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OVERVIEW OF CLEARFIELD SYSTEM



CLEARFIELD® production system | wheat

The new solution for improved weed management, sustainable crop rotations and increased profitability for Australian grain producers.

The CLEARFIELD Production System for Wheat is a non-GMO herbicide tolerant cropping system that combines:

- **Wheat varieties** that are specially developed to be tolerant to the imidazolinone herbicide, MIDAS.
- **MIDAS Herbicide**, a broad spectrum herbicide that provides excellent one-pass, in-crop control of grass and broadleaf weeds in wheat crops with CLEARFIELD technology.
- **A Best Management Practice (BMP)** program, designed to maximise the in-field performance and responsible management of CLEARFIELD technology.



Wild oats and climbing buckwheat infesting wheat crop before treatment of MIDAS Herbicide.

The key features of the CLEARFIELD Production System for Wheat are:

1. Simplified weed control

The CLEARFIELD Production System for Wheat is an integrated weed management program that offers outstanding control of key "problem" weeds in wheat including; brome grass, barley grass, wild radish, climbing buckwheat, phalaris and wild oats; via a robust pre and post-emergence control program.

2. Non-GMO technology

Wheat varieties that incorporate CLEARFIELD technology have been developed using traditional plant breeding techniques that have been used in Australia for many years. CLEARFIELD is internationally recognised as being non-GMO technology, which means there is no threat to market access or need for segregation.



MIDAS Herbicide application showing typical red discolouration of wild oats and climbing buckwheat.



Brome grass infestation in wheat crop (left) versus MIDAS Herbicide treated CLEARFIELD wheat crop (right)

3. High performance wheat varieties

Wheat varieties that incorporate CLEARFIELD technology have been bred from a number of popular varieties used in the Australian wheat industry. In addition to their tolerance to MIDAS Herbicide, each variety has been improved over parent lines. Areas of improvement include seedling vigour, grain size and milling performance. BASF's seed partners are continuing to develop elite wheat varieties for use in the CLEARFIELD Production System.

4. Available exclusively from BASF AgriCentres

The CLEARFIELD Production System for Wheat is available exclusively from BASF AgriCentres. Located throughout the major wheat regions of Australia, these selected rural merchandise centres have accredited agronomists who can advise you on all aspects of the CLEARFIELD Production System for Wheat and the Best Management Practice program.

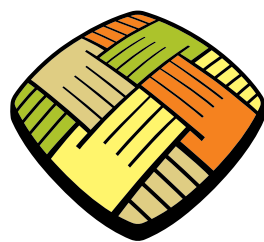
5. Best Management Practice (BMP) program

The CLEARFIELD Production System for Wheat must be implemented in accordance with a Best Management Practice (BMP) program. Developed by BASF at the request of the National Registration Authority, this program is designed to optimise the in-field performance of the CLEARFIELD Production System. Your local BASF Accredited Agronomist can assist you with the implementation of the BMP program.

6. Access to seed

Growers can either purchase certified seed from BASF AgriCentres or from current CLEARFIELD wheat growers. Growers can then retain seed for future use, or sell to other growers. A complete list of BASF AgriCentres and current CLEARFIELD wheat growers can be obtained by contacting BASF toll free 1800 501 597, BASF fax-on-demand service, 0500 544 044 or by visiting www.agro.basf.com.au

FEATURES AND BENEFITS



Midas[®]
HERBICIDE | for CLEARFIELD wheat

One-pass, in-crop control of key grass and broadleaf weeds as part of the CLEARFIELD Production System for Wheat.

Broad spectrum control

MIDAS Herbicide is registered for the early post-emergence control of certain annual grass and broadleaf weeds as part of the CLEARFIELD Production System for Wheat. Applied as a post-emergence treatment, MIDAS Herbicide has a dual mode of action that provides excellent knockdown control and residual activity against a broad spectrum of key weeds found throughout Australia, including wild oats, brome grass, barley grass, wild radish, climbing buckwheat and phalaris.

Reduced number of passes

Applied as part of an integrated weed control program that incorporates the robust, pre-emergence control of weeds using STOMP[®] 330E or trifluralin, MIDAS Herbicide enables one-pass, in-crop control of grass and broadleaf weeds. This reduces the need for tank mixes and the number of herbicide applications required in any given season.

Crop rotation flexibility

MIDAS Herbicide has an excellent plant-back profile. It is applied about six weeks after planting and provided there is adequate rainfall during the growing season, all popular grain legumes, cereals and pastures can be grown the following winter.

Herbicide resistance management

MIDAS Herbicide is used as part of a planned herbicide resistance management program that is suitable for use in all tillage systems and management practices associated with wheat production across Australia. MIDAS Herbicide should not be applied more than once per season to any crop, with a maximum of two Group B herbicides applied to the same paddock in any four-year period.

Environmental safety

MIDAS Herbicide poses no undue risk to operators or the environment when it is stored and handled according to label directions. The active ingredients in MIDAS Herbicide affect enzymes found only in plants and have very low levels of toxicity in mammals, birds, fish and soil microflora.

WEED SPECTRUM

MIDAS Herbicide provides excellent knockdown control and residual activity against a broad spectrum of grass and broadleaf weeds that are susceptible to Group B and I Herbicides.

African turnip weed (*Rapistrum rugosum*)
Amsinckia (*Amsinckia intermedia*)
annual ryegrass (*Lolium rigidum*)
barley grass (*Hordeum leporinum*)
bedstraw (*Galium tricornutum*)
brome grass (*Bromus diandrus*)
capeweed (*Arctotheca calendula*)
cat's-ear* (*Hypochoeris radicata*)
climbing buckwheat* (*Fallopia convolvulus*)
clover (*Trifolium* spp.)
common vetch* (*Vicia sativa*)
corn gromwell (*Buglossoides arvensis*)
cotula* (*Cotula australis*)
crassula (*Crassula* spp.)
deadnettle (*Lamium amplexicaule*)
doublegee (*Emex australis*)
fumitory (*Fumaria* spp.)
hedge mustard (*Sisymbrium officinale*)
Indian hedge mustard (*Sisymbrium orientale*)
London rocket (*Sisymbrium irio*)
medics* (*Medicago* spp.)
mintweed* (*Stachys arvensis*)
Paterson's curse (*Echium plantagineum*)
phalaris (*Phalaris* spp.)
prickly lettuce* (*Lactuca serriola*)
saffron thistle* (*Carthamus lanatus*)
silver grass* (*Vulpia bromoides*)
shepherd's purse (*Capsella bursa-pastoris*)
sowthistle* (*Sonchus oleraceus*)

spear thistle (*Cirsium vulgare*)
spreading night phlox (*Zaluzianskya divaricata*)
storksbill* (*Erodium* spp.)
toadrush (*Juncus bufonius*)
turnip weed (*Rapistrum rugosum*)
variegated thistle (*Silybum marianum*)
volunteer canola (*Brassicaceae* spp.)
volunteer barely (*Hordieum* spp.)
volunteer faba beans* (*Vicia faba* spp.)
volunteer wheat (*Triticum* spp.)
wild turnip (*Brassica tournefortii*)
wild oats (*Avena fatua*)
wild radish (*Raphanus raphanistrum*)
wireweed (*Polygonum aviculare*)



Always consult the product label prior to use.

*Surviving plants will generally be retarded and will not compete with the crop.



MODE OF ACTION

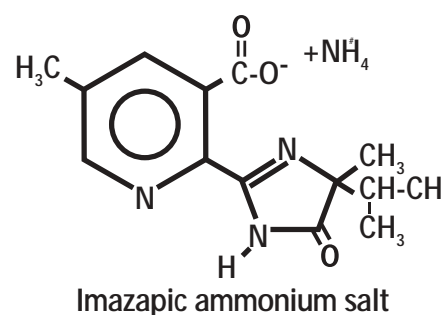
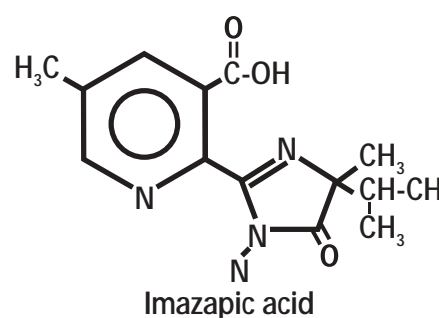
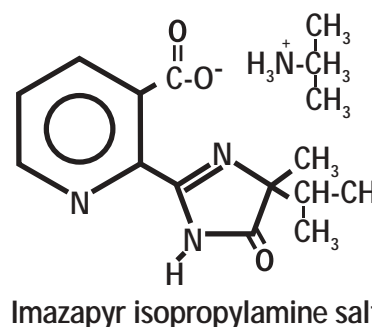
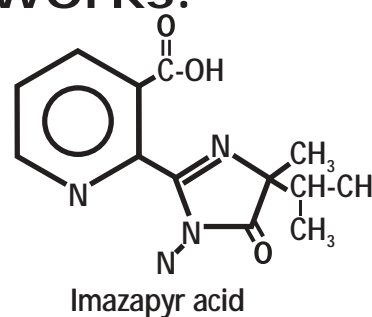
How MIDAS Herbicide works.

Three active ingredients, two different modes of action

MIDAS Herbicide contains imazapic and imazapyr, two members of the imidazolinone group of herbicides, and MCPA, which is a member of the phenoxy group of herbicides. The imidazolinone components inhibit the formation of acetolactate synthase (ALS), an enzyme that is required for the formation of key amino acids used for protein synthesis in plants. MCPA disrupts plant cell growth by mimicking plant hormones. This dual action enables MIDAS Herbicide to control a broad range of grass and broadleaf weeds. For weed resistance management, MIDAS is a Group BI herbicide.

The difference between imazapic and imazapyr

Imidazolinone compounds are rapidly absorbed via the roots and foliage, and then translocated to the growing points of susceptible plants. The herbicidal activity of each imidazolinone compound is determined by a complex interaction of biological and physical factors that regulate how much of the active ingredient actually reaches the plant's growing points. Biological factors include plant absorption, translocation, plant metabolism and soil microbial activity. Physical factors include photodecomposition, chemical hydrolysis and soil binding. In general, imazapic has greater soil activity than imazapyr, while imazapyr has greater foliar activity than imazapic.



Residual activity

In normal seasons, MIDAS Herbicide will provide ongoing control of late-germinating weeds. Moist soil conditions facilitate the availability of the herbicide for plant uptake. The effect of this residual activity on weeds is more variable under dry conditions. Under such conditions, the active ingredients will bind tightly to the soil and become unavailable for plant uptake.

Crop selectivity

Wheat varieties that incorporate CLEARFIELD technology have been specifically selected for their tolerance to MIDAS Herbicide. In some circumstances, the use of this product may lead to transient crop yellowing and temporary slowing of growth. Affected plants soon recover and crop yield is unaffected. This effect may be more pronounced in crops that are stressed due to waterlogging, frost, disease or nutritional disorders. The use of MIDAS Herbicide on any wheat variety other than those certified for use with the CLEARFIELD Production System for Wheat will result in severe crop damage.

Recommended re-cropping intervals

The use of MIDAS Herbicide will not affect crop rotation programs, provided more than 250 mm of rainfall occurs between its use and sowing the following season. The primary route of degradation is via microbial breakdown, which in turn is determined by soil pH, soil moisture and microbial activity. Long periods of moist soil will increase the availability of the herbicide in the soil, facilitating uptake by the plant or microbial breakdown. Breakdown is slower in dry soils or those that have little or no microbial activity. As environmental and agronomic factors make it impossible to eliminate all risks associated with the use of MIDAS Herbicide, the following minimum re-cropping intervals should be observed:

Minimum re-cropping interval (months after application)

0 months

- CLEARFIELD
Canola varieties
- CLEARFIELD
Wheat varieties
- Chickpeas
- Faba beans
- Field peas

8 months

- Lupins
- Pasture legumes
- Vetch
- Conventional
wheat varieties*
- Triticale*
- Barley*

**see additional
comments (below)*

22 months

- Safflower
- Oats

34 months

- All other crops,
including
conventional
canola varieties

The following additional requirements apply if conventional wheat, barely or triticale varieties are to be sown the following winter:

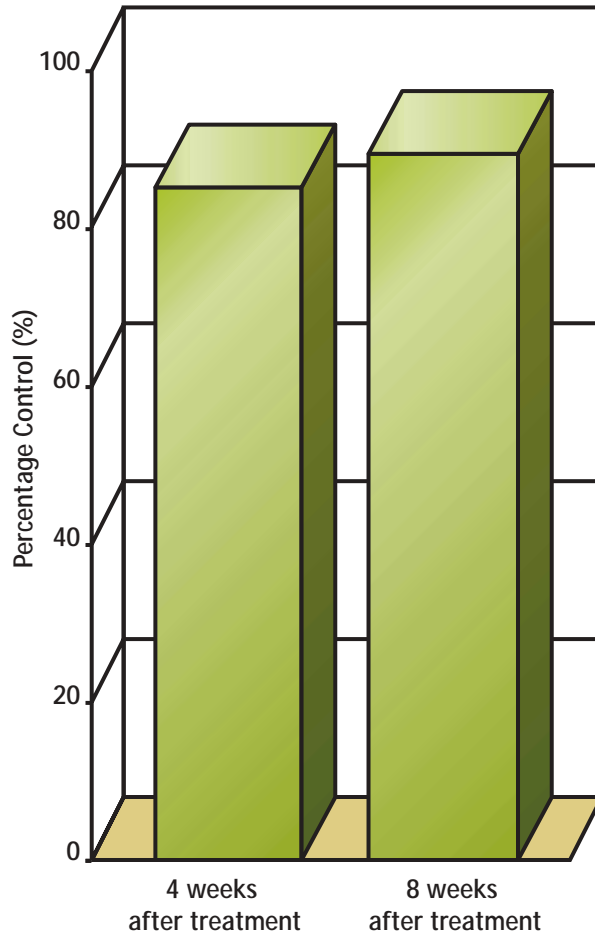
- DO NOT apply MIDAS Herbicide later than the end of August.
- DO NOT use MIDAS Herbicide if the rainfall between spraying and sowing is expected to be less than 250 mm.
- If less than 250 mm rainfall (excluding isolated heavy summer and autumn falls of more than 100 mm) occurs during this interval, contact your local BASF representative before sowing.

Always consult the product label prior to use.

EFFICACY DATA

Robust control of key grass and broadleaf weeds in one pass.

Climbing Buckwheat control

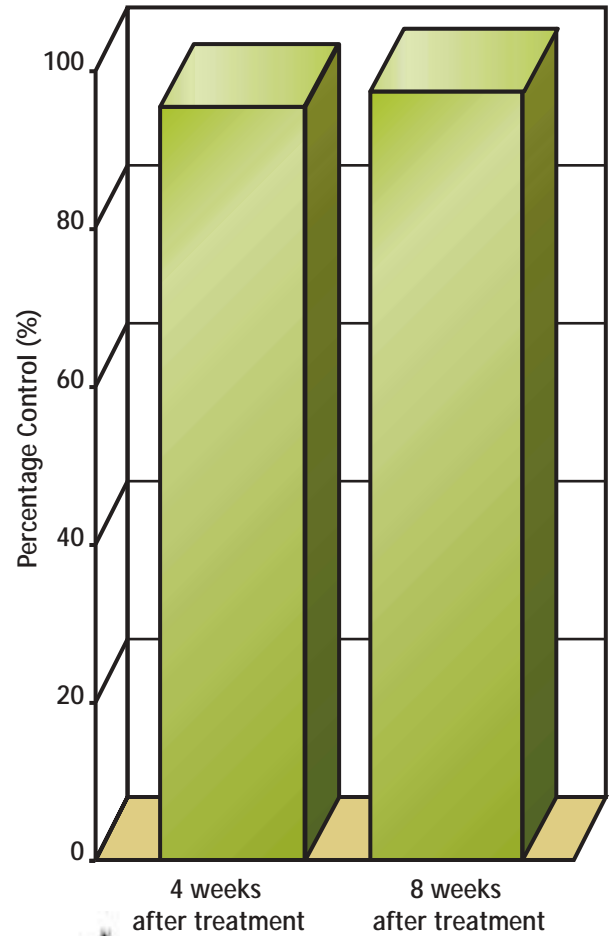


(Average 2 sites, 1999)

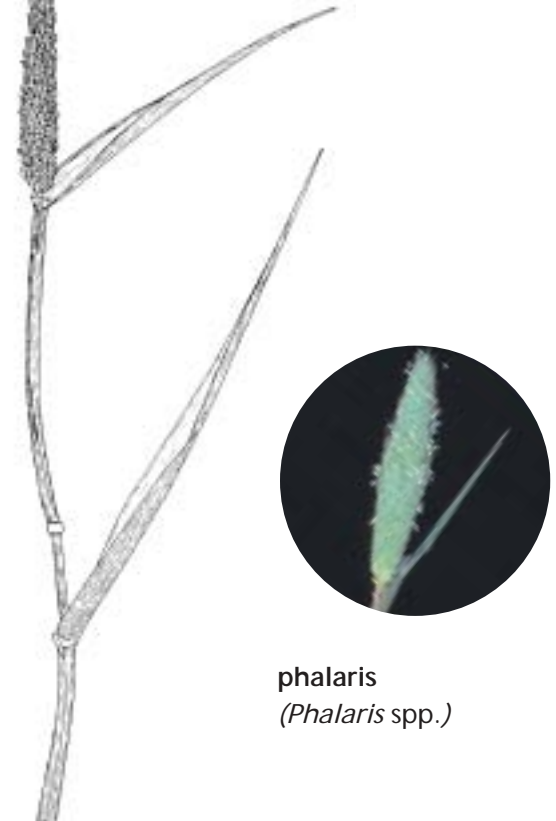


climbing buckwheat
(*Fallopia convolvulus*)

Phalaris control



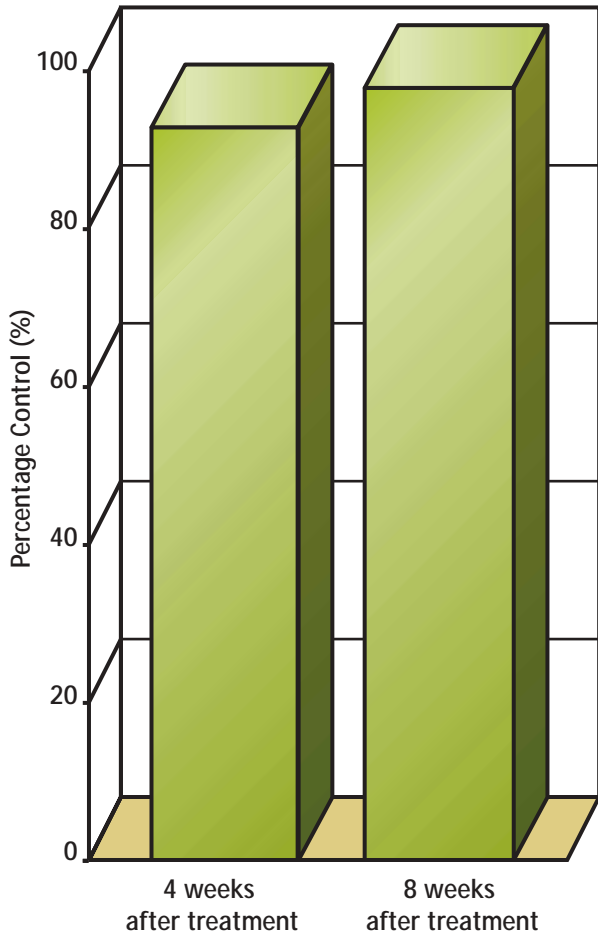
(Average 13 sites, 1997, 1998, 1999, 2000)



phalaris
(*Phalaris* spp.)

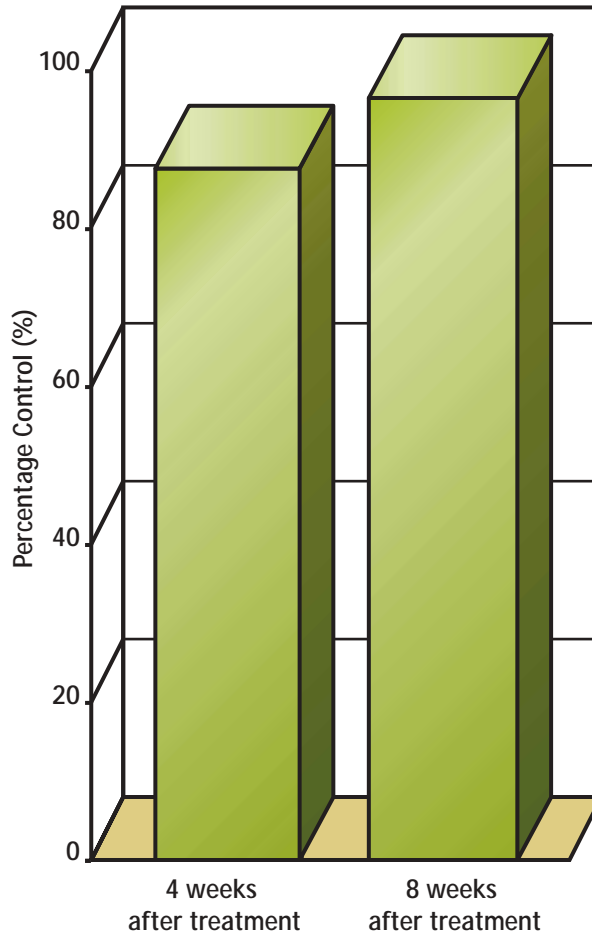
Applied as a post-emergence treatment, MIDAS Herbicide provides excellent knockdown control and residual activity against a broad spectrum of key weeds found throughout Australia, including wild oats, brome grass, barley grass, wild radish, climbing buckwheat and phalaris.

Wild Oat control



(Average 54 sites, 1997, 1998, 1999, 2000)

Barley Grass control



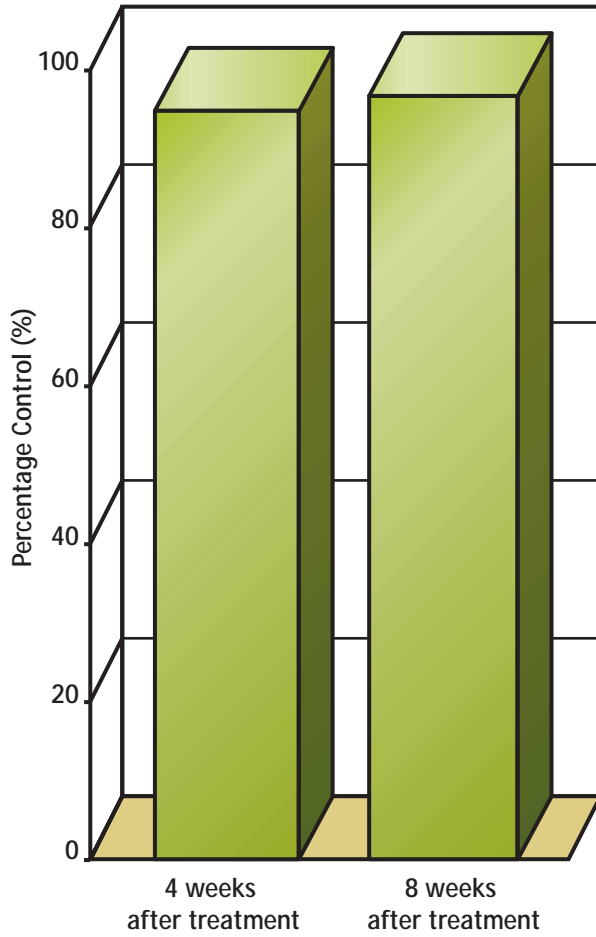
wild oats
(*Avena fatua*)



barley grass
(*Hordeum leporinum*)

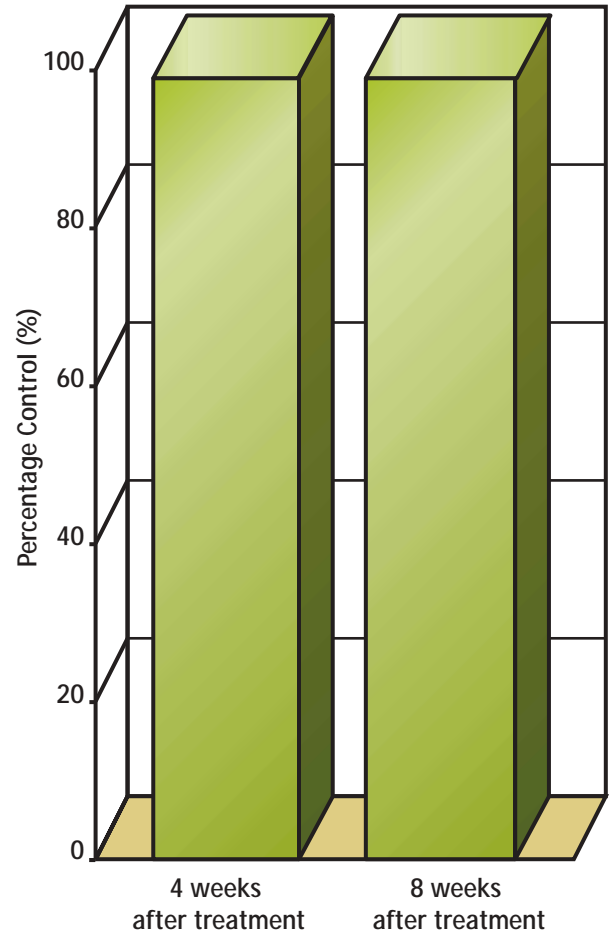
EFFICACY DATA

Brome Grass control



(Average 22 sites, 1997, 1998, 1999, 2000)

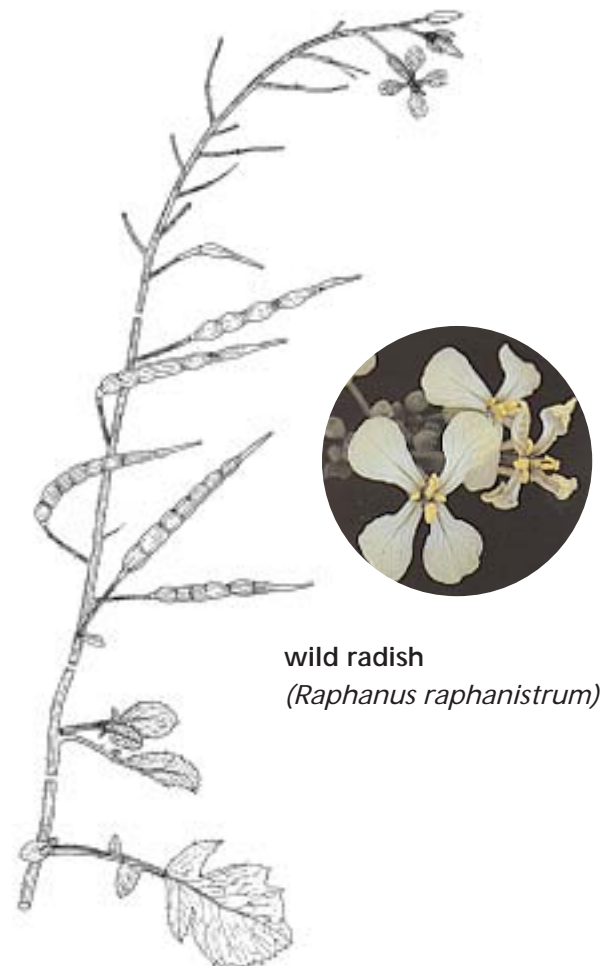
Wild Radish control



(Average 28 sites, 1997, 1998, 1999, 2000)



brome grass
(*Bromus diandrus*)



wild radish
(*Raphanus raphanistrum*)

DIRECTIONS FOR USE

How to get the best results from MIDAS Herbicide.

1. Pre-emergence control program

The CLEARFIELD Production System is an integrated weed management program that incorporates the use of a robust pre-emergence herbicide. MIDAS Herbicide provides the best results and crop safety when applied at the four-leaf stage. The pre-emergence application of STOMP® 330E, trifluralin or other non-Group B herbicides will prevent crop yield losses resulting from early weed competition, particularly if ALS-resistant ryegrass is present. While annual ryegrass and wireweed are the only species controlled by DNA Herbicides (e.g. STOMP® 330E) at the rates used in cereal crops, there is growing evidence that these herbicides suppress a number of other important species, such as wild oats, capeweed and silver grass.

2. Application timing

Imidazolinone compounds inhibit the formation of acetolactate synthase (ALS), an enzyme which is critical for the manufacture of protein in plants. This process primarily occurs in rapidly dividing and growing cells, which in turn are typically found at the growing points of the plant. Optimum weed control will be achieved when application is made to young, actively growing weeds. Likewise, vigorous crop growth will help to suppress stunted or late germinating weeds. Treated weeds will either be killed, or remain stunted and uncompetitive in the crop.

Crops: Apply to crops between the four-leaf (Z14) and commencement of flag leaf (Z39) stages.

Grass Weeds: Apply to actively growing weeds at the three-leaf to two-tiller stage.

Broadleaf Weeds: Apply to actively growing weeds at the two-leaf to six-leaf stage.

3. Adjuvants

Laboratory conditions have demonstrated foliar absorption is much higher under high humidity conditions or when plants are not water stressed. MIDAS Herbicide must be applied with Hasten¹ or Kwicken¹ at 0.5 L/100L spray volume to ensure adequate coverage and herbicide uptake by the plant.

4. Other application guidelines

(i) Mixing

MIDAS is an emulsifiable concentrate formulation. When mixing, partially fill the spray tank and engage the agitation system. Add the required amount of MIDAS Herbicide and then fill the spray tank with water.

If tank-mixing with a compatible product, add the other product to the tank first and mix thoroughly before adding MIDAS Herbicide.

(ii) Compatibility

MIDAS Herbicide is compatible with FASTAC® 100, FASTAC® Duo, dimethoate, omethoate and endosulfan.



DIRECTIONS FOR USE

How to get the best results from MIDAS Herbicide.

(iii) Application

Apply MIDAS Herbicide at 900 mL/ha in a minimum of 50 L water per hectare. DO NOT apply under weather conditions or from spraying equipment that may cause spray to drift onto nearby susceptible plants/crops, cropping land or pasture. Canola, cotton, tobacco, grapevines, lupins, fruit trees and ornamentals are especially susceptible to spray drift and vapour movement. DO NOT spray within 50 m of wetlands or waterways.

(iv) Equipment clean up

MIDAS Herbicide contains MCPA LVE. Thoroughly clean all spray equipment, especially plastic spray lines, using ammonium solution or washing soda before using on sensitive crops, such as canola and legumes.

(v) Restraints

- DO NOT use MIDAS Herbicide on any wheat variety other than those certified for use with the CLEARFIELD Production System for Wheat.
- DO NOT apply MIDAS Herbicide to crops that are stressed due to conditions such as waterlogging, frost, disease or nutritional disorders.
- DO NOT apply if rain is expected within six hours of application.
- DO NOT apply more than one application of MIDAS Herbicide per season to any crop.
- DO NOT apply by aircraft.

(iv) Withholding periods

- Fodder: Do not graze or cut for stock food for four weeks after application.
- Grain: Nil when used as directed.

Operator Safety.

Storage and disposal

Store in the closed, original container, in a dry, cool and well ventilated area.

Do NOT store for prolonged periods in direct sunlight.

Triple or preferably pressure rinse containers before disposal. Add rinsings to spray tank. Do NOT dispose of undiluted chemicals on-site. If recycling, replace cap and return clean containers to recycle or designated collection point.

If not recycling, break, crush or puncture and bury empty containers in a local authority landfill. If no landfill is available, bury the containers below 500 mm in a disposal pit specifically marked and set up for this purpose, clear of waterways, desirable and native vegetation and tree roots. Empty containers and product should NOT be burnt.

Safety directions

Will irritate the eyes and skin. Avoid contact with eyes and skin. When opening the container and preparing spray, wear elbow-length PVC gloves and face shield or goggles. If product in eyes, wash it out immediately with water. After each day's use, wash gloves and face shield or goggles. Wash hands after use.

First aid

If poisoning occurs, contact a doctor of Poisons Information Centre. Telephone 131126 Australia-wide.

MSDS

Additional information is listed in the Material Safety Data Sheet (MSDS).

Always consult the product label prior to use.