FAQs for Custodia® Fungicide Use in Grapes

Fungicide Resistance Management

How many applications can I apply of Custodia® per season?
Maximum of two sprays of Custodia® per season as per the Fungicide Resistance Management Strategy (FRMS) developed by CropLife Australia Fungicide Resistance Management Review Group and industry researchers.

How many consecutive sprays of Custodia® should I use?
Maximum of two, however, we recommend that no Group 11 fungicides be applied consecutively. If applied alone, Group 11 fungicides should be used in strict alternation with fungicides from an alternative chemical group for the control of Powdery Mildew in Grapes as per CropLife FRMS.

Is Custodia® in the published AWRI Dog Book for 2014/15?
Custodia® is in the 2014/15 AWRI Dog Book in both hard copy and online at www.awri.com.au.

When is the best time to use strobilurin fungicides in Grapevines?
Custodia® can be used at any time from when shoots are 10-20cm long through to 80% capfall in Winegrapes or up to 4 weeks pre-harvest in Table Grapes. We recommend applying Custodia® prior to or at the start of flowering and/or in the next spray application (EL 17-19 through to EL 25) because these are critical growth stages for controlling Powdery Mildew infections on developing bunches.

Can I use Custodia® to control Powdery Mildew once signs of the disease are evident?
No. All Group 11 and other systemic fungicides including Custodia® SHOULD NOT be used curatively. Custodia® contains a Group 11 fungicide (strobilurin) and a DMI. The strobilurins have only locally systemic activity and are not strongly translocated. DMI fungicides have greater systemic activity than strobilurins but if the Powdery Mildew infection is too advanced, then compared to a preventative spray there will still be significantly more disease symptoms, secondary cycles of disease and greater risk of unmarketable fruit. Bunch infections can cause Grapes to be rejected by wineries or supermarkets. Therefore, apply Custodia® and other fungicides in a preventative (protectant) spray program.

Is Powdery Mildew resistance to strobilurin fungicides really a problem in my area?
Recent field surveys and field trial results have indicated that where Group 11 products have been routinely used for many seasons, there is widespread prevalence of Powdery Mildew strains resistant to Group 11 fungicides. If this is the case in your area, then the presence of strobilurin resistant Powdery Mildew is likely as inoculum (spores) are wind-borne and able to rapidly spread throughout a growing region if not adequately managed.
How does resistance to strobilurin fungicides differ from the type of resistance that we have previously experienced in Grapes?

- Strobilurin resistance is most commonly the result of the mutation of a single gene which alters the binding site of the fungicide in the mitochondria of Powdery Mildew cells. Strobilurin resistance is strongly expressed by fungi and can be described as an “all or nothing” phenomenon. When a fungal colony is resistant to a strobilurin, it is effectively immune, regardless of which particular type (product) of strobilurin fungicide or rate being used. Once resistant isolates are present at a potentially damaging level, the ONLY way that you can control them commercially is with a fungicide from a different mode of action which is registered for Powdery Mildew.

What is the industry stance on strobilurin use in Grapes going forward?

Revised guidelines for the use of strobilurins in Grapes were released by the CropLife Fungicide Resistance Management Review Group (FRMRG) in June 2013. These guidelines recommend that strobilurins (Group 11 fungicides) are used as follows:

a) DO NOT apply more than two sprays per season of Group 11 fungicides

b) Where Group 11 products have been routinely used for many seasons, field research indicates there is an increased risk of Powdery Mildew resistance to Group 11 fungicides occurring. To ensure continued protection against Powdery Mildew in these circumstances, either abstain from using Group 11’s or mix Group 11 fungicides with a registered rate of a compound from an alternative chemical group for the control of Powdery Mildew in Grapes.

c) Alternatively, if applied alone, Group 11 fungicides should be used in strict alternation with fungicides from an alternative chemical group for control of Powdery Mildew in Grapes.

What is the Adama recommendation for strobilurin use in Grapes going forward?

Adama are an active member of the FRMRG and have contributed significantly towards the revised guidelines for strobilurins in Grapes. Based on the best available data from field trials, resistance monitoring results and expert opinion, Adama advise that the second point (point b) above is the most responsible approach.

The rationale behind this is:

- Growers who have had control failures with straight strobilurin products and who are only focused on PM control, may decide to use another MOA fungicide instead of a strobilurin.

- Growers who are also targeting Downy Mildew/Botrytis can continue to use the relevant strobilurin, but should do so in a tank mix with another MOA fungicide which controls PM.

Adama are not convinced that the third option (point c) above is a responsible use of strobilurins and would prefer to see growers apply either Custodia® or a strobilurin in a tank mix with another MOA fungicide which controls PM. We would prefer that strobilurin use continues only in a manner that minimises strobilurin resistance selection pressure in PM.

Custodia® is a solution that eliminates the need to tank mix other MOA fungicides with straight strobilurin products and complies with the CropLife FRMRG strategy. The tebuconazole in Custodia® is sufficient to control PM where DMI resistance is not an issue.

Summary point:
Custodia® can be used in place of all other Group 11 fungicides including Azoxystrobin, Trifloxystrobin (FLINT®) and Pyraclostrobin (CABRIO®)
How does Custodia® compare to other Powdery Mildew fungicides with different modes of action?

There are now a range of premium Powdery Mildew fungicides on the market including Talendo (proquinazid – Group 13), Vivando (metrafenone – Group U8) and Flute (cyflufenamid – Group U6). While the Grape Powdery Mildew market has a range of different MOA fungicides, the following points should be considered:

- Talendo (proquinazid) is in the same MOA group as Legend (quinoxyfen – Group 13) and doesn’t represent a new resistance management option. However, Talendo has some advantage of being more efficacious than Legend and has a shorter EHI in Winegrapes.

- Vivando (metrafenone) has the same 80% capfall EHI cutoff for export Winegrapes, and is less flexible for the time of application than the other new fungicides. It is also less effective than Legend, Flute and Talendo.

- Filan (boscalid – Group 7) can no longer be used on export Winegrapes due to MRL restrictions, therefore there are no Group 7 fungicides available for PM.

- The new fungicides only control PM and would need to be tank mixed with another MOA fungicide under moderate to high DM and Botrytis pressure.

Custodia® has provided superior efficacy to straight DMI’s, Prosper and strobilurins (where resistance is present). Direct comparisons to the efficacy of Vivando, Talendo and Flute are yet to be made. However in a protectant spray program it is unlikely that a commercial difference would be found between Custodia®, Vivando, Talendo and Flute.

Where does Custodia® fit in my spray program?

Custodia® should be used as a preventative fungicide in rotation with other PM fungicides from a different MOA group. Depending on the expected level of disease pressure, Custodia® can be used either during flowering or pre-flowering. Some suggested spray programs to incorporate Custodia® are provided below:

Suggested Powdery Mildew spray programs for Grapes according to disease pressure scenarios

<table>
<thead>
<tr>
<th>Application Number</th>
<th>Growth Stage</th>
<th>Disease Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>1</td>
<td>Bud burst to early shoot growth</td>
<td>Sulfur</td>
</tr>
<tr>
<td>2</td>
<td>20cm shoots</td>
<td>Prosper*</td>
</tr>
<tr>
<td>3</td>
<td>&gt;20cm shoots to pre-flowering</td>
<td>Sulfur</td>
</tr>
<tr>
<td>4</td>
<td>Pre-flowering</td>
<td>Vivando*</td>
</tr>
<tr>
<td>5</td>
<td>80% capfall</td>
<td>Custodia®</td>
</tr>
<tr>
<td>6</td>
<td>Post-flowering</td>
<td>Sulfur</td>
</tr>
</tbody>
</table>

In addition to Powdery Mildew control, Custodia® also assists in managing Botrytis and Downy Mildew when used at 100 mL/100 L (or 1 L/Ha). Other standalone Powdery Mildew fungicides do not offer this additional benefit and must be tank mixed with a specific Botryticide or Downy Mildew fungicide. This significantly increases the cost/Ha when controlling multiple diseases.

In other markets where strobilurins have become resistant to PM they have continued to be used either in tank mixtures or more recently, as co-formulations. Strobilurin co-formulations marketed in the US include:

- Azoxystrobin + difenoconazole (Quadris Top)*
- Trifloxystrobin + tebuconazole (Adament)*
- Pyraclostrobin + boscalid

Co-formulations now represent approximately 40% of crop protection sales in the US.

Co-formulations with strobilurin fungicides allow their ongoing use for Powdery Mildew, Downy Mildew and Botrytis control.
If resistance has occurred to the strobilurin fungicides how long will it persist if they are no longer used?
The most common experience globally is that once a disease becomes resistant to a strobilurin then resistance will always be present. The severity of resistance will depend on the frequency of the resistance genes in the PM population which is determined largely by how the resistant strains are managed. If strobilurins are co-formulated/tank-mixed and rotated with PM products from a different MOA group then this may prolong the useful life of strobilurins in Grapes.

There are many cases where resistance to strobilurins has occurred and yet the product still has an important fit and ongoing use. This will largely depend on whether this is the key disease in a given crop and whether there are a range of effective alternative fungicides available. In Grapes, some strobilurins also control Botrytis and Downy Mildew as well as populations of PM that are not strobilurin resistant. In the original trial site in South Australia where PM strobilurin resistance was first identified, there have been subsequent applications of strobilurins and these products have still controlled PM.

Does giving a low dose rate of strobilurin fungicides on already strobilurin resistant powdery make matters worse by further increasing selection for resistance?
Strobilurin resistance depends primarily on the pathogen type and number of total number of strobilurin applications applied either consecutively in a season or as a cumulative total over several years (the “selection pressure”). The more often a high resistance risk fungicide is applied (particularly as a solo product), the greater the selection pressure for resistance. If a strobilurin was applied as a solo product for PM control and the frequency of strobilurin resistance in the PM population was low to moderate, the dose may have some relevance on the rate of selection pressure. However, if a Powdery Mildew population is already highly resistant to strobilurin chemistry, increasing the dose of strobilurin alone will not overcome the resistance mechanism and a control failure may occur.

Applying a strobilurin with another mode of action fungicide that controls PM, either by tank mixing or use of a co-formulation such as Custodia®, will ensure that a control failure does not occur and that there are fewer survivors (irrespective of resistance status). Co-formulations or tank mixtures with other MOA fungicides are widely used in other markets to enable ongoing use of high resistance risk fungicides such as strobilurins. Both AI’s in Custodia® are active on PM and in situations where strobilurin resistance is low or moderate, both AI’s will contribute to PM control. In vineyards where high levels of strobilurin resistance are present, the DMI in Custodia® will contribute more to PM control.

Who did the trial work prior to registration in Australia and where?
In Australia, field trials were conducted on behalf of Adama (then known as Farmoz) by independent researchers including SARDI and Peracto between 2010 and 2012 to generate the data required for registration. These trials were conducted in key Winegrowing areas with a long history of Group 11 fungicide use. Custodia® has also been evaluated widely in other major Grape producing countries including Chile, Argentina, Italy, Spain, Greece, Germany and Israel.

Do Adama have a summary of trial results, to indicate performance on Powdery Mildew, Downy Mildew & Botrytis when compared to industry standards?
Yes. Summaries of trials conducted by Peracto and SARDI can be discussed by contacting your local Adama representative.
Application

What is the registered label use rate per 100 L of water?
Use Custodia® at 65 mL/100 L of water for Powdery Mildew control prior to flowering, when dilute spraying and adjust accordingly for concentrate spraying.

Use Custodia® at 100 mL/100 L of water for dilute spraying when targeting Powdery Mildew at the start of flowering and when looking to protect from potential Downy Mildew or Botrytis outbreak. Adjust accordingly for concentrate spraying. Spray to the point of run-off when dilute spraying, however, if greater than 1000 L/Ha is required to achieve point of run-off, adjust the amount of product added for each 100 L of water to ensure no more than 1.0 L/Ha product is applied.

Can I apply Custodia® using my current spray equipment?
Custodia® can be applied by dilute or concentrate spraying equipment. In field trials, concentrate rates of up to 3X the label rate were applied with no application problems or crop safety issues.

What volume of water should I use per hectare? Can I apply with water volumes less than 250 L/Ha?
Dilute water rates are preferred as they generally achieve more consistent coverage and efficacy. The recommendation is to use enough spray volume to achieve sufficient coverage of foliage and bunches, without going below 250 L/Ha. The required dilute spray volume will change according to crop growth stage/canopy size, spray quality and application equipment.

Do I need to add a wetting agent or can I use a vegetable oil?
Custodia® should not be mixed with oils and does not require the addition of a wetter.

What is the Rainfast period for Custodia®?
The rainfastness period for Custodia® is a minimum of 2 hours providing the spray has dried on the plant surface. Under humid conditions it may take considerably longer than 2 hours for the spray to dry on the plant surface. Custodia® is not considered rainfast until at least 2 hours after application and the spray has dried.

Can I use bore water or river water when applying Custodia®?
As with water for all agricultural chemical applications, the best water available should be used – usually rainwater. Whichever source is used should be free of silt, neutral in pH and free of foreign matter which may block nozzles.

Do I need to apply at a certain time of day?
There are no general rules with the time of day to apply Custodia®. If applying earlier in the morning the plant surfaces may not have dried adequately from heavy dew and more spray will be lost due to runoff. Spraying during the hottest period of the day is generally not preferred as this increases the risk of phytotoxicity to leaves/fruit from some fungicides i.e. Sulphur.

Does droplet size have impact on efficacy? Is good coverage essential?
Thorough coverage of the vines is essential to maximise fungicide performance. Droplet size and water volumes need to be chosen carefully to ensure this is achieved.

Will Custodia® kill beneficial Mites and Wasps? How safe is it on Bees?
At field rates there is no evidence of any negative impact from Custodia® on beneficial Insects including Mites, Bees, Wasps or Lady beetles.
Compatibility

What other fungicides and insecticides can I mix with Custodia®?
A full range of physically compatible insecticides and fungicides is available on the Custodia® webpage on the Adama website.

What foliar fertiliser products or growth regulants can I mix with Custodia®?
Mixing Custodia® with foliar fertilisers is not recommended due to the wide range of products on the market, variability in their specifications and the large number of compatibility tests that would be required. No growth regulants have been tested in combination with Custodia®.

Can I use a pH buffering agent in my tank mix?
Yes. There are no issues with adjusting water pH prior to mixing with Custodia® providing the pH is within the normal range for spraying agricultural chemicals.

Phytotoxicity

What Winegrape varieties can I safely apply Custodia® to?
Custodia® has been applied safely to the following varieties:
- Biancone
- Cabernet Sauvignon
- Chardonnay
- Lagrein
- Malbec
- Pinot Noir
- Shiraz
- Verdelho
- Viognier

It is not anticipated that any varieties will be sensitive to Custodia® applications when used as directed.

What Table Grape varieties can I safely apply Custodia® to?
Custodia® has been applied safely to Thompson Seedless Table Grapes. It is not anticipated that any varieties will be sensitive to Custodia® applications when used as directed.

What concerns (if any) are there for spray drift onto non-target crops?
Minimising spray drift is a general rule for spraying any crop protection product. Aside from any crop specific phytotoxicity that can occur when using products such as herbicides, there is also an issue with residues and trade. In the case of Custodia®, the azoxystrobin component is known to be phytotoxic to certain Apple varieties. Adequate precautions must be used to prevent injury to Apple Trees.

AVOID SPRAY DRIFT and DO NOT spray Custodia® where spray drift may reach Apple Trees. Spray equipment that has been previously used to apply Custodia® should not be used to spray Apple Trees as even trace amounts can cause unacceptable phytotoxicity.

If a tank mix partner requires wetter, will this be phytotoxic?
A 100% Non-ionic wetter will not change the level of crop safety for Custodia®, however, do not mix with vegetable or mineral oil-based adjuvants.

Do high Summer temperatures cause any burning issues?
There has been no trial work done under extreme weather conditions i.e. week-long periods with temperatures over 40°C. If extreme heat is expected within a few days of application then caution should be exercised when applying Custodia® or any other product.
Domestic and Export Wine Restrictions

Are there MRL’s in place for both Domestic and Export Wine markets?
There are CODEX international food standard MRL’s set by the FAO that apply to Custodia®. MRL’s are generally used to establish the WHP in Wine and Table Grapes. However, in addition to the WHP, there are also export harvest intervals (EHI’s) for all products registered in Winegrapes. The EHI’s are established by the Australian Wine Research Institute (AWRI) as not all products with CODEX status will have an MRL in the importing country. This may be because Grapes are not grown commercially in these countries and there is no need to register products for use on Grapes. As a result no MRL is set, which means that the importing country will either not allow any detectable residue of the agrochemical in Wine, or only permit ‘safe’ amounts of it.

AWRI have established an EHI for Custodia® and this is listed in their industry publication known as the ‘Dog Book’.

What is the latest growth stage that I can apply Custodia® on Grapes destined for the Export Wine market?
The WHP for Custodia® is 4 weeks in Table Grapes. For Winegrapes - the EHI recommendation is DO NOT APPLY after 80% capfall.

Efficacy Issues

What is in Custodia® and how do its components work?
Custodia® is a co-formulation of a strobilurin and a DMI fungicide.

Strobilurins (Group 11 fungicide) inhibits mitochondrial respiration of fungi. The strobilurin in Custodia® can redistribute via limited systemic movement (both translaminar and acropetal) within the leaf. The mode of action of strobilurins gives them particularly good protectant activity as they can stop spore germination and host penetration. However, once the infection has entered the host plant tissue, the strobilurins have very limited capacity to control advanced infections within colonised plant tissues. Post-infection activity can also increase the selection pressure for resistance and should be avoided.

The DMI (demethylation inhibitor - Group 3 fungicide) fungicide in Custodia® has protectant and systemic activity. It is rapidly absorbed into the leaves and is translocated acropetally to provide more uniform protection. The DMI fungicides inhibit the production of ergosterol, which is a component of the cell membrane of a wide range of fungi including Powdery Mildew. DMIs are most active on the mycelia (vegetative growth) of the fungi, but have limited direct activity on spores. DMIs also need to be applied before infection to allow the fungicide to enter the plant tissues and redistribute before the infection becomes too advanced to stop sporulation/crop losses.

Is Custodia® as good as other Powdery Mildew options currently available?
Custodia® offers very similar levels of control of Powdery Mildew populations that are sensitive to Group 11 Fungicides including Cabrio® and Flint®. Custodia® significantly outperforms these products when a proportion of the Powdery Mildew population is strobilurin resistant.

Why not simply tank-mix Mirador (Azoxytrobin) and Orius (Tebuconazole) to achieve the same level of actives and outcomes?
Custodia® was developed as a simple and effective solution for controlling disease and complying with the recommended fungicide resistance management strategies for diseases such as Powdery Mildew in Grapes.

What sort of residual protection will I get from Custodia®?
Custodia® will protect leaves and bunches when applied on spray intervals of 10-14 days.

Is there any vapour activity within the canopy?
No. Neither active ingredients exhibit vapour activity.

How safe is it to humans? How safe is it on beneficial insects?
Custodia® toxicity is low for mammals, birds, bees, insects, and earthworms.

Will it have any effect on blister or bud mite like sulphur?
No. Custodia® exhibits no miticidal or insecticidal activity.
Purchasing Questions

Where can I buy Custodia® in season 2014/15?
Custodia® will be available in 2014 from select distributors of crop protection products across the grape growing regions of Australia.

What pack sizes is Custodia® available in?
Custodia® will be available in 5 L and 20 L pack sizes.

How much will Custodia® cost?
Custodia® for Powdery Mildew, Downy Mildew and Botrytis control in Grapes is priced at similar levels to other Label Rates of Group 11 fungicides including Azoxystrobin, Trioxystrobin (Flint®) and Pyraclostrobin (Cabrio®) and will have the significant benefit of being pre-formulated, easy to mix and proven to be effective with active compounds from two alternative Modes of Action groups.

Visit adama.com for further details.
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