

# Avoiding crop damage from residual herbicides

*When researching the residual activity and cropping restrictions following herbicide application, the herbicide label is the primary source of information and should be read thoroughly.*

*This fact sheet supports those labels by providing a background explanation of how herbicides break down and extra notes on some specific herbicides used in broadacre cropping.*

## WHAT ARE THE ISSUES?

Some herbicides can remain active in the soil for weeks, months or years. This can be an advantage as it ensures good long term weed control. However, if the herbicide stays in the soil longer than intended it may damage sensitive crop or pasture species sown in subsequent years. For example, chlorsulfuron is used in wheat and barley, but can remain active in the soil for several years and damage legumes and oilseeds. A real problem for growers is the difficulty in identifying herbicide residues before they cause a problem. Currently, we are limited to predicting carryover based on information provided on the product labels about soil type and climate. Herbicide residues are often too small to be detected by chemical analysis, or if the testing is possible it is too expensive to be part of routine farming practice. Once the crop has emerged, diagnosis is difficult because the symptoms of residual herbicide damage can often be confused with and/or make the crop vulnerable to other stresses, such as nutrient deficiency or disease.

## WHICH HERBICIDES ARE RESIDUAL?

The herbicides listed in the table all have some residual activity or planting restrictions. Product labels DO NOT use consistent terminology or put warnings in the same place so you need to read the entire label carefully. Selected residue issues for each of the herbicide groups are discussed in more detail further on.

Herbicide group	Active constituent
Group B: Sulfonylureas	azimsulfuron, bensulfuron, chlorsulfuron, halosulfuron, iodosulfuron, mesosulfuron, metsulfuron, sulfosulfuron, triasulfuron, tribenuron
Group B: Imidazolinones	imazamox, imazapic, imazapyr, imazethapyr
Group B: Triazolopyrimidines (sulfonamides)	flumetsulam, florasulam, metosulam, pyroxsulam
Group C: Triazines	atrazine, simazine
Group C: Triazinones	metribuzin
Group C: Ureas	diuron
Group D: Dinitroanilines	pendimethalin, trifluralin
Group H: Pyrazoles	pyrasulfotole
Group H: Isoxazoles	isoxaflutole
Group I: Phenoxyacetic acids	2,4-D
Group I: Benzoic acids	dicamba
Group I: Pyridine carboxylic acids	aminopyralid, clopyralid
Group K: Chloroacetamides	dimethenamid, metolachlor
Group K: Isoxazoline	pyroxasulfone

*N.B. New herbicides may be released after publication of this fact sheet.*

## HOW DO HERBICIDES BREAK DOWN?

Herbicides break down via either chemical or microbial degradation. Chemical degradation occurs spontaneously, but the speed depends on the soil type (clay or sand, acid or alkaline), moisture and temperature. Microbial degradation depends on a population of suitable microbes living in the soil to consume the herbicide as a food source. Both processes are enhanced by heat and moisture. However, these processes are impeded by herbicide binding to the soil, and this depends on the soil structure (pH, clay or sand, and other compounds like organic matter or iron).

For these reasons degradation of each herbicide needs to be considered separately and growers need to understand the soil type and climate when trying to interpret recropping periods on the product label for each paddock.

## HOW CAN I AVOID DAMAGE FROM RESIDUAL HERBICIDES?

Select a herbicide which is necessary for the weed population you have. Make sure you consider what the recropping limitations may do to future rotation options. Read the herbicide label including the fine print.

Chemical users are required to keep good records, including weather conditions, but in the case of unexpected damage good records can be invaluable, particularly spray dates, rates, batch numbers, rainfall, soil type and pH (including different soil types in the paddock).

If residues could be present, choose the least susceptible crops (refer to product labels). Optimise growing conditions to reduce the risk of compounding the problem with other stresses such as herbicide spray damage, disease and nutrient deficiency. These stresses make a crop more susceptible to herbicide residues.

Be wary of compounding a residue problem by planting a herbicide resistant crop and spraying with more of the same herbicide group. You may get around the problem with residues in the short term, only to be faced with herbicide resistant weeds in the longer term.



## GROUP B: THE SULFONYLUREAS (SUS)

The sulfonylureas persist longer in alkaline soils (pH > 7) where they rely on microbial degradation.

Residual life within the sulfonylurea family varies widely with chlorsulfuron persisting for 2 or more years and not suitable for highly alkaline soils. Triasulfuron persists for 1-2 years and metsulfuron generally persists for less than 1 year. Legumes and oilseeds are most vulnerable to SU's, particularly lentil and medic. However, barley can also be sensitive to some SUs - check the label.

## GROUP B: THE TRIAZOLOPYRIMIDINES (SULFONAMIDES)

There is still some debate about the ideal conditions for degradation of these herbicides. However, research in the alkaline soils of the Victorian Wimmera and Mallee, and the Eyre Peninsula in South Australia has shown that the sulfonamides are less likely to persist than the SU's in alkaline soils. Plant back periods should be increased in shallow soils.

## GROUP B: THE IMIDAZOLINONES (IMI'S)

The imidazolinones are very different from the SU's as the main driver of persistence is soil type, not soil pH. They tend to be more of a problem on acid soils, but carryover does occur on alkaline soils. Research has shown that in sandy soils, such as on the Eyre Peninsula in South Australia, they can break down very rapidly (within 15 months in alkaline soils), but in the heavy clay soils in Victoria they can persist for several years. Breakdown is by soil microbes. Oilseeds are most at risk. Widespread use of imi-tolerant canola and wheat in recent years has increased the incidence of imidazolinone residues.

## GROUP C: THE TRIAZINES

Usage of triazines has increased to counter Group A resistance in ryegrass and because of high rates used on Triazine Tolerant canola. Atrazine persists longer in soil than simazine. Both generally persist longer on high pH soils, and cereals are particularly susceptible to damage. Recent research in the US indicates that breakdown rates tend to increase when triazines are used regularly, as the number of microbes able to degrade the herbicide can increase. This may mean that breakdown can take an unexpectedly long time in soils that have not been exposed to triazines for some years.

## GROUP D: TRIFLURALIN

Trifluralin tends not to leach through the soil, but can be moved into the seed bed during cultivation or ridging.

Trifluralin binds strongly to stubble and organic matter and is more likely to be a problem in paddocks with stubble retention. Be particularly careful with wheat, oats and lentils. Barley is more tolerant. Use knife points to throw soil away from seed and sow deep.

## GROUP H: THE ISOXAZOLES

Persistence in acid soils (pH < 7) has not been fully tested, but research has shown that isoxazole persistence is expected to be longer than the label recommendations for legume crops and pastures. Isoxazoles will also persist longer in clay soils and those with low organic matter. Cultivation is recommended prior to recropping.

## GROUP I: THE PHENOXYs

Clopyralid and aminopyralid can be riskier on heavy soils and in conservation cropping as it can accumulate on stubble. Even low rates can cause crop damage up to two years after application. They cause twisting and cupping, particularly for crops suffering from moisture stress. 2,4-D used for fallow weed control in late summer may cause a problem with autumn sown crops. There have been changes to the 2,4-D label recently and not all products can be used for fallow weed control – check the label. The label recommends you don't sow sensitive crops, especially canola, until after a significant rainfall event. Oilseeds and legumes are very susceptible to injury from 2,4-D.

## GROUP K: METOLACHLOR

Metolachlor can be safely used for weed control in canola crops if sowing and herbicide application are carefully managed. However, the precautions on the label limit sowing of canola within 6 months of application. This essentially prevents re-sowing of canola if there is poor germination.

## GROUP K: PYROXASULFONE

Pyroxasulfone relies on microbial degradation, which is favoured by in-season rainfall. Label plantbacks are important particularly for oats, durum wheat and canola. Residues will lead to crop stunting.

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## ACCESSIBILITY

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