Always read the product label prior to using Vivus Max Helicoverpa Biocontrol

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Vivus Max Helicoverpa Biocontrol is manufactured by:
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AgBiTech – a company 100% owned and managed by farmers and agricultural scientists – is a leader in developing and manufacturing biological insect control solutions. Around the world, field crop and horticultural farmers rely on our registered products. They trust and use our products because they know AgBiTech will always deliver dependable, practical, easy to use, high quality and cost-effective solutions.

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Contents

5 Introduction
5 How is Vivus Max Made?
6 Vivus Max Quality Control
7 Vivus Max In Integrated Pest Management
7 Vivus Max In Resistance Management
8 How Vivus Max Works
9 Achieving Optimum Results With Vivus Max
   9 Coverage
   11 Temperature
   12 Larval Size
   13 Optimol And Sugar Based Additives
   14 Spray Solution pH
14 Vivus Max Rain Fastness
14 Vivus Max Compatibility
14 Vivus Max Storage
15 Vivus Max Performance
   15 Vivus Max Laboratory Potency
   15 Vivus Max Field Performance
16 Vivus Max – Crop Specific Advice
   16 Sorghum
   18 Chickpeas
   19 Cotton
   20 Sweet Corn
   20 Horticultural Crops
22 Vivus Max Application Via Overhead Irrigation
23 Label Directions For Overhead Irrigation

Inside Back Cover  Label Insert

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Introduction

**VIVUS MAX HELICOVERPA BIOCONTROL IS A BIOLOGICAL INSECTICIDE THAT CONTROLS HELICOVERPA ARMIGERA AND HELICOVERPA PUNCTIGERA LARVAE.**

The active constituent of Vivus Max is occlusion bodies (OBs – see Fig. 1) of the nucleopolyhedrovirus (NPV) of *Helicoverpa* spp. This baculovirus is a naturally occurring, highly effective biological control agent for *Helicoverpa* control. It is specific to larvae of *Helicoverpa* spp. and therefore has no impact on beneficial and other pest species in the crop. For these reasons, Vivus Max has a unique fit as a preferred option for the integrated management of *Helicoverpa* in a wide range of crops.

Occlusion bodies are protein bodies that have baculovirus particles embedded in them; they enable NPV to survive outside its insect host – like the spores of a fungus. When *Helicoverpa* larvae feed on Vivus Max treated plants they ingest the OBs and become infected with the virus. The virus utilises the insect’s metabolism to replicate itself. The replicating virus invades almost every cell in the insect and eventually causes its cells to rupture, killing the caterpillar and releasing an NPV-laden liquid. Healthy larvae that feed on this liquid will also become infected and die (secondary infection).

How Is Vivus Max Made?

**Vivus Max is made in Australia by AgBiTech, a wholly Australian owned company.**

The production process involves the mass rearing of huge numbers of *H. armigera* caterpillars (see Fig. 2), infecting them with a small amount of NPV, harvesting the resultant OBs from the dead caterpillars and formulating the final product. This process is conducted in climate-controlled facilities with highly specialised equipment. Vivus Max is available in 1 L and 5 L pack sizes. Each millilitre of Vivus Max contains 5 billion occlusion bodies.

The NPV in Vivus Max is a combination of a native Australian *H. armigera* isolate, (developed in conjunction with Queensland Department of Agriculture, Fisheries and Forestry (QDAFF)), that exhibits high laboratory potency, and a US *H. zea* isolate used in the original Vivus that exhibits a faster speed of kill. This combination is designed to maximise field performance.
Vivus Max Quality Control

THE MANUFACTURE AND FORMULATION OF NPV-BASED INSECTICIDES HAS SPECIFIC QUALITY ISSUES THAT REQUIRE SPECIALISED PROCESSES.

AgBiTech has strict quality control systems in place, developed through many years of experience. These include:

- **OB Counts** – The OB count defines the level of active viral particles in the final product. AgBiTech undertakes regular OB counts during and after formulation to ensure the appropriate virus loading; targeting a level 5% higher than indicated on the label. In addition to in-house testing, AgBiTech has Vivus Max independently tested to determine OB levels.

- **Potency bioassays** – The other key factor defining Vivus Max performance is the potency of the virus. AgBiTech uses a reference virus sample of known virulence and compares all batches produced to this reference sample. The Vivus Max specification requires that all product has equivalent or higher potency in comparison to this reference sample. AgBiTech also has Vivus Max independently tested for virulence.

Vivus Max In Integrated Pest Management

**VIVUS MAX HAS A KEY ROLE TO PLAY IN INTEGRATED PEST MANAGEMENT (IPM) IN CROPS THAT ARE ATTACKED BY HELICOVERPA SPP.**

It provides effective and highly selective control of Helicoverpa larvae and has NO IMPACT on other pest or beneficial species in the crop. This means that natural predators and parasites in the crop are able to provide ongoing suppression of pests after Vivus Max is applied.

The use of less selective insecticides, while providing good initial knockdown control of larvae, can cause subsequent flaring of pests (including Helicoverpa) due to the removal of their natural enemies. This is a particularly important consideration in the first half of the season and in crops prone to pests normally kept in check by predation and parasitism, such as whitefly (Fig. 3), aphids and mites.

For growers releasing biological agents, such as predatory mites or Trichogramma wasps, using Vivus Max early helps to maintain these valuable beneficial species while allowing effective control of Helicoverpa larvae.

**RESISTANCE MANAGEMENT IS A KEY CONSIDERATION WHEN CHOOSING AN INSECTICIDE.**

Helicoverpa armigera has developed resistance to a wide range of insectical groups such as carbamates (e.g. methomyl) and synthetic pyrethroids (e.g. cypermethrin).

Vivus Max is able to control larvae of Helicoverpa populations that have developed resistance to synthetic chemistry. It is also a valuable rotational product and mixing partner to help avoid resistance developing to synthetic insecticides.

Vivus Max Quality Control

» **Contaminant levels** – The production of NPV is a biological process involving the mass rearing and infection of huge numbers of Helicoverpa larvae. This process has the potential to allow bacteria and fungi to reach high levels in the final product. AgBiTech’s manufacturing process minimises the risk of contamination and every batch of Vivus Max is tested in a food laboratory to ensure the final product meets food standards with respect to microbial contamination.

» **Storage and Transport** – To ensure long term stability of the virus in Vivus Max, the product should be stored at temperatures below 4°C. Temperatures above 30°C cause the virus to gradually degrade (over months) while above 40°C, degradation occurs more quickly (within 3 months). To ensure Vivus Max is readily available and reaches growers in perfect condition, AgBiTech has established a large cold depot and delivery network throughout all key areas where Vivus Max is used.

Vivus Max In Resistance Management

Current scientific evidence shows that the chance of resistance developing to NPV is extremely low; with no known cases of resistance developing to NPV based insecticides anywhere in the world. This means that Vivus Max can be used throughout the season; early for use in IPM and later as a resistance break or mixing partner for synthetic insecticides.
When Vivus Max is sprayed onto a crop, *Helicoverpa* larvae that are actively feeding on the crop will ingest OBs that are on the plant surface (A) (Fig. 4). Alkaline conditions in the insect’s digestive tract cause the OB protein coating that encapsulates the baculovirus to dissolve, releasing virus particles that penetrate the cells lining the midgut (B). The virus enters the nucleus of the midgut cells (C) and utilizes the insect’s metabolism to replicate itself. The replicated virus, known as budded virus, is not in OB form and is how the virus spreads from cell to cell within the insect. Budded virus is transported via the haemolymph to invade virtually all of a larva’s tissue (D). Prior to a cell rupturing from NPV infection, OBs form in the nucleus (E) to enable virus survival outside the caterpillar. The replicating virus eventually causes the larva’s cells to rupture (F), resulting in death. Upon death, larvae liquefy and release an OB-laden liquid (G) (Fig. 4).

The OB-laden liquid can be spread around the crop by other insects and/or during rainfall or overhead irrigation. Healthy larvae that feed on this liquid will become infected and die – this is known as secondary infection. NPV infection cycles can provide ongoing suppression of *Helicoverpa* for many weeks to months, depending on conditions.

Larvae typically take 3-9 days to die from NPV depending on temperature and larval size at infection (i.e. warmer temperatures = faster kill; smaller larvae = faster kill). Dead and dying larvae are often seen near the top of the crop canopy.

### Achieving Optimum Results With Vivus Max

Like other biological insecticides, a number of key environmental and biological factors can affect Vivus Max performance. Unfavourable conditions can lead to variable results and control levels that are below expectations. However, by adhering to a few important recommendations, maximum results can be consistently achieved.

**Coverage, Coverage, Coverage**

Thorough coverage is the key aspect in achieving consistently high mortality with Vivus Max.

Thorough coverage is vital because LARVAE MUST INGEST THE VIRUS for infection to occur.

Thorough coverage is best achieved by paying close attention to nozzle selection and boom setup, using optimum application volumes and considering environmental conditions at the time of application.

**Nozzle selection and boom setup**

For ground-rig application avoid the use of flat fan nozzles, unless they are used in row crops with multiple nozzles per row (particularly if droppers are used) or when spraying a young crop without an established canopy. Flat fan nozzles used with a standard boom setup are likely to result in spray shadows due to the two dimensional nature of the spray pattern. Flat fans are primarily designed for herbicide application where maximum coverage is not as critical for performance. The use of TwinJet nozzles (Fig. 5) or hollow cone nozzles will significantly improve canopy penetration and spray coverage by reducing spray shadows, particularly when applying to a crop with a dense canopy. Nozzle selection should also consider droplet number and size. Fine droplets will penetrate dense canopies better however are more prone to evaporation.
During the warmer spring and summer months, these ideal conditions often occur during the early hours of the morning between 2 – 8am, particularly if there is a dew. Larvae tend to feed more actively during these hours and are less likely to be in protected feeding sites where they may avoid ingesting the virus. The higher humidity will also provide better spray conditions to give good coverage.

Temperature

*Helicoverpa* larvae must ingest NPV for infection to occur, so in addition to good spray coverage, it is important to apply Vivus Max when larvae are actively feeding. *Helicoverpa* larvae are most active at temperatures between 25-35°C, so applying Vivus Max in this temperature range increases the likelihood of a larva ingesting occlusion bodies (OBs) and therefore maximises the level of control achieved from the application.

Temperatures above 35°C will cause larval activity to rapidly decrease; below 25°C activity will decline gradually; below 18°C activity is reduced even further, and below 12°C larvae stop feeding.

A study by Queensland DAFF has shown that most virus is ingested within the first hour after application. A study by Queensland DAFF has shown that most virus is ingested within the first hour after application, therefore applying Vivus Max during active feeding is more critical than applying Vivus Max when longer residual light conditions. The 25-35°C temperature range also corresponds with higher insect metabolism, resulting in rapid infection by the virus once ingested.

Environmental conditions

In addition to the spray parameters outlined previously, it is also important to apply Vivus Max when environmental conditions favour good coverage. Hot (above 35°C) and dry (below 40% relative humidity) conditions cause droplet evaporation and reduce coverage. This can be minimised by increasing spray volumes and droplet size and by using Optimol or other anti-evaporation products to reduce droplet evaporation. However, it is best to apply Vivus Max in humid (above 50% RH) and warm (25-35°C) conditions that favour good coverage.

For ground rig spraying in broadacre crops, a minimum application volume of 100 L/ha is recommended. In horticultural crops, use a minimum volume of 400 L/ha. The use of a wetter may also help to improve coverage in certain crops.

For aerial application using only water as the carrier, application rates of greater than 30 L/ha are required. In all situations, higher application volumes are recommended for more dense crops and where higher application volumes will result in improved coverage. Lower volumes may be possible if using band spraying and/or applying Vivus Max to early stage crops with a small leaf surface area.

In broadacre crops, Vivus Max can also be aerially applied in ultra-low volume (ULV) using a minimum of 3 L/ha of an oil carrier (such as D-C-Tron). ULV application produces a large number of very fine droplets, giving very good coverage. ULV droplets are not prone to evaporation during hot or dry conditions due to the oil carrier.

In sorghum only, Vivus Max can be aerially applied in 9 L water per ha plus 1 L Optimol per ha. This enables large areas to be treated quickly and cost-effectively during peak *Helicoverpa* control windows. Optimol is manufactured by AgBiTech and is a blend of molasses, sucrose and petroleum oil - for more information please refer to the Optimol Technical Manual.

Application volume

For ground rig spraying in broadacre crops, a minimum application volume of 100 L/ha is recommended. In horticultural crops, use a minimum volume of 400 L/ha. The use of a wetter may also help to improve coverage in certain crops.

A study by Queensland DAFF has shown that most virus is ingested within the first hour after application, therefore applying Vivus Max during active feeding is more critical than applying Vivus Max when longer residual effects may be expected (such as low UV light conditions). The 25-35°C temperature range also corresponds with higher insect metabolism, resulting in rapid infection by the virus once ingested.
Larval Size
Smaller Helicoverpa larvae are more susceptible to NPV infection than larger larvae because they need to ingest fewer OBs for infection to occur.

Smaller larvae are also more likely to be feeding on leaves and other unprotected areas, increasing the odds of ingesting NPV.

Larvae larger than 13 mm (4th instar and larger) should not be targeted with Vivus Max since control will be unsatisfactory (Fig. 7).

It is best to target very small to small larvae less than 7 mm in length (1st & 2nd instars) particularly in high value crops. Medium larvae between 8-13 mm (3rd instar) can be effectively controlled, however some damage may occur.

The addition of Optimol to Vivus Max sprays can improve larval control at the top end of the recommended size spectrum.

Helicoverpa Growth Stage Identification
Showing the actual size of H. armigera larvae at a given age (days since egg hatch) when reared at 25°C.

<table>
<thead>
<tr>
<th>Instar</th>
<th>Age (days)</th>
<th>Size category</th>
<th>Length (mm)</th>
<th>Actual size</th>
<th>Vivus Max timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>0 - 2</td>
<td>Very Small</td>
<td>1 - 3</td>
<td></td>
<td>✓ ✓</td>
</tr>
<tr>
<td>2nd</td>
<td>2 - 4</td>
<td>Small</td>
<td>4 - 7</td>
<td></td>
<td>✓ ✓</td>
</tr>
<tr>
<td>3rd</td>
<td>4 - 8</td>
<td>Medium (small)</td>
<td>8 - 13</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>8 - 11</td>
<td>Medium (large)</td>
<td>14 - 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td>11 - 14</td>
<td>Large</td>
<td>24 - 28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th</td>
<td>14 - 18+</td>
<td>Large (snake)</td>
<td>29 - 40+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7 Helicoverpa growth stage identification chart.

Optimol And Sugar Based Additives
The use of molasses based additives can significantly improve mortality compared to Vivus alone (Fig. 9). Optimol improves the residual activity of Vivus Max, improves spray coverage and increases initial uptake and infection (see Optimol Technical Manual). The molasses, sugar and oil components in Optimol combine to greatly increase NPV infectivity (Fig. 8), however the mechanism for this is not fully understood. It may be due to a feeding stimulant effect from the sugars. However, research indicates it is more likely caused by interactions inside the gut of the larva. It is suggested that the Optimol components protect virus particles from inactivation by plant chemicals inside the gut, and may also increase larval susceptibility to NPV. Research in this area is ongoing. Mobait and various UV protectants have not been shown to improve Vivus Max performance and are not recommended.

Field-lab Bioassay Showing The Impact Of Molasses
Trial 02-004: Field-lab bioassay showing the impact of molasses and D-C-Tron (ULV) on Vivus residual efficacy on cotton plants – Narrabri 2002.

Fig. 8 CRDC PROJECT DAQ 105C: Cotton leaf bioassay showing the effect of 3 additives on the relative potency of NPV.

Fig. 9 Field-lab bioassay showing the impact of adding molasses and petroleum oil to Vivus in cotton.
Vivus Max will provide between 60 - 90% control depending on a range of conditions.

Vivus Max Laboratory Potency

The native Australian NPV isolate in Vivus Max was selected because it exhibits higher virulence in comparison to the US isolate used in the original Vivus product.

Laboratory bioassays, using caterpillars to NPV, have shown the isolate in Vivus Max has consistently improved potency compared to the US isolate.

It should be noted that differences seen in laboratory bioassays cannot be extrapolated to field differences, but provide a guide to the quality and virulence of a particular isolate or sample.

Vivus Max Field Performance

Data showing Vivus Max field performance and advice relating to specific crops and use patterns is presented in the following pages. In general, Vivus Max will provide between 60-90% control depending on a range of conditions.

Vivus Max will provide between 60 - 90% control depending on a range of conditions.

Vivus Max Rain Fastness

The majority of larvae will ingest the virus within 1 hour of application (given optimum temperature and actively feeding larvae). For this reason, it is best to avoid applying Vivus Max if heavy rain is expected within one hour following application. However do not delay application if only moderate rain is expected, or heavy rain is not imminent.

Vivus Max Compatibility

When mixed in water, Vivus Max is highly compatible with the majority of pesticides and fertilisers. Vivus Max has no physical compatibility issues with other products, and is chemically very benign. Ensure that the mixture has a pH of 8 or less before adding Vivus Max as alkaline mixtures will damage the virus.

When applied in ultra-low volumes (ULV) with an oil carrier, Vivus Max should not be mixed with other products as the solvents in other pesticides can damage the virus in the concentrated ULV mixture. Vivus Max is compatible with Optimol in ULV mixtures.

Vivus Max Storage

Store in the closed, original container out of direct sunlight at or below 4°C. The product is stable for 2½ years if stored as indicated. Refer to label for additional storage conditions.
Sorghum threshold calculation – Research by Queensland DAFF has shown that Helicoverpa larvae will cause an average loss of 2.4 g of sorghum grain for each larva present in the crop. This information (cost of control, head density and grain price) allows the calculation of the threshold of Helicoverpa larvae that will cause economic loss if not controlled. This economic threshold is then used to determine if control using Vivus Max is warranted in a particular situation. The economic threshold formula for Helicoverpa in sorghum is:

\[
\text{Economic threshold} = \frac{(C \times R)}{(N \times V \times 2.4)}
\]

Where:
- \(C\) = cost of control (\$/ha)
- \(R\) = row spacing (cm)
- \(N\) = Number of heads per m row
- \(V\) = Grain price (\$/tonne)
- 2.4 = Grain damage (g/larva)

The economic threshold formula is used to determine if Helicoverpa control using Vivus Max is warranted in a particular sorghum crop.

For example, in a situation where the cost of control (\(C\)) is $32/ha (Vivus Max at 150 mL/ha + aerial application cost of $12/ha), with a 100 cm row spacing (\(R\)), 12 heads per metre (\(N\)) and a sorghum price of $200/tonne (\(V\)), the economic threshold will be 0.56 larvae per head. This means that if monitoring showed an average Helicoverpa density of more than 0.56 larvae per head, control with Vivus Max would be warranted.

Higher yielding crops, a higher sorghum price or lower Vivus Max application costs would further reduce this threshold (and vice versa).

Vivus Max will provide reliable control if applied when 50% of heads have reached 100% flowering.
**Chickpeas**

Vivus Max is a valuable tool for *Helicoverpa* management as part of an IPM approach in chickpeas. Queensland DAFF research has shown that the feeding activity of *Helicoverpa* larvae prior to pod set has little impact on yield. However, controlling very small and small larvae during flowering will minimise the number of large, difficult to control larvae during pod set and pod fill.

Trials conducted by AgBiTech have shown that using Vivus Max on pre-threshold larval populations can delay larval numbers reaching economic threshold during podding and thereby delay the need for a chemical insecticide. This reduces the likelihood of requiring multiple larvicides in a season. Pod damage can also be significantly reduced when pre-podding chickpeas are inoculated with NPV (Fig. 13).

Lower rates of Vivus Max (75 mL/ha) can be used in pre-podding chickpeas and/or on pre-threshold larval populations. The high rate of Vivus Max (150 mL/ha) plus Optimol (1 L/ha) should be used when the pest population reaches economic threshold.

**Specific recommendations in chickpeas** – In addition to the general recommendations for applying Vivus Max, there are some specific recommendations for maximising its performance in chickpeas:

- Molasses-based additives such as Optimol will improve the performance of Vivus Max in chickpeas. Add Optimol or molasses based additives at a rate of 1 L/ha. For more information refer to the 'Optimol and sugar based additives' section of this manual.
- *Helicoverpa* management in chickpeas will often be required during cool periods. At these times, ensure Vivus Max is applied during the warmest part of the day to maximise larval activity and increase the likelihood of virus ingestion. Ensure that temperatures have been at least 18°C for a minimum of 3 hours before applying Vivus Max. Ideally apply between 20-35°C where possible.
- If applying Vivus Max by ground rig, avoid the use of flat fan nozzles as they are likely to compromise coverage (except when the crop is young). Use TwinJet or hollow cone nozzles – these nozzles are also ideal if applying protectant fungicides.
- Vivus Max alone will provide around 70% control of *Helicoverpa* larvae in chickpeas, so should not be solely relied upon during and after pod set if larval numbers exceed 6 per m².

**Cotton**

Vivus Max can be successfully used for *Helicoverpa* control in conventional cotton (Fig. 14) as part of an integrated pest management program, however its performance in cotton can be highly variable. Vivus Max must only be applied in cotton when st & 2nd instars) AND NPV has a very short residual life (hours) due to cotton’s alkaline leaf chemistry (pH 9+).

- Larvae will often be in protected feeding sites where they will not ingest the virus. The addition of molasses-based additives such as Optimol will significantly improve the residual life and performance of Vivus Max in cotton (Fig. 8).
- Due to the specific agronomic characteristics of cotton, infection cycles and ongoing suppression from NPV is less reliable compared to other crops.
Sweet Corn

Vivus Max plays a valuable role in *Helicoverpa* management in sweet corn (Fig. 15). It is used to control larvae from the early vegetative stages through to tasselling and prior to the emergence of silks. At silking, contact synthetic insecticides with residual activity should be employed. Vivus Max has short residual activity so regular application may be required under consistent pest pressure. Where the crop is grown under overhead irrigation, Vivus Max is best applied in the irrigation water as excellent control can be achieved – refer to the ‘Application via Overhead Irrigation’ section for more information.

Horticultural Crops

Vivus Max is registered for use in a wide range of horticultural crops for *Helicoverpa* management. Its high selectivity to *Helicoverpa* makes it the ideal IPM product during the early vegetative stages of production when some damage can be tolerated. Under high larval numbers or later when protection against damage is vital, it is an excellent mixing partner with synthetic insecticides as it will control resistant larvae and assist in controlling any larvae that may survive the synthetic insecticide. The virus has a relatively short residual effect, however regular applications will maintain background NPV levels in the crop, meaning the virus will be present to provide additional control of *Helicoverpa*. While Vivus Max is relatively slow to kill larvae, with peak control at 4-7 days, it will greatly assist in keeping crops free of the larger larvae that cause the majority of damage (Fig. 16).

Vivus Max has a rate range in horticultural crops of 150-300 mL/ha. The highest rate is only necessary for circumstances where there is a high demand on the product (such as very high larval numbers or when controlling larvae are not available (such as in organic production, due to withholding period constraints of other insecticides or during rainy conditions – Vivus Max is highly effective during wet weather). For general use, the lower rate should be used, particularly if applying the product on a regular (4-7 day) schedule. In situations when even more regular applications of Vivus Max are possible (e.g. daily overhead irrigation in lettuce), it is recommended to use split rates proportional to the number of applications, e.g. instead of 150 mL/ha every 5 days, use 30 mL/ha every day. This approach will provide the maximum levels of control without increasing the total amount of Vivus Max used.

---

![Fig.15](image1.png)  
**Fig.15** Trial 02-009: Field trial data showing the performance of 2 rates of Vivus in sweet corn – Bowen 2002.

![Fig.16](image2.png)  
**Fig.16** Trial 05-002: Field trial data showing the performance of two rates of Vivus in Capsicums – Bowen 2005.
Vivus Max Application Via Overhead Irrigation

Vivus Max is the first insecticide registered in Australia for application in overhead irrigation water.

By adding Vivus Max to irrigation water, growers can artificially inoculate their crop with NPV and achieve a high level of control of Helicoverpa larvae.

Vivus Max is unique among insecticides because applying the product via overhead irrigation provides excellent control of Helicoverpa larvae (Fig. 18). Rainfall is NPV’s main natural dispersal mechanism throughout the crop canopy. Rain splash spreads the virus around the crop from the soil and NPV infected larvae, for infection of other larvae to occur (known as secondary infection). Applying Vivus Max in overhead irrigation mimics NPV’s natural dispersal method.

Fieldwork has shown that applying Vivus Max in overhead irrigation water consistently achieves maximum control levels. While only a small proportion (<20%) of the virus will remain on the plant, this amount is sufficient for a high level of control. This is because Vivus Max is known to work effectively at below label rates when coverage is optimised, and application in overhead water provides the maximum coverage achievable, including in protected feeding sites. It is also known that Helicoverpa behaviour changes during rainfall; including feeding in more exposed positions and wet larvae grooming themselves, increasing the likelihood of NPV infection. In addition, virus that does not remain on the crop but ends up in the soil is able to survive for significant periods, providing a source for re-inoculation of the plant with NPV at subsequent irrigations.

Vivus Max Application Via Overhead Irrigation

Vivus Max should be introduced to the irrigation water at the appropriate rate using fertigation equipment.

If the product is diluted in water prior to injection into the irrigation water, ensure that the dilution water is clean and not silty with a pH of 8 or less and ensure there is constant agitation. Preferably, rainwater should be used for dilution. Ensure any diluted Vivus Max is used within 10 hours of mixing.

For one-pass mobile irrigators such as centre pivots, laterals and travellers (guns) continuously introduce the required quantity of Vivus Max into the irrigation water over the course of irrigation.

For stationary irrigators, introduce the required amount of Vivus Max into the irrigation water just prior to completion of the irrigation period, to maximise the concentration of Vivus Max applied and the amount that remains on the crop.

Fig. 18 Trial 04-001: Typical control achieved from Vivus applied through centre pivot irrigation in Azuki beans.