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Impose®

Managing the risk to rotational crops

Introduction

ADAMA Australia has compiled this guide to create greater awareness of rotational crop risk management options following an Impose application in fallow (Refer Table 1, overleaf). Imazapic has been widely adopted for fallow weed control due to its long soil residual activity. While there are label guidelines for FOLLOW CROPS on solo imazapic labels (including Impose), if conditions do not favour the breakdown of imazapic, soil residues can affect susceptible follow/rotational crops. This bulletin discusses conditions that can slow the breakdown of imazapic and how to manage the potential risk to rotational crops.

At a glance

- Impose (240 g/L imazapic) is a highly effective residual herbicide registered for use in fallow
- Adequate rainfall is required after application to activate imazapic and start the breakdown process
- Microbial degradation is the primary breakdown pathway for imazapic
- Carry-over soil residues can affect susceptible crops following Impose application
- It is not possible to eliminate all risks to following crops when using Impose
- Additional risk mitigation may be required to manage the risk to follow crops

Factors affecting breakdown in soil

After application and soil incorporation of Impose, the process of breakdown commences. Imazapic is primarily degraded in soil by microbial activity and there are several factors impacting the rate of degradation including:

- Soil moisture and soil temperature
- Soil pH, organic matter and other soil properties

Soil moisture and soil temperature

Sufficient rainfall is required after an Impose application to wet soil to a depth of 5 cm (Table 1). Adequate soil incorporation ensures Impose is activated and triggers the start of the microbial breakdown process of imazapic. Further rainfall is required during the season to ensure adequate breakdown of imazapic prior to sowing follow crops.

Once incorporated, there is a strong relationship between soil moisture and soil temperature on the rate of imazapic degradation. As soil becomes drier, imazapic forms a stronger bond to the soil leaving less active ingredient available for microbial degradation. Soil microbial activity is also lower in drier soils and under low soil temperature conditions.

As soil moisture increases, more imazapic is released from soil for microbial degradation. The presence of soil moisture and warm soil conditions also ensure sufficient microbial activity.

The amount of time that soil is moist is important in promoting effective degradation. Consecutive rainfall events that prolong the duration of moist soil are more effective for imazapic breakdown than infrequent, heavy rainfall events.

Under favourable moisture and temperature conditions, the rate of imazapic breakdown will be higher, reducing the risk of injury to following crops.

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Effect of pH, organic matter and other soil properties on imazapic breakdown

Imazapic breakdown can be reduced in soils with unfavourable organic matter, poor soil structure, low water infiltration, sandy soils and soils with limited water holding capacity, nutrient deficiencies/imbalances, and other issues.

The degree of soil binding is important as it determines the amount of imazapic available in the soil for microbial breakdown. In addition to soil moisture, soil binding of imazapic is affected by pH, with stronger bonds in low pH soils (acidic conditions) and weaker bonds in neutral to high soil pH soils (alkaline conditions).

Sufficient soil organic matter is also required to support the microbial population to break down imazapic. Soils with very low organic matter may have insufficient microbial activity to effectively degrade imazapic. Conversely, soils with high organic matter (i.e. ≥2.5%) may result in greater binding to organic carbon making imazapic less available for microbial breakdown and increasing persistence.

Imazapic has moderate solubility and moderate soil mobility. Soils with a sandier texture favour leaching of imazapic into the subsoil. There is less microbial activity in the subsoil, which can reduce the rate of imazapic degradation and increase the soil persistence.

Other soil properties that may impact microbial activity and crop establishment include nutrient deficiencies or imbalances (e.g. sodic soils, strongly duplex soils, poorly structured soils with low infiltration rates and water holding capacity). Crops grown in soils with underlying agronomic issues may also become more stressed and susceptible to imazapic soil residues during crop establishment.

Table 1. Impose summer fallow use recommendations.

SITUATION	WEEDS CONTROLLED	RATE PER HA	KEY COMMENTS
Fallow prior to planting Winter crops as directed in the follow crops table (Qld and Northern NSW only)	Barnyard grass (*Echinochloa colona*) Liverseed grass (*Urochloa panicoides*) Stink grass (*Eragrostis cilianensis*) Blowaway grass (*Panicum decompositum*) Button grass (*Dactyloctenium radulans*) Pigweed (*Portulaca oleracea*) Yellow vine (*Tribulus terrestris*) Mintweed (*Salvia reflexa*) Boggabri weed (*Amaranthus mitchelli*) Dwarf Amaranth (*Amaranthus macrocarpus*) Peachvine/Cowvine (*Ipomoea lonchophylla*)	150–200 mL	Best results are obtained where treatments are applied to dry, weed-free soil prior to weed germination. Treatments can be applied to standing crop residues. Sufficient rainfall is required after application and prior to weed emergence to wet soil to a depth of 5 cm. Use the higher rates for increased residual control of weeds or anticipated high weed pressure. Emerged weeds must be controlled by prior cultivation, or by application of a knockdown herbicide. Where infestation of emerged weeds is light, tank mix treatment with glyphosate or paraquat. Cultivation following application of treatments may reduce pre-emergence weed control provided by Impose. Prolonged wet soil conditions following treatment will reduce the effective life of pre-emergence treatments. Weed escapes may require follow up application of knockdown herbicides. DO NOT apply more than 200 mL/ha per season on cropland. DO NOT apply in more than two successive seasons on cropland. DO NOT overspray headlands.

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Minimizing risk

If one or more of the above factors are not conducive to imazapic microbial degradation, then insufficient soil breakdown may occur prior to sowing susceptible crops. These risk factors should all be taken into consideration when planning the use of Impose and selecting rotational crops.

Always read and observe Impose label guidelines for following crops, including minimum re-cropping intervals and minimum rainfall requirements. Consider the seasonal rainfall outlook and plan following crops prior to using Impose.

Due to the range of environmental and agronomic factors associated with imazapic breakdown, it is impossible to eliminate all risks associated with use of Impose and rotational crop injury is always possible.

If there is any doubt that conditions were favourable for effective breakdown of imazapic after an application of Impose in fallow, the following options should be used:

- DO NOT plant a susceptible crop e.g. conventional wheat and barley, the year after applying Impose in fallow
- Plant Clearfield* varieties that are more tolerant of imidazolinone residues the year after using Impose
- Where imazapic residue carryover is suspected (even after observing minimum re-cropping intervals) and susceptible crops are to be planted, treated areas should be tested as follows:
  - **Field bioassay:** Where rain allows, plant a small area of the susceptible crop four to six weeks before the desired planting date and take note of any symptoms of injury. If any herbicide symptoms are observed, only plant a non-susceptible crop.
  - **Pot bioassay:** Where it is not practical to do a field bioassay, plant a small number of seeds of the susceptible crop into pots containing soil from the treated field four to six weeks before the desired planting date. If any herbicide symptoms are observed, only plant a non-susceptible crop.

If using a pot bioassay, ensure soil samples are representative of the soil in each paddock. Soil should be sampled from several locations and each sample should be carefully labelled to ensure the location of sampling is known.

For more information, please contact your local ADAMA representative or your agronomist.

Table 2. Minimum re-cropping intervals (months)ß

The following minimum re-cropping intervals (months after application) should be observed.

4*	8*	15#	18#	24	36
Peanuts, mung beans, soybeans and non-genetically modified Imidazolinone tolerant varieties of: - Barley - Wheat - Maize	Chickpeas, faba beans, lucerne, lupins, pasture legumes	Barley, Wheat, Maize (except when listed with a 4 month minimum re-cropping interval)	Sorghum#	Cotton^ (dryland and irrigated), sunflower	Any other crops^

ßThe following requirements apply for all crops grown after application of IMPOSE:
The re-cropping interval commences from when sufficient rainfall occurs to wet the soil profile to a minimum depth of 5 cm.
At least half the minimum recommended rainfall should fall within the first half of the re-cropping interval.
DO NOT apply IMPOSE® in fallow later than the end of December.
**DO NOT apply IMPOSE® in areas where rainfall from spraying to sowing is expected to be below 200 mm.*
#The following additional requirement applies for barley, wheat, maize (except for non-genetically modified imidazolinone tolerant barley, wheat or maize varieties) or sorghum:
DO NOT apply IMPOSE® in areas where rainfall from the start of the re-cropping interval to sowing is expected to be below 500 mm.
^The following additional requirement applies for cotton, sunflowers and any other crops not listed in the Minimum Re-cropping Interval table above:
DO NOT apply IMPOSE® in areas where rainfall from the start of the re-cropping interval to sowing is expected to be below 550 mm.

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