Helicoverpa NPV

TECHNICAL NOTE

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What is NPV?

Nucleopolyhedrovirus (NPV) of *Helicoverpa* spp. is a naturally occurring virus that specifically infects and kills *Helicoverpa* larvae.

Commercial formulations of NPV are used in a wide range of crops to control *Helicoverpa* spp. and *Heliothis* spp. in both conventional and integrated pest management (IPM) systems.

How NPV works

When NPV is sprayed onto a crop, the feeding *Helicoverpa* larvae ingest the virus particles.

The virus infects the caterpillar through cells lining the gut. It then multiplies inside the caterpillar, infecting virtually every cell in the insect.

An infected caterpillar ceases feeding within a day or two after infection. The replicating virus causes the 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).

Larvae typically take 3-8 days to die from NPV depending on temperature and larval size at infection (ie. smaller larvae = faster kill; warmer temperatures = faster kill).

Infection cycle and ongoing suppression

NPV is unique because dying larvae release huge quantities of virus particles into the environment. Various factors such as rain, other insects and cannibalism by larvae cause the replicated virus to spread and persist in the crop for long periods, providing ongoing suppression of *Helicoverpa* for many weeks to months, depending on conditions. A single application of NPV (combined with the naturally present pathogens, predators and parasites) is commonly used in grain crops to reduce, delay or eliminate the need for chemical control options due to this unique ability to replicate itself, while having nil impact on other organisms in the crop.

Achieving optimal performance with NPV

Coverage, coverage, coverage

Thorough coverage on the target plant is vital because LARVAE MUST INGEST THE VIRUS for infection to occur. Coverage can be optimised by:

- Using higher application volumes
- Selecting appropriate nozzles and boom setup
- Applying NPV in overhead irrigation water where possible

Larval size

- Ideally target larvae less than 7 mm in length - particularly in high value crops
- Larvae larger than 13 mm should NOT be targeted with NPV = unsatisfactory control
- Larvae between 7-13 mm in length can be effectively controlled, however some damage can occur

Spray solution pH

- Spray solution must have a pH less than 8 before adding NPV products
- If pH is above 8 a suitable buffer or acidifier must be added
- pH levels above 8 will damage NPV particles = reduced or no control

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Environmental conditions at time of spray

IDEAL CONDITIONS FOR NPV

WARM TEMPERATURES 20 - 35°C

HUMID Above 40% relative humidity

» **Ensures larvae are actively feeding**

» **Minimises droplet evaporation**

AVOID APPLYING NPV

HIGH TEMPERATURES Above 35°C

LOW HUMIDITY Below 40% relative humidity

» **High evaporation = poor coverage = reduced NPV performance**

NOTE: *Active feeding at the time of spray is vital because NPV is rapidly broken down by ultra-violet light and therefore has a short residual life on the plant surface.*

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.

Instar	Age days	Size category	Length mm	Actual size	NPV timing
1st	0 - 2	Very Small	1 - 3		✔✔
2nd	2 - 4	Small	4 - 7		✔✔
3rd	4 - 8	Medium (small)	8 - 13		✔
4th	8 - 11	Medium (large)	14 - 23		✖
5th	11 - 14	Large	24 - 28		✖
6th	14 - 18+	Large (snake)	29 - 40+		

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NPV use patterns

The three main use patterns that are employed when using NPV are:

1. *Classical insecticide applied at threshold*

- Used in crops where high efficacy from NPV alone can be achieved
- Generally requires application to larvae less than 7 mm
- Strong fit in sorghum; can be used effectively in corn; has potential in grain legume crops

2. *Preemptive spray applied pre-threshold*

- Valuable in situations where *Helicoverpa* appear early in crop growth and the fruiting window is long (30+ days)
- Used to set up a virus infection cycle (inoculate the crop)
- Suppresses damage during early fruiting
- Valuable tool in grain legumes (eg. soybeans, chickpeas)

3. *Program spray*

- Used to eliminate damage from *Helicoverpa* where the use of chemical insecticides may disrupt IPM systems or cause residue problems
- Can be applied in combination with other spray programs (eg. fungicides, foliar fertilisers)
- Used primarily in high value crops such as strawberries, lettuce, tomatoes, cucurbits and other fruit crops

Nucleopolyhedrovirus has no detrimental impact on humans or the environment contributing to sustainable farming

NPV use in Cotton

NPV performance in cotton can be highly variable. NPV sprays must only be applied in cotton when larvae are less than 7 mm AND are actively feeding because:

- NPV has a very short residual life (hours) due to cotton's alkaline leaf chemistry (pH 9+)
- Larger larvae will often be in protected feeding sites where they will not ingest the virus

In cotton, NPV is best used as an IPM compatible tool to suppress the *Helicoverpa* population and to help delay resistance developing to chemical insecticides. Using NPV at lower rates regularly, in mixture with other products, will help prevent "blow-outs" in larval numbers. Due to the specific agronomic characteristics of cotton, infection cycles and ongoing suppression from NPV is less reliable compared to other crops.

NOTE: *The addition of molasses-based additives will significantly improve the residual life and performance of NPV sprays in cotton.*

Additional information

- NPV products are highly compatible with the majority of pesticides and fertilisers when mixed in water
- NPV has no environmental, toxicological or non-target impacts
- Research to date 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
- Can be effectively applied by ground-rig, aeroplane or overhead irrigation

This is a general guide relating only to *Helicoverpa* NPV use. Always refer to the product label of any NPV based products in your jurisdiction before use.

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At AgBiTech, our overriding commitment is to the farmer. The company is 100% owned and managed by farmers and agricultural scientists. Which is why we understand the business and science of farming because it's our business too.

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