Colliss® is a new powdery mildew fungicide containing boscalid and kresoxim-methyl, two active ingredients for effective control of powdery mildew.
INTRODUCTION

Powdery mildew (*Podosphaera xanthii*) is a common and serious disease of cucurbit crops in all growing regions in Australia. The disease can lead to early leaf loss which reduces yield potential and can also lead to severe sunburn in rockmelon and cucumber crops. Powdery mildew is spread by wind-borne spores and, unlike other diseases of cucurbits, will flourish in relatively dry weather.

Cucurbit growers depend upon a program of fungicide sprays in order to avoid or reduce powdery mildew infection. Fungicide programs usually rely on a combination of protectant products (applied before infection occurs) and systemic products that may also provide eradicant properties to control or reduce the spread of disease after infection has taken place.

The widespread distribution of the disease combined with high potential levels of virulence has placed powdery mildew fungicides under a considerable challenge from strains of the disease that are naturally resistant to particular fungicide modes of action. Over use of fungicides, especially those with eradicant or systemic properties, can render them ineffective due to a rapid build-up of resistance. Cucurbit powdery mildew is considered to be one of the plant diseases that rate highest to the risk of resistance development.

The use of co-formulations presents another strategy for resistance management and Crop Care chose this path when developing a mixture of their strobilurin, kresoxim-methyl (Group 11) and their Group 7 fungicide boscalid. Colliss is a co-formulation containing 200 g/L boscalid and 100 g/L kresoxim-methyl.

Boscalid is a member of the anilide class of fungicides and is the only member of Group 7 to be used in horticulture. Although it has a similar mode of action to the strobilurins, boscalid differs in that it blocks Complex 11 rather than Complex 111. This is thought to provide complementary and even synergistic activity on some plant pathogens. Boscalid has limited systemic movement in plants allowing translaminar activity and acropetal movement. Kresoxim-methyl moves around the plant surface through vapour activity and is particularly suited to control of the powdery mildews as they reside mainly on the exterior plant surface.

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FEATURES AND BENEFITS OF COLLISS

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Two distinct fungicide active ingredients working together to control the disease</td>
<td>Superior control of powdery mildew</td>
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<td>Introduction of a new chemical group (Group 7)</td>
<td>New chemistry to assist with resistance management</td>
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<td>Co-formulation with two different modes of action</td>
<td>Avoids the continued use of a product with a single activity site</td>
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<td>Liquid formulation</td>
<td>Easy to use and measure</td>
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<td>Re-entry allowed once spray is dry</td>
<td>Allows work to continue</td>
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<tr>
<td>Low toxicity</td>
<td>Low toxicity to operators</td>
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<td>Classified as “reduced risk compounds” by the US EPA</td>
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POWDERY MILDEW CONTROL

Field trials were conducted over four seasons in Australia (2003 to 2006) to evaluate Colliss. The trials were conducted in a range of cucurbit crops e.g. pumpkins, zucchini and cucumber for the control of powdery mildew (Podosphaera xanthii). Trial locations included Kununurra, Western Australia and also Bowen, Giru and Mareeba in Far North Queensland.

Colliss was compared with the reference compounds triadimenol (Bayfidan® 250 EC) and azoxystrobin (Amistar®). Colliss proved to be superior to Bayfidan which often performed below expectation, possibly because of the presence of resistant powdery mildew strains. Colliss was also shown to provide similar or superior performance to Amistar when applied in the dose range of 250 to 500 mL/ha. The performance of Colliss in this dose range was further enhanced through the addition of the silicon adjuvant Du-Wett® (500 g/L trisiloxane ethoxylate).

This enhancement of activity is due to the superior spreading activity of Du-Wett and a comparison with Pulse® Penetrant (1020 g/L polyether modified polysiloxane) demonstrated that Du-Wett was both better in performance and safer to the cucurbit crop than Pulse.

Assessments of total fruit forms in each treatment were conducted in a number of the Kununurra trials. No signs of phytotoxicity were observed in the Queensland trials and no adverse effects occurred on the vegetative parts of any of the crops tested.

At Mareeba, a trial in pumpkins cv. Jarrahdale was assessed for yield and Colliss at 250 mL/ha produced a numerically higher yield than the commercial reference Amistar at 0.24 kg/ha.
TRIAL RESULTS

Figure 1 shows that Colliss provides excellent control of powdery mildew in zucchini with the best result being achieved at the highest rate of 500mL per Ha. It also shows that the addition of Du-Wett can significantly improve performance at the lower rate.

Figure 2 shows the results from a trial also conducted in Kununurra in 2005 by Phytech on cucumber. This trial compared four rates of Colliss with Bayfidan and Amistar. Excellent control of powdery mildew was obtained with Colliss in this trial and once again Du-Wett improved the performance of Colliss.

Figure 3 is a combination of two trials conducted in Ayr and Bowen on zucchini by Crop Care researchers. The results show that Colliss provided excellent control of powdery mildew. The Stroby and Amistar treatments provided much poorer control which indicates a medium to high level of strobilurin resistance at this site.

The combination of boscalid and kresoxim-methyl in the Colliss formulation is providing excellent disease control.

Figure 4 shows the results of a trial conducted by Crop Care researchers in Mareeba on pumpkins in 2005.

The results show significantly higher yields of pumpkins achieved in the Colliss treatments verses the untreated. The Colliss treatments were superior to the Amistar treatment.
APPLICATION GUIDELINES

Colliss should not be applied by aerial application in cucurbit crops. It is for use in field grown cucurbit crops only. It should also not be applied to glasshouse or tunnel house grown cucurbit crops.

Colliss fungicide should only be applied as a protectant spray before powdery mildew becomes established. Applications before early fruit formation are recommended.

Two consecutive Colliss spray applications 7 to 10 days apart commencing before powdery mildew becomes established are recommended using the higher registered rate and the shorter spray interval when weather conditions favour disease development. As a precaution no more than two applications of Colliss per crop should be applied.
USAGE AND HANDLING

Mixing
To ensure even mixing, half-fill the spray tank with clean water and add the required amount of product. If required, add compatible products and agitate thoroughly, then add the remainder of the water. Agitate again before spraying commences.

Compatibility
For information on compatibility please contact your local Crop Care Australasia Pty Ltd representative.

Re-Entry Period
DO NOT allow entry into treated areas until the spray has dried. When prior entry is necessary, wear cotton overalls buttoned to the neck and wrist (or equivalent clothing) and chemical resistant gloves. Clothing must be laundered after each day’s use.

Withholding Period
The withholding period for Colliss is 7 days.

Application
Apply by boom equipment using spray volumes between 250 to 500 L/ha and nozzles designed to deliver droplets of medium spray quality according to the ASAE S572 definition for standard nozzles.
Du-Wett Low Volume Application Spreader may assist the performance of Colliss at all spray volumes but is especially recommended when reduced water volumes are used.

Colliss versus Untreated zucchini leaves in a Bowen field trial.

Zucchini stems sprayed with a program of Colliss and Vivando®.

* The active constituent metamifenone is not an approved active and the end-use product Vivando is not registered for use in Australia. An application for approval of the active constituent and registration of the product has been lodged in Australia with the Australian Pesticides and Veterinary Medicines Authority (APVMA).
**BUFFER ZONE**

Do not apply Colliss if water bodies or wetlands are within 10 metres downwind of the application area.

**EXPORT OF TREATED CROPS**

Growers should note that MRLs or import tolerances do not exist in all markets for crops treated with Colliss. If you are growing crops for export, please check Crop Care or your local industry body for the latest information on MRLs and import tolerances before using Colliss.

**ROTATIONAL CROP GUIDELINES**

Minimal amounts of boscalid can be taken up from the soil by rotated crops. To avoid risk to Australia’s animal commodity export markets, when using Colliss in annual cropping situations, it is important that the use of Colliss is restricted to a maximum of 2 applications per crop and 4 applications per paddock per year. Colliss should not be applied to cucurbits that follow an annual crop that has been treated with Filan®.

Untreated zucchini stems.

Powdery mildew trial in zucchini, VIC, 2010.
CROP REGISTRATIONS

<table>
<thead>
<tr>
<th>CROP</th>
<th>DISEASE</th>
<th>RATE</th>
<th>WHP</th>
<th>CRITICAL COMMENTS</th>
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<tbody>
<tr>
<td>Cucurbits</td>
<td>Powdery mildew (&lt;i&gt;Podosphaera xanthii&lt;/i&gt;)</td>
<td>250 – 500 mL/ha</td>
<td>7 days</td>
<td>Apply two consecutive COLLISS spray applications 7 to 10 days apart commencing before powdery mildew becomes established.</td>
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<td>Use the higher rate and the shorter spray interval when weather conditions favour disease development.</td>
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<td>Applications beginning at early fruit formation are recommended.</td>
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<td>COLLISS fungicide should only be applied as a protectant spray.</td>
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<td>DO NOT apply to crops where powdery mildew is already present.</td>
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<td>As a precaution DO NOT apply more than two applications of COLLISS per crop.</td>
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<td>Refer to the Application directions below for information on the use of Du-Wett® Low Volume Application Spreader with COLLISS fungicide.</td>
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<td><strong>This use is subject to a CropLife Australia fungicide resistance management strategy.</strong></td>
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