

The role of Clearfield® wheat varieties in rotations



With much of southern Australia experiencing below average rainfall through the past spring and summer, many growers and advisors are concerned about herbicide residues carrying over and potentially affecting the 2015 crop.

Some herbicides can remain active in the soil for weeks, months or years. These herbicides are specifically formulated for residual weed control and are an important tool for weed management. However, the issue with these types of chemicals is if they remain in the soil longer than intended they can potentially damage sensitive crops in subsequent years.

One problem for growers is identifying herbicide residues before they cause a problem. Currently growers are limited to predicting carry over based on information regarding soil type and climate, provided on product labels. Chemical analysis often does not detect low level residual issues and can be too expensive to be included in routine farming practices. Once the crop has emerged, diagnosis can be difficult because residual symptoms can often be confused and/or make the crop vulnerable to other stresses, such as nutrient deficiency or disease.

Utilising the Clearfield® production system

The Clearfield® production system offers growers the opportunity to counteract these plant back concerns and maintain their normal crop rotations through the use of conventional bred Clearfield Plus® wheat, Clearfield® canola and Clearfield® barley varieties. Clearfield Plus® wheat, Clearfield® canola and Clearfield® barley crops are tolerant to Clearfield® (imidazolinone) herbicide Intervix®.

With AGT Clearfield Plus® wheat varieties and the BASF Clearfield® herbicide Intervix®, growers can have greater flexibility and confidence at planting time. By using AGT Clearfield Plus® wheat to counteract crop plant-back concerns and BASF's Intervix® for post-emergent and in-crop residual control of both broadleaf and grass weed species, growers can optimise their cereal production.

Intervix® provides growers with the greatest flexibility of all Clearfield® herbicides, as it is the only product registered for use in all Clearfield® production systems including Clearfield Plus® wheat, Clearfield® canola and Clearfield® barley.

Intervix® was custom designed to minimise the residual carry over effects, making it the lowest risk plant back imidazolinone product on the market. It is also important to note that the off label use of alternate imazapic product combinations can exacerbate plant back and soil carry over concerns in low rainfall conditions. The use of these product combinations are not registered in Clearfield Plus® wheat and Clearfield® barley, and can result in MRL infringements and jeopardise grain exports as highlighted by recent infringements recorded in barley destined for Japan.

Herbicide labels should be consulted if growers or agronomists are concerned about residual plant back issues relating to all imidazolinone products.

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Clearfield® (imidazolinone) herbicides are residual herbicides that can potentially cause carry over issues. Due to the residual nature of these Clearfield® herbicides, a knowledge of plant back crop sensitivity is essential to minimising crop effect. If a two gene Clearfield Plus® wheat variety such as Elmore CL Plus[®] can be utilised then the risk of crop damage and added susceptibility to disease and nutrient imbalances can be negated.

Microbial degradation is the primary driving factor for Clearfield® herbicide breakdown. Microbes in the soil are responsible for degradation. The rate of degradation is relative to microbial population which is driven by the amount of organic matter and moisture in a soil profile. As soil microbes are most active in moist soils, degradation of Clearfield® herbicides is enhanced during periods when topsoil moisture is available. Soils with high pH also create a good environment for microbial breakdown as the rate of degradation decreases as the soil becomes more acidic.

Table 1 displays the plant back interval for Intervix® herbicide. Plant back intervals allow enough opportunity for significant rainfall events, and therefore residue breakdown to occur. It takes time after a rainfall event for imidazolinone residues to be released and become available for microbial breakdown. A one off storm followed by warm days will dry the soil out quite quickly, which will limit the amount of breakdown that can occur. Five rainfall events of 20mm fortnightly is a much better scenario than a one off rainfall event of 100mm.

Table 1. Intervix® label re-cropping intervals.

Months after application	Following crops
0	Clearfield Plus® wheat, Clearfield® wheat, Clearfield® barley, Clearfield® canola
10	Chickpeas, Faba beans, Field peas, Lucerne, Lupins, Pasture legumes, Vetch, Oats*, Triticale*, Non-Clearfield® Barley*, Non-Clearfield® Wheat*
34	Conventional and other herbicide tolerant canola, All other crops

***Non-Clearfield® Barley, Non-Clearfield® Wheat, Oats, Triticale**
 The following additional requirements apply if it is intended to sow these cereals during the next winter season:
 - DO NOT apply Intervix® later than the end of August (no later than the end of July in WA)
 - DO NOT use Intervix® in areas where rainfall from spraying to sowing of cereals is expected to be below 150mm (for 300-375mL/ha use), 200mm (for up to 500mL/ha use) and 250mm (for 600-750mL/ha use)
 - DO NOT use above 375mL/ha in the Lower Great Southern region of WA



Photo 1. Symptoms that can be seen in a conventional wheat crop following a crop treated with imidazolinone herbicide. Ill thrift, yellowing in early growth, delayed heading by up to 4 days and reduced uptake of nutrients including nitrogen and zinc. Early symptoms of Clearfield® carry over can easily be confused with nutrient deficiencies.

Clearfield® plant back trial work

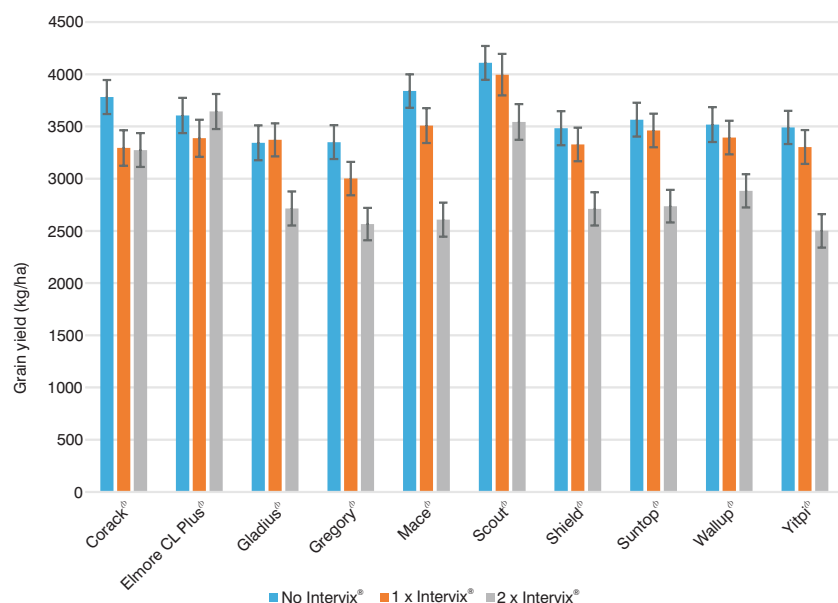
AGT conducted a trial in Horsham, Vic, in 2013, researching the plant back effects on non-tolerant varieties on areas that had been treated with varying rates of Intervix® herbicide the previous year. Intervix® was applied to a Clearfield® wheat trial in 2012, with treatments being 1x label rate Intervix®, 2x label rate Intervix®, and an untreated control. In 2013, a variety trial was sown over the top of the 2012 trial residue to determine if the herbicide residue would have effect on yield. The time between the 2012 herbicide application and the 2013 planting was 10 months, as per the minimum plant back period stated on the Intervix® label for non-Clearfield® wheat varieties. However, only 171mm of rain was recorded at the site over this 10 month period, with the highest single rainfall event of 25mm being recorded in August 2012. The rainfall received over this period was insufficient to meet the minimum rainfall requirement of 250mm as stated on the label.

The results shown in Graph 1 illustrate the potential loss of yield that can occur when planting susceptible varieties into soils that have Clearfield® residue carry over (resulting from slow microbial breakdown in low rainfall environments).

This trial shows the importance of adhering to the Intervix® label restrictions on plant back period and

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Graph 1. Plantback effects on yield, AGT Clearfield® trial, Horsham, Vic, 2012-2013.



minimum rainfall requirements to non Clearfield® tolerant crops.

Minor reductions in the yield of non Clearfield® wheat varieties in the 1x Intervix® rate plots (750ml/ha) was observed, while significant reductions were observed in non Clearfield® wheat varieties at the off label rate of 2x Intervix® (1500ml/ha). This trend can be seen on the majority of the intolerant varieties, whilst tolerant variety Elmore CL Plus® showed no significant difference at either rate when compared to the control.

Clearfield® tolerant wheat varieties

There are four AGT Clearfield Plus® wheat varieties available to growers for the 2015 season: Elmore CL Plus®, Grenade CL Plus®, Kord CL Plus® and Justica CL Plus®. Please consult with your agronomist or the AGT website to choose the most appropriate variety for your situation.

There are several reasons why Clearfield® tolerant varieties are a valuable tool for growers:

- At times, the plant back interval cannot be adhered to and crop rotations limit what choices a grower has for

planting.

- When a herbicide susceptible grass weed population such as barley grass or brome grass cannot be controlled by other methods.
- In the event of dry sowing, Clearfield® technology adds an in crop residual herbicide option to combat the flush of germinating weeds after opening rainfall events.
- Clearfield Plus® wheat varieties can be grown as a competitive variety in their own right, but still give flexibility in herbicide choice if needed through the season.

Tables 2 and 3 outline yield potential and disease resistance packages of the Clearfield® tolerant varieties currently available.

Summary

Advantages of the Clearfield® system

- One pass post-emergent knockdown and residual control on both grass and broadleaf weeds.
- Control and suppression of a vast range of problem weeds including brome grass, barley grass and volunteer cereals.
- With the application of Intervix® at label rates, growers can be confident that their crop is pure with minimal contamination from non-tolerant Clearfield® varieties.
- AGT Clearfield Plus® wheat varieties can be used to manage the risk of imidazolinone herbicide residue carry over.

The importance of stewardship with the Clearfield® system

- Intervix® is a Group B herbicide - be cautious about over use which may select for herbicide resistant

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Table 2. Predicted yield of Clearfield® tolerant varieties (yield % of trial mean) from NVT long term MET analysis (2009-2013).

Variety	Mallee Vic	Wimmera Vic	North Central Vic	North East Vic	South West NSW	South East NSW
Elmore CL Plus®	101	101	101	102	102	103
Grenade CL Plus®	95	91	101	101	99	98
Kord CL Plus®	100	97	100	97	101	102
Justica CL Plus®	100	101	-	-	-	-
Clearfield JNZ*	93	91	94	94	93	91
Clearfield STL*	97	88	-	-	-	-

*NOTE: Clearfield JNZ and Clearfield STL carry a lower level of resistance to imidazolinone herbicides than CL Plus varieties, and are only registered for use with Clearfield® Midas® herbicide. Use of Clearfield® Intervix® herbicide on Clearfield JNZ and Clearfield STL will result in crop damage.

when sprayed with Intervix®

- Clearfield® paddock locations, making sure that only Clearfield Plus® wheat varieties are sprayed with Intervix®

- Purity of seed - Clearfield Plus® wheat seed must be sourced through an AGT Affiliate or your local reseller. 'Over the fence' trading is not permitted for Clearfield Plus® wheat varieties.

Do I have to use Intervix® on Clearfield® tolerant varieties?

- Intervix® is the only imidazolinone herbicide registered for use in Clearfield Plus® wheat.
- Clearfield® tolerant varieties can be grown using existing agronomy practices, without the use of Intervix® herbicide.

How will this technology fit my rotation?

- Following either a Clearfield® canola or another Clearfield® cereal variety, taking away the risk of Intervix® residual issues
- Where a lack of summer rainfall limits chemical breakdown and residues are an issue for non Clearfield varieties
- As a one pass post-emergent knockdown and residual control of many major grass and broadleaf weeds including brome grass, barley grass,

wild oat, Indian hedge mustard, muskweed, wild radish, wild turnip, and suppression of annual ryegrass

For more information please contact your local AGT or BASF representative.

Table 3. Agronomic ratings of Clearfield Plus® varieties.

Trait	Elmore CL Plus®	Justica CL Plus®	Grenade CL Plus®	Kord CL Plus®
Quality	AH	APW	AH*	AH*
CCN	S	MS	MR	MR
Stem Rust	R-MR	MR	MR	MR
Stripe Rust	MR-MS	MR-MS	MR-MS	MR-MS
Leaf Rust	MR	MS-S	MS-S	MS
Yellow Leaf Spot	MS-S	S	S	MS-S
Black Point	MS-S	MS	MS-S	MR
Sprouting	OK=Janz	OK=Janz	OK=Janz	VS
Maturity	Mid=Janz	Mid=Janz	Early-Mid=Gladius	Early-Mid=Gladius
Boron Tolerance	I	MT	MT	MT
Screenings	Moderate	Low	Low	Low
Test Weight	High	Moderate	High	Moderate

*AH quality classification in Southern Zone, APW quality classification in South Eastern Zone.

weed populations.

- Existing Group B resistant weeds may not be fully controlled with Intervix® - know your weed resistance status.
- There is potential for residual plant back issues in low rainfall seasons after the application of Intervix® herbicide.
- Growers need to keep accurate records of:
 - Silo storage - accidentally sowing a non tolerant Clearfield® variety can result in total crop wipe out



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