicide rotation for sustainability.

The herbicide groupings have been revamped to reflect new herbicides and knowledge since the original 1995 classifications.

There will be six new groupings (H, O, P, Q, R and Z) and several key herbicides have been moved to different groups (highlighted below). For a complete list refer to the Croplife web page, www.croplife.org.au, click on 'resistance management' and then double-click on the file called Herbicide MOA 2008.pdf.

Groups A and B remain largely unchanged with the 'Den' chemistry (Pinoxaden—Axial®) being added to Group A. It is emphasised that ryegrass resistance to Group A and B herbicides is widespread in Australia. However, WAHRI surveys establish that many Group A herbicides (including pinoxaden) remain effective on wild oats.

The big news in Group E is that Triallate (Avadex®) has been moved out of Group E and into Group J—inhibitors of fat synthesis (not ACCase inhibitors).

Group F has undergone major changes and will influence resistance strategies. This group has been split into three groups with all being called 'bleaching' herbicides. Group F is now restricted to herbicides which inhibit phytoene desaturase (PDS inhibitors—for example, diflufenican).

Group H (bleaching herbicide) are the new herbicide mode-of-action group which inhibit HPPD inhibitors (for example, Precept®, Pyrasulfotole). The reason for the split from Group F is that while all groups inhibit caretenoid (green pigments that filter the sun) formation, they do so at different stages of its synthesis. This means that if you have a target site resistance mechanism to Group F herbicides then Group H herbicides should still control them.

The biggest change has been within Group K. This group has traditionally been for herbicides with multiple modes of actions or with unknown mode of action. Group K now consists of herbicides that inhibit very long chain fatty acids. Metolachlor, for example, remains in this group. Propyzamide (Kerb®) has been moved from Group K into Group D (for example, trifluralin). While a single study has shown that propyzamide controlled a trifluralin resistance annual ryegrass population it does not rule out that other resistance mechanisms may give resistance to both trifluralin and propyzamide in the future as they are closely related.

Most of the other groups remain the same, with Group Z now being the group with unknown mode of action.

This article does not list all the changes so next time you are concerned about what chemical group to rotate to make sure you check the new list.

And remember that introducing any additional diversity into your farming practice will slow down the evolution of herbicide resistance.

New (and old) herbicide options for wild radish in wheat

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Several new herbicides are likely to be registered for wild radish control soon. Some of these are merely small variations on old themes whereas others are new chemistry. Their ultimate challenge is to control 2,4-D resistant wild radish. However many still rely on phenoxy for complete wild radish control. This article will attempt to give an unbiased view of a range of wild radish herbicide options.

Precept® is a new Bayer product that can be considered to be exciting new chemistry. If you suspect phenoxy resistance then Precept® rates should start at 1.5 L/ha for 4-leaf radish. At 1 L/ha, Precept® will rely on phenoxy herbicides to do at least some of the killing. Crop safety with Precept® is excellent. So far there has been no recorded cross resistance to diflufenican. Precept® is a combination of a new active, pyrasulfotole 25 g/L (Group H) and LVE MCPA 125 g/L + softener and is registered at 1 to 2 L/ha. Bayer has another new herbicide due for release next year that does not rely on phenoxy and is exciting due to it being of novel herbicide group.

Ecopar® is a new herbicide from Sipcam Pacific Australia. The active is pyraflufen ethyl 20 g/L (Group G) and will be mixed with MCPA Amine (500) 500 mL/ha. It is registered from the 2-leaf stage of the crop. Ecopar® is a contact type herbicide that relies on the phenoxy to destroy the crown of the plant. Ecopar® may struggle to kill phenoxy resistant radish but is another good option for small radish.

Torpedo® is a new Dow product. Given that Torpedo® is a Group B herbicide it will be of limited use where there is Group B resistance, especially in the Northern Agricultural Region of WA. However, there have been some cases where Torpedo® kills Group B resistant radish. Torpedo® will be useful

in some paddocks where this is the case but this will need to be determined prior to spraying. Torpedo® is a co-formulation of clorpyralid 300 g/L (Lontrel) + florasulam 50 g/L (group B). Florasulam is from the Eclipse® family of Group B herbicides.

X-Pand® is another new Dow product due for release in 2008. X-Pand® is a combination of florasulam 40 g/kg and isoxaben 610 g/kg (Group O). X-Pand® has poor knockdown capabilities so for best results this herbicide should be applied to small (cotyledon to 2-leaf) radish. Isoxaben is known to have some residual activity on wild radish and gives good stand-alone control of very small weeds, particularly where there is good soil moisture. As it is registered for application from the 3-leaf stage of the crop, X-Pand will only be useful as a stand-alone radish herbicide where the weeds germinate after the crop and are at the 2-leaf stage when the crop is 3 leaf.

Jaguar® applied at 600 mL/ha at the 2-leaf stage of the crop (wild radish—cotyledon to 2-leaf stage) is an excellent option where sulfonylurea (SU) and phenoxy resistance are suspected. Commencing radish spraying with Jaguar effectively brings the whole spraying program forward to reduce the spraying of very large radish. Jaguar® may need a follow-up spray with another herbicide to control late germinators.

Linuron (480) is an old product that is similar to diuron and is rumoured to be coming to the Australian market at a discounted price. Linuron is of a useful chemical group and will be low cost. Research is under way to determine if it has a fit in WA.

Precept Selective Herbicide

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Precept® Selective Herbicide (25 g/L pyrasulfotole + 125 g/L MCPA + 6.25 g/L mefenpyr-diethyl), incorporating a new active ingredient called pyrasulfotole, is the latest innovation developed by Bayer CropScience. In 2008, Precept brings a HPPD inhibitor into the Australian cereal market segment for the first time.

Precept will be the first product to be released using HPPD-inhibiting technology, branded as photo-X® technology. Precept offers Australian cereal growers a new option to control broadleaf weed infestations including wild radish in their cereal crops in 2008. Wild radish is a major weed in Australia with existing resistance to acetolactate synthase (ALS)-inhibiting herbicides (Group B), photosystem II-inhibiting herbicides (Group C), auxin analogue herbicides (Group I) and phytoene desaturase (PDS)-inhibiting herbicides (Group F).

The photo-X technology works by interrupting three crucial processes in the growth of weeds. First, photo-X stops energy production within the plant. Second, photo-X restricts vitamin E production, interrupting photosynthesis. Furthermore, photo-X destroys carotenoids, the light energy protection in plants.

The mode of action of Precept means optimum results occur when it is applied in warmer temperatures with good light intensity. Consult the Precept label for further information.

The herbicide resistance groups in Australia have changed recently. In the new classification, Precept is a Group H and Group I herbicide. When used as directed it will control groups B, C and F-resistant weeds. Precept's ability to control PDS-resistant and ALS-resistant wild radish is significant because many Western Australian wild radish populations have been confirmed resistant or developing resistance to the PDS-inhibiting herbicides diflufenican and picolinafen and the ALS-inhibiting herbicides chlorsulfuron and triasulfuron. Where Group I resistance is present consult your local Bayer Cropscience representative.

The Precept label will contain a broad spectrum of broadleaf weeds, including wild radish, mustard, turnip, volunteer canola, wireweed, deadnettle and sow thistle. With the addition of Lontrel® SG, capeweed and volunteer legumes can also be controlled. Further weed extensions are planned.

For further inquiries contact your local Bayer Cropscience representative:

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Ecopar—rapid, robust and early broadleaf weed control

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Ecopar is a new herbicide from Sipcam Pacific Australia for the control of broadleaf weeds in cereals. Ecopar contains 20 g/L of pyraflufen-ethyl, a new Group G active. It is formulated as a suspension concentrate which provides excellent safety to cereal crops while still providing robust control of broadleaf weeds. Ecopar should always be applied with MCPA Amine.

Five years of development in Australia have shown that Ecopar provides robust control of weeds in a variety of situations, different weed sizes and in different years. Over 35 trials between 2002 and 2007 have shown excellent control of many weeds, including those shown in table below:

Weed	% Control 2002–2007
Wild radish	95%
Capeweed	85%
Volunteer lupins	99%
Wild turnip	97%
Mustard	99%
Volunteer canola	99%
Erodium	95%
Doublegee	91%

Ecopar is registered for application from the 2-leaf stage of the wheat onwards. This is a key and important characteristic. Too often we concentrate purely on issues of herbicide resistance and different methods of weed control without asking why we are trying to control the weeds in the first place—to reduce competition with the crop and maximise yield.

Australian research has shown that it is the weeds coming up in the first five weeks after crop emergence that have the greatest effect on yield. This means that with Ecopar farmers can stop weeds robbing their crop of moisture and nutrients as early as possible. Many farmers underestimate the effect that weeds are having—as few as 25 wild radish per square metre can reduce yield by 11%, further highlighting the importance of early weed control.

This doesn't mean that resistance management should be ignored. Being a Group G herbicide, Ecopar moves away from traditional broadleaf weed herbicides which are generally in groups B, C and F. Ecopar does involve the use of a Group I herbicide (MCPA) like many other mixes but does not rely on this alone.

Remember that Ecopar is a contact herbicide so it is important to get coverage right. Ecopar is recommended to be used at 70L/ha spray volume, with a fine to medium droplet spectrum—aiming to achieve coverage of 30–40 droplets per square centimetre. Ecopar has limited movement through the leaf, so it is vitally important to apply the herbicide so that minimal movement within the leaf is required.

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