Contents

4 & 5 Overview of CLEARFIELD Production System for Canola
6 & 7 Overview of ONDUTY Herbicide
- Features and benefits
- Weed spectrum
8 & 9 Chemistry / mode of action
- Mode of action
- Difference between imazapic and imazapyr
- Residual activity
- Re-cropping interval
- Crop selectivity
10 - 12 Efficacy data
- Efficacy against key weeds
13 & 14 How to get the best results with ONDUTY Herbicide
- Application timing
- Adjuvants
- General application guidelines
15 Regional contact details
An innovative herbicide-tolerant cropping system with significant benefits for Australian canola growers.

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

- **Canola varieties** that are specially developed to be tolerant to the imidazolinone herbicide, ONDUTY;

- **ONDUTY Herbicide**, a broad spectrum herbicide that provides excellent one-pass, in-crop control of grass and broadleaf weeds in canola crops with CLEARFIELD technology;

- **A Best Management Practice (BMP)** designed to maximise the in-field performance and responsible management of CLEARFIELD technology.

Wild radish infestation in canola crop (left) versus ONDUTY Herbicide treated CLEARFIELD Canola crop (right).

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

1. **Simplified weed control**
   The CLEARFIELD Production System for Canola is an integrated weed management program that offers outstanding control of key "problem" weeds in canola including; wild radish, barley grass, bedstraw, doublegee, fumitory, Indian hedge mustard and wild turnip; via a robust pre- and post-emergence control program.

2. **Non-GMO technology**
   Canola 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.
3. High performance canola varieties
Canola varieties that incorporate CLEARFIELD technology have been bred from a number of popular varieties used in the Australian canola industry. In addition to their tolerance to ONDUTY Herbicide, each variety has been improved over parent lines. Areas of improvement include crop yield, oil content and high levels of blackleg resistance. BASF’s seed partners are continuing to develop elite canola varieties for use in the CLEARFIELD Production System.

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

5. Best Management Practice (BMP) program
The CLEARFIELD Production System for Canola 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.
For the early post-emergence control of certain annual grass and broadleaf weeds as part of the CLEARFIELD Production System for canola.

**Broad spectrum control**
ONDUTY Herbicide is registered for the early post-emergence control of certain annual grass and broadleaf weeds as part of the CLEARFIELD Production System for Canola. Applied as a post-emergence treatment, ONDUTY 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 radish, wild turnip, doublegee, bedstraw, barley grass and annual ryegrass.

**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, ONDUTY 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**
ONDUTY 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**
ONDUTY 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 canola production across Australia. ONDUTY 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.

ONDUTY Herbicide reduces the reliance on triazines and Group A grass herbicides in the canola phase.

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

amsinckia (Amsinckia intermedia)
nannual ryegrass (Lolium rigidum)
barley grass (Hordeum leporinum)
bedstraw (Galium tricornutum)
brome grass (Bromus diandrus)
climbing buckwheat* (Fallopia convolvulus)
clover (Trifolium spp.)
corn gromwell (Buglossoides arvensis)
crassula (Crassula spp.)
deadnettle (Lamium amplexicaule)
doublegee (Emex australis)
fumitory (Fumaria spp.)
Indian hedge mustard (Sisymbrium orientale)
Paterson’s curse (Echium plantagineum)
phalaris (Phalaris spp.)
shepherd’s purse (Capsella bursa-pastoris)
silver grass (Vulpia bromoides)
storksbill* (Erodium spp.)
toadrush (Juncus bufonius)
volunteer canola (Brassicaceae spp.)
Other varieties than the Clearfield technology.
volunteer barely (Hordieum spp.)
volunteer wheat (Triticum spp.)
volunteer vetch (Vicia 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.
How ONDUTY Herbicide works.

ONDUTY Herbicide contains imazapic and imazapyr, two members of the imidazolinone group of herbicides. Imidazolinone compounds 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. For weed resistance management, ONDUTY is a Group B herbicide.

The first sign of herbicidal activity is a purple discolouration or chlorosis of the youngest leaves, leading to stunted growth or death. Depending upon the weed species and environmental conditions, visual effects of the herbicide may not appear until several days after application and complete death may take several weeks. This symptom of green but stunted and non-competitive weeds is often referred to as the “green skeleton” effect and is often observed in harder to kill species such as capeweed.

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, ONDUTY 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.

**Recommended re-cropping intervals**
The use of ONDUTY 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 ONDUTY Herbicide, the following minimum re-cropping intervals should be observed:

**Crop selectivity**
Canola varieties that incorporate CLEARFIELD technology have been specifically selected for their tolerance to ONDUTY 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 ONDUTY Herbicide on any canola variety other than those certified for use with the CLEARFIELD Production System for Canola will result in severe crop damage.

**Minimum re-cropping interval (months after application)**

<table>
<thead>
<tr>
<th>0 months</th>
<th>8 months</th>
<th>22 months</th>
<th>34 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ CLEARFIELD canola varieties</td>
<td>■ Lucerne</td>
<td>■ Safflower</td>
<td>■ All other crops, including conventional canola varieties</td>
</tr>
<tr>
<td>■ CLEARFIELD wheat varieties</td>
<td>■ Lupins</td>
<td>■ Oats</td>
<td></td>
</tr>
<tr>
<td>■ Chickpeas</td>
<td>■ Pasture legumes</td>
<td></td>
<td></td>
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<tr>
<td>■ Faba beans</td>
<td>■ Vetch</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>■ Conventional wheat varieties*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ Triticale*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ Barley*</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>*see additional comments (below)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- DO NOT apply ONDUTY Herbicide later than the end of August (no later than the end of July in Western Australia).
- DO NOT use ONDUTY 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.**
Robust control of key grass and broadleaf weeds in one pass.

**Wild Oat control**

![Wild Oat control graph](image)

(Average 19 sites, 1998, 1999)

**Shepherd’s Purse Control**

![Shepherd’s Purse Control graph](image)

(Average 12 sites, 1998, 1999)

Wild oats (Avena fatua)

Shepherd’s purse (Capsella bursa-pastoris)
Applied as a post-emergence treatment, ONDUTY Herbicide provides excellent knockdown control and residual activity against a broad spectrum of key weeds found throughout Australia.

**Double Gee control**

![Double Gee control chart](chart1.png)

(Average 6 sites, 1998, 1999)

**Fumitory control**

![Fumitory control chart](chart2.png)

(Average 6 sites, 1998, 1999)

**doublegee**
(Emex australis)

**fumitory**
(Fumaria spp.)
EFFICACY DATA

Wild Radish control

Indian Hedge Mustard Control

Percentage Control (%)

4 weeks after treatment  8 weeks after treatment
(Average 19 sites, 1998, 1999)

Percentage Control (%)

4 weeks after treatment  8 weeks after treatment
(Average 17 sites, 1998, 1999)

Indian hedge mustard
(Raphanus raphanistrum)

Wild radish
(Raphanus raphanistrum)

Indian hedge mustard
(Sisymbrium orientale)
How to get the best results from ONDUTY 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. ONDUTY is an early-post-emergence herbicide with some residual soil activity under good soil moisture conditions. Residual effects on weeds can be variable where dry conditions follow the application of ONDUTY, because the herbicide is not freely available to weeds. ONDUTY Herbicide provides the best weed control as soon as conditions allow after the crop reaches the two-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 canola 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 two to six leaf stage.

Grass Weeds: Apply early 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. ONDUTY Herbicide must be applied with Hasten† or Kwicken† at 0.5 L/100L spray volume to ensure adequate coverage and herbicide uptake by the plant.

4. Other application guidelines

(i) Mixing

ONDUTY is a water dispersible granule formulation. When mixing, partially-fill the spray tank and engage the agitation system. Add the required amount of ONDUTY Herbicide and then fill the spray tank with water.

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

(ii) Compatibility

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

ONDUTY is also compatible with Lontrel† and Lontrel† 750SG.
DIRECTIONS FOR USE

How to get the best results from ONDUTY Herbicide. Operator Safety.

(iii) Application
Apply ONDUTY Herbicide at 20, 40 or 55 g/ha (depending on the weed burden) 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
Thoroughly flush all equipment with water following the use of ONDUTY Herbicide and before use with other products.

(v) Restraints
■ DO NOT use ONDUTY Herbicide on any canola variety other than those certified for use with the CLEARFIELD Production System for Canola.
■ DO NOT apply ONDUTY 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 ONDUTY Herbicide per season to any crop.
■ DO NOT apply by aircraft.

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

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.
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