



**BOTANIGARD®**

**GROWING FOR  
THE FUTURE**

**CERTIS**  
BIORATIONALS

**BOTANIGARD WP:  
BEST PRACTICE GUIDE**



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## INTRODUCTION

Botanigard WP is a microbiological insecticide based on the entomopathogenic fungus *Beauveria bassiana* strain GHA, a particularly aggressive strain.

The formulated product is a wettable powder making the product an ideal choice where crop safety is a concern. Due to the powder formulation, the spores of *Beauveria* spp. are in a semi-dormant state and with the slightest increase in humidity they start to germinate.

Botanigard WP contains living microorganisms and it is essential to follow the best practice guidelines to maximise its efficacy on targets such as whitefly and thrips.

Maintaining viability of the spores prior, during and after use is essential for best results.

## MODE OF ACTION



Picture 1: Muscadine disease

*Beauveria bassiana* GHA is a fungus which causes an insect disease known as the white muscadine disease. (Picture 1 )



Picture 2: Germinated spores of *Beauveria bassiana* GHA

When spores (Picture 2) of the fungus come into contact with the cuticle of susceptible insects, they germinate and grow directly through the cuticle to the inner body of the host.

Here the fungus proliferates throughout the insect's body, producing toxins and draining the insect of nutrients, eventually killing it.

Unlike bacterial and viral pathogens of insects, *Beauveria* infects the insect by contact and does not need to be ingested by their host to cause infection.

Once the fungus has killed its host, it grows back out through the softer portions of the cuticle, covering the insect with a layer of white mould (hence the name white muscadine disease).

This process may take several days under normal conditions. The mould then produces millions of new infective spores (Ascospores) that are released to the environment.

A typical isolate of *B. bassiana* can attack a broad range of insects due to its contact mode of action. Known susceptible targets, other than whitefly, are spider mites, thrips, aphids and some beetle species.



## DOSE RATES AND WATER VOLUMES

Botanigard WP has a label approval for a wide range of crops under permanent protection as well as Extensions of Authorisations for Minor Uses (EAMU's) covering many more (see tables 1 & 2 below).

Table 1: ON LABEL

Crops	Dose Kg/ha	Water Volume L/ha
Aubergines, courgettes, squash, cucumbers, melon, tomato, sweet and chilli pepper and roses (under permanent protection with full enclosure)	0.94	500 to 1,500
Strawberries and ornamentals (under permanent protection with full enclosure)	0.75	500 to 1,200
Nursery Fruit Trees (under permanent protection with full enclosure)	0.63	500 to 1,000

- Using larger water volumes does not necessarily mean better crop coverage and growers should check their spray equipment and the coverage they achieve with water sensitive paper (see Crop coverage section).
- Lower water volumes and consecutive applications normally achieve higher efficacy.
- When applying Botanigard WP it is recommended to apply 2-3 consecutive applications with a shorter interval between applications where good coverage is required and pest population dynamic is in favour of younger larval stages.

Table 2: OFF LABEL (EAMU's) – Please contact Certis for any updates

Crops		Dose Kg/ha	Water Volume L/ha	Restrictions
Outdoor and protected leafy salad vegetables and herbs	Outdoor and tunnel grown crops	0.6	1,500	Maximum 5 applications permitted per crop
	Crops grown in glasshouses	0.94	1,500	25 applications permitted per year per glasshouse
Protected and outdoor crops of bilberry, blackberry, blackcurrant and redcurrant, blueberry, cranberry, elderberry, gooseberry, loganberry and rubus hybrid, mulberry, raspberry, rose hips.	Outdoor and tunnel grown crops	0.6	600 to 1,200	Maximum 5 applications permitted per crop
	Crops grown in glasshouses	0.75	1,200	12 applications are permitted per year per glasshouse
Outdoor strawberry, Protected strawberry	Outdoor and tunnel grown crops	0.6	600 to 1,200	Maximum 5 applications permitted per crop





## ACHIEVING MAXIMUM EFFICACY

*Beauveria bassiana* GHA is a fungus from the Ascomycota family (the same as powdery mildews), therefore in order to achieve the best results with Botanigard WP, several factors need to be taken into account before application begins.

### 1. Storage of Botanigard WP prior to use.

- Store product in a cool dry place.
- Avoid freezing and temperatures above 30°C.
- Part used containers should be tightly closed and trapped moisture avoided to prevent decrease in viability of spores.
- The storage period for unopened Botanigard WP is two years from date of manufacture.

The spores will remain viable providing they are not exposed to water, which will trigger germination.

### 2. Spray equipment

Botanigard WP is a living organism and its viability can be reduced when it is in contact with some pesticides, especially fungicides. Therefore, it is extremely important to thoroughly clean the spray tank before starting any mix and spray operations with Botanigard WP.

- Certis recommend the use of All Clear® Extra spray tank cleaner to ensure no residues are present in the tank prior to Botanigard WP use.
- After mixing with water, Botanigard WP should be sprayed as soon as possible, as fungal spores are very aggressive when in contact with water - pre-soaking is not required.
- Do not leave spray solution in the tank overnight, as this will lead to a decrease in spore viability.
- The operating pressure should be between 2.5 and 3.0 bar closer to the spray nozzles.
- With large capacity spray tanks it is advisable to have constant agitation during the application process to maintain an even solution.

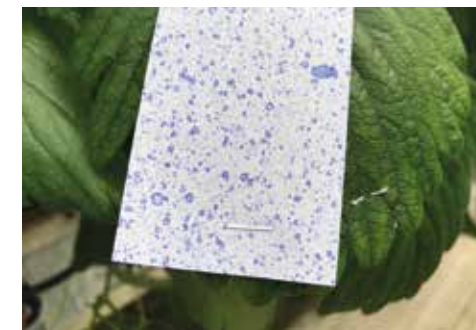
### 3. Crop coverage

Botanigard WP works by contact only; therefore, to work effectively it is important to get good crop coverage.

- The foliage should be sprayed until the plants are thoroughly wet including both the upper and lower side of the leaves.
- Equipment that gets the spray solution to the undersides of the leaves will provide higher efficacy where the pest is located (whitefly and some aphid species).



- The use of water sensitive paper can be a useful tool when planning to use Botanigard WP for the first time, or when changing the equipment. (Picture 3)
- Aiming for 100µ micron or medium size droplets will be ideal for whitefly.
- Smaller droplets of 50µ micron or fine size may be better for smaller incidental targets e.g. spider mites.
- Generating some turbulence will aid under leaf coverage.



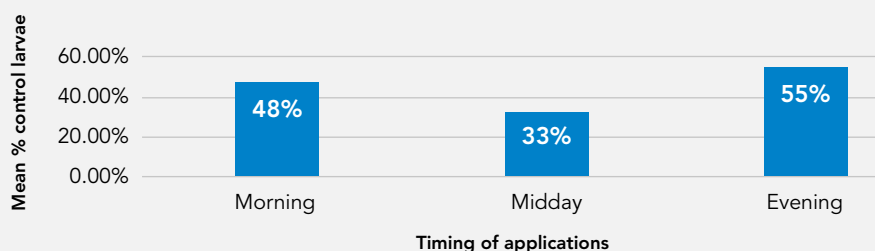
Picture 3: Strategically placed water sensitive paper provides an analysis of the spray coverage effectiveness Left = Good Right = Poor



#### 4. Application timing

- Once the spray solution is mixed, it is essential to use it immediately.
- Spraying in the evening rather than daytime is recommended as high UV light can negatively impact spore germination (Fig.1)

**Botanigard WP performance on Western Flower Thrips larvae**



- Relative humidity at crop canopy should be above 70%, at time of application and for several hours (5-6 hours) after application to encourage spore germination on the surface of the insect.
- Lower relative humidities may proportionately decrease levels of efficacy.
- The optimum temperature for Botanigard WP is between 20-30°C. Temperatures lower than 15°C may result in lower levels of control but will not impact the spore viability.
- Temperatures higher than 35°C may kill the fungus
- *Beauveria bassiana* GHA spores are inactivated by sunlight. To ensure optimum efficacy, applications made during low light levels and/or evening are most suitable as the humidity, temperatures and light are in the optimum levels for longer period of time.
- For efficient pest management, it is recommended that treatment begins as soon as the insect pests are detected.

#### 5. Lethal dose

Depending on the target pest, to achieve a lethal dose the spore count delivered per area of leaf in the crops is very important.

##### Example: Glasshouse whitefly and tobacco whitefly

The lethal dose of spore counts should be 270spores/mm<sup>2</sup>.

To achieve thorough coverage of 1mm<sup>2</sup> using 100µ droplet = 2 droplets of spray solution per mm<sup>2</sup>. Each droplet contains 40 spores of Botanigard WP.

To achieve 270spores/mm<sup>2</sup> with 100µ droplet size and medium spray quality it is recommended to apply minimum of 3 spray applications 5 days apart

3 sprays x2 droplets x40 spores= 240spores/mm<sup>2</sup>

#### 6. Application intervals

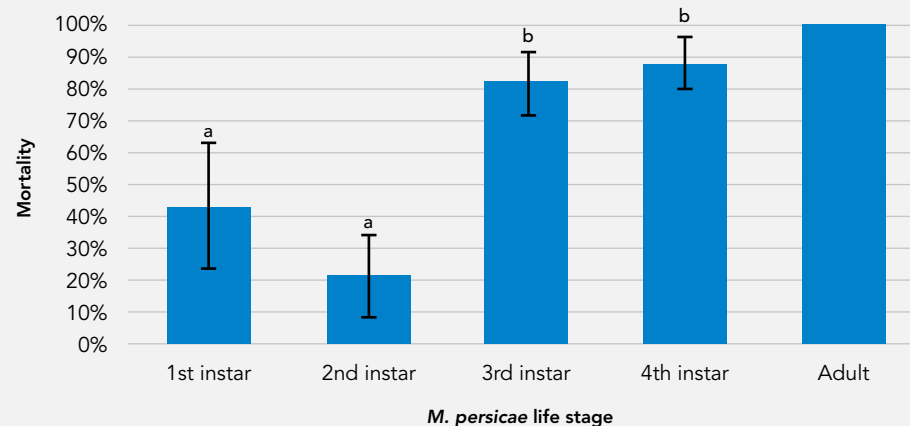
Depending on the target pest and the dynamics of the population, the interval between applications will vary.

- The ratio of the various lifecycle stages combined with the environmental conditions will determine the interval.

The higher the number of larvae and juveniles the shorter the interval.

- Certis recommends a 5 day spray interval where the number of the larvae and juveniles is 2.5-3 times the number of adults.

**Botanigard WP efficacy vs *M. persicae* (peach potato aphid) life stages**



## 7. Post application

- To ensure the highest efficacy from Botanigard WP applications it is crucial to maintain the key environmental parameters in optimum range.
- Cultural practices such as closing overhead screens, vents and doors

following application and increasing temperature will also aid germination of the Botanigard WP spores on the cuticle of the targets.

- When monitoring the pest levels post application, colour changes in the insect may not indicate a consistent kill effect on the target.



## CREATION OF ROBUST IPM PROGRAMME

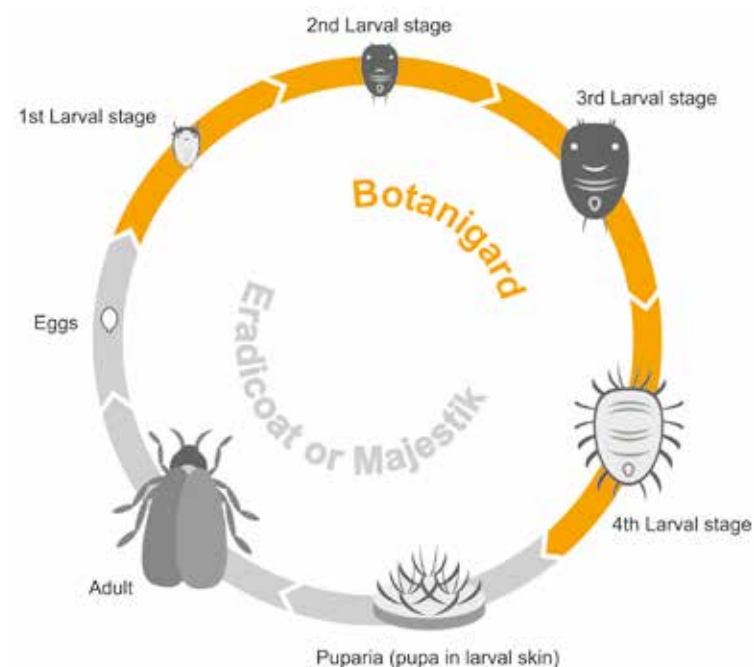
Botanigard WP is effective at controlling the larval stages of whitefly.

When used with other pesticide programs in an Integrated Pest Management Strategy (IPM) all stages of the pests lifecycle can be targeted, helping to ensure that the lifecycle is disrupted and more effective control is achieved.

Experience overseas has shown that mixing Botanigard WP with maltodextrin products can improve the overall efficacy.

Botanigard WP is excellent on the 1st, 2nd, 3rd and 4th larval stages of the whitefly and by adding maltodextrin as a tank mix the efficacy on egg, adult and pupa is improved overall.

Figure 1. Targeted control of the whitefly lifecycle



Botanigard WP can be tank mixed with other active ingredients but careful choice is required. For the most up to date tank mix sheet please contact Certis.

Some active ingredients have persistent properties on the leaf surface of crops and a specific interval within a spray programme may be required to ensure spore viability remain as high as possible.





## BOTANIGARD WP: BEST PRACTICE GUIDE

### The strongest biorational insecticide for whitefly control

- The most robust strain of *Beauveria bassiana*
- Excellent low residue programme compatibility
- No harvest interval
- High number of colony forming units per ha
- Ideal option for integrated Crop Management systems
- The only *Beauveria* spp. with 24 months shelf life



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USE PLANT PROTECTION PRODUCTS SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE.

For further information with regard to the warning phrases and symbols for this product please refer to the product label. Botaniguard® is a registered trademark of Emerald BioAgriculture Corp.

Botaniguard® contains *Beauveria bassiana*. All Clear® Extra is a trademark of E.I. du Pont de Nemours and Company

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