LOOPOVIR®

Natural Efficacy that is Reliable

Technical Information

Target Pest
Chrysodeixis includes; common name: Soybean Looper

Crops
Legumes (Soybeans, Beans), Potatoes and other vegetables

Formulation
Wettable Powder containing >5x10^{11} OBs (occlusion bodies) *Chrysodeixis includens* nucleopolyhedrovirus (ChinNPV) per liter

Standard Dosage
Depending upon crop and pressure: 50-200 ml/ha

Timing
For optimal timing, target first application at the beginning of moth flight, ensuring to continue to cover egg laying and 1st instar presence

Mode of Action
Larvae need to ingest the virus particles sprayed onto the plant surface in order to become infected.

Water Volume
200-600L/ha. This should be adjusted according to the canopy density. Repeat applications every 7 days until larvae hatching period is over.

Pre-harvest (PHI) and Re-entry Interval (REI)
No residues. PHI and REI are defined according to the national registration regulations

Toxicity Profile
Contains no chemical ingredients. No residue on the crop. Complies with international guidelines for organic farming. No side effects on mammals, beneficial insects, bees, aquatic organisms and other non-target organisms. No max-residue levels (MRLs) are defined for Spodovir.

Compatability
Compatible with most insecticides, fungicides and fertilizers. **A pH level between 5 and 8.5 in the tank mix must be respected.**

Storage
Excellent storage stability:>2 years at -18°C, 2 years at 5°C, 1 month at 25°C. Avoid temperatures above 40°C.

Rainfastness
Good rain resistance 3 to 4 hours after application.

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High Selectivity and Safety

The active substance of Loopovir® is a *Chrysodeixis includens* nucleoployhedrovirus (ChinNPV). This virus belongs to the family of Baculoviruses that only occur in arthropod species (mainly lepidopteran species) and generally have a narrow host range. Baculoviruses are safe and cause no hazards to human health (OECD, 2002).

Compatibiity

Loopovir® can be used in tank-mixes with other pesticides, like wettable sulphur, chemical fungicides and insecticides but not with copper products. A pH level between 5 and 8.5 has to be respected, when tank-mixed with other products. Otherwise the protective protein capsule will be destroyed and the active ingredient deactivated. Spraying of copper a few days before or after a Loopovir® application has no adverse effect on its performance.

No Side Effects

Loopovir preserves natural antagonists due to its specific host range. Aquatic species, birds and mammals are not affected. It is also safe for bumble bees, predatory mites, parasitoids, and insects in general.

- Narrow host range, high selectivity, very host specific
- No effects on plants, mammals, or humans
- No production of metabolites or toxins
- Baculoviruses are safe and cause no hazards to human

Storage and Handling

Avoid temperatures above 40°C during storage and transport. Temporarily sub-optimal storage conditions (25-40°C) during transport or at the end-user may be acceptable for a few days. At -18°C the product remains stable and can be immediately used for spraying. Once opened, the package can be stored further at low temperatures without loss of quality.

High temperatures after application are not a limiting factor for the virus efficacy, because temperatures on the plant surface rarely rise above 40°C. At high temperatures the pest activity is also reduced.

Optimal storage conditions are -18°C for >2 years and at 5°C, Loopovir is stable for 2 years, at for 1 month at 25°C

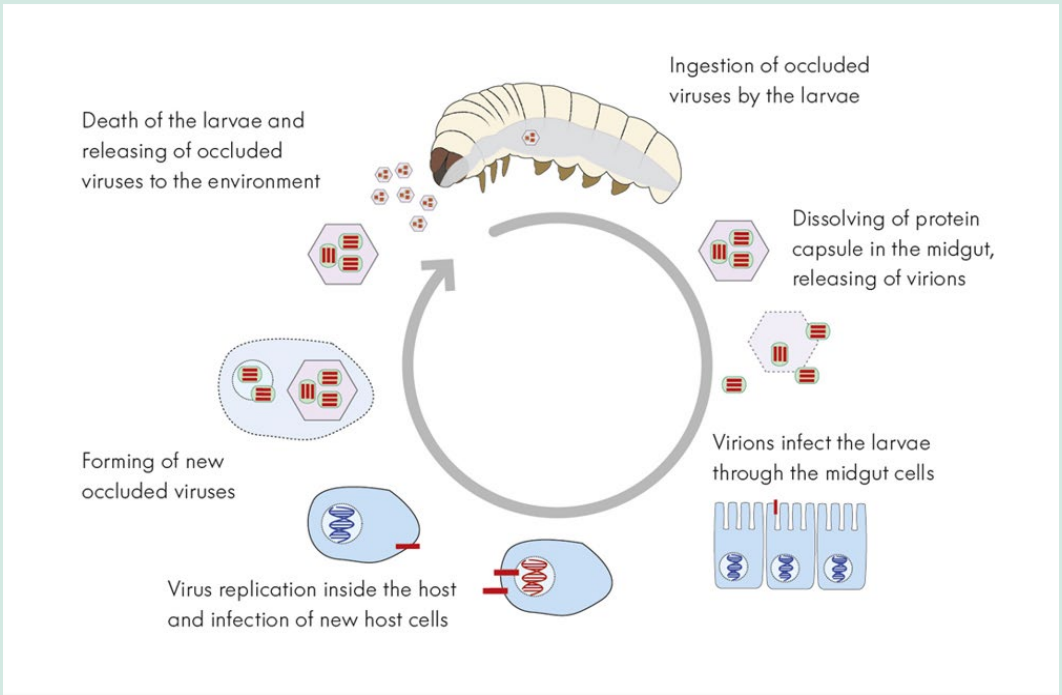
Mode of Action

Young larvae that are actively moving and feeding on the crop will ingest the virus that was sprayed onto the plant surface. Following ingestion, the virus particles enter the larval midgut where the protein capsules dissolve due to the high pH level (pH higher than 10). The virion is released and infects the midgut cells. The genetic information of the virus is incorporated into the host genome, resulting in the production of new replicate copies of the virus. The host cells get destroyed and the new viruses infect new host cells. Within 2 – 4 days, the viruses infest most organs of the host and the larva stops feeding. Upon death, the larval body deteriorates and releases millions of new viruses into the environment, infecting other larvae. Under laboratory conditions, only 1 ingested virus particle is sufficient to kill a first instar larva.

Older larvae (older than L3) are not instantly killed and may therefore cause further damage before getting killed in later larval instars. They can also pass on the virus infection to the next generation, where it may develop due to biotic or abiotic stress.

C. includens larvae infected with an Loopovir turn dark and then liquify. Eventually decomposing and releasing virus particles to their friends.

Photo Credit: Andermatt do Brazil, *C, includens* larvae viral death due to a Loopovir infection.



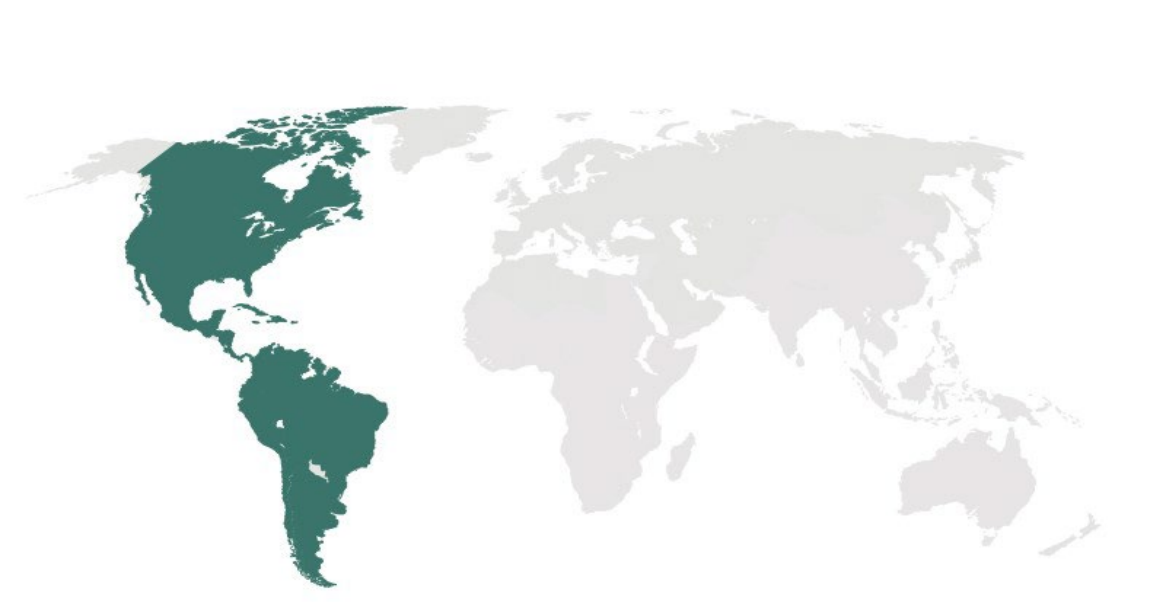
Virus replication inside the host and infection of new host

Information about *Chrysodeixis includens*

Soybean looper, *Chrysodeixis includens*, are an important agricultural pest with an exceptionally broad geographical range. Soybean looper can be found throughout the Americas, but are especially prevalent in the Southern USA and South America. In warmer climates, soybean looper can have up to 11 generations per year.

Eggs are laid on the underside of leaves in the lower canopy. Larvae are generally foliage feeders, but they can also feed on pods or fruit. Larvae feed from the lower inside canopy working outwards and upwards. Resulting in damage often being overlooked. Older larvae cause the most damage, reducing plant vigor and yield.

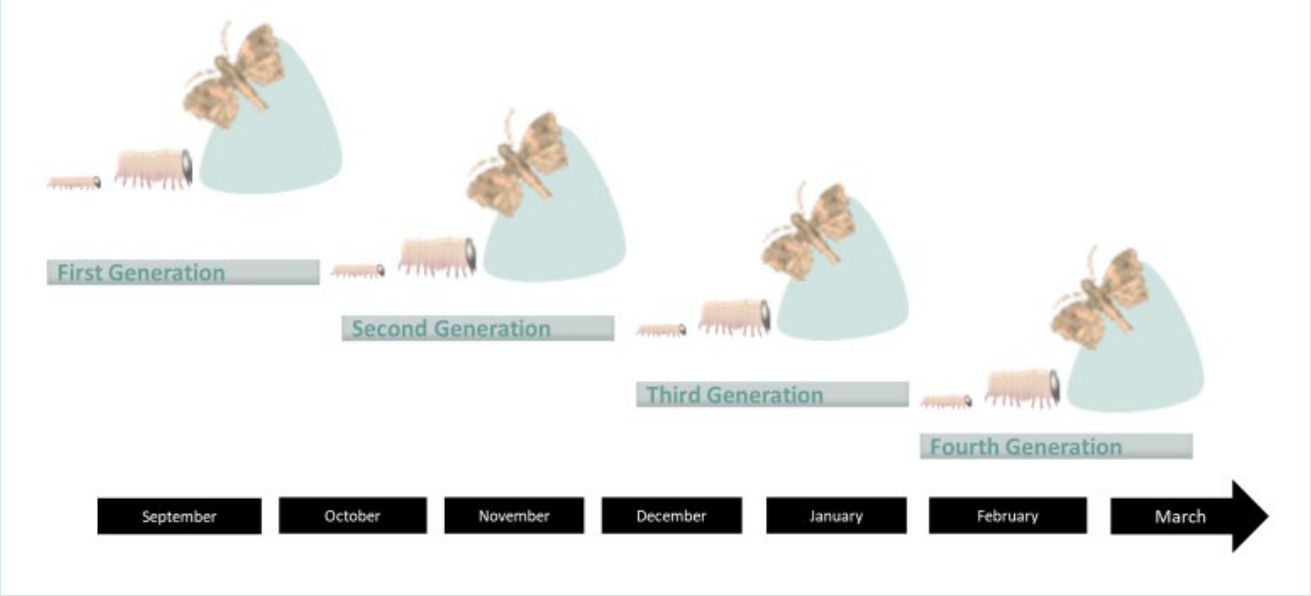
Worldwide Distribution



Common Host Crop

- Soybeans
- Beans
- Potatoes
- Other Vegetables

Life Cycle of *Chrysodeixis includens*: South America



The soybean looper larvae can have up to 4 generations in South America. Adult female moths will start to lay eggs a few days after eclosion. Each female moth is capable of laying 300-600 eggs which are normally laid over a period of 10-12 days. Egg masses are commonly found on the under side of leaves but under high pest pressure, any surface can be used.

Fecundity of adults and mortality of young larvae is negatively affected by high temperature and low humidity. The life cycle length and number of eggs per female can differ to a great extent, depending on host plant and climatic region. The larvae normally pass through six instars. Larvae generally feed for 2-3 weeks.

The increased temperatures in South America can contribute to quick generations resulting in up to 5 generations of soybean looper in South America during prime growing seasons. Adults have the ability to fly for many kilometers prior to laying their eggs and therefore have the ability to migrate and expand their populations.

General Information

- Up to 4 generations in South America
- Up to 600 eggs per adult female
- L1-L2 feed on inside, lower canopy
- Older Larvae cause the most damage

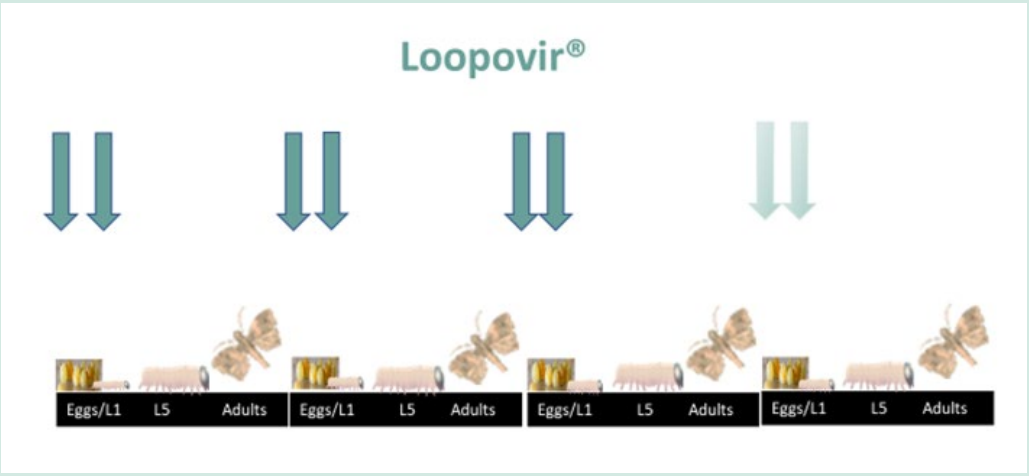
General Instructions

Weekly monitoring of *Chrysodeixis* activity, by using pheromone traps for monitoring the arrival of adults and also scouting for eggs and larvae, is **essential**. Application timing for Loopovir° is crucial to provide optimal control over soybean looper. The first application of Loopovir° should target eggs and first instar larvae. Loopovir° can provide 75-100% efficacy against soybean looper if applied correctly and at the optimal time to target eggs and small larvae. Good coverage of the feeding area is essential, as the larvae need to ingest the virus to get infected. Young infected larvae may survive a few days until they die, but feeding activity will be reduced. Older larvae require longer to succumb to the viral infection and it is therefore essential to apply Loopovir° when larvae are still small and not yet hidden within the crop.

Large *Chrysodeixis includens* larvae are responsible for creating the most damage within the crops. This highlights the importance of targeting the smaller larvae with Loopovir°, prior to their ability to cause economic damage to the crop.

***C. includens* damage**: Late instar damage caused by soybean looper larvae. Targeting small, early instar soybean looper larvae with Loopovir° will reduce this type of damage.

Application timing and spray intervals



For best crop protection, the first Loopovir® application is applied just prior to first egg-hatch. The young larvae will consume part of the egg shell during hatching, and therefore can become infected at the earliest possible time point of their development. As baculoviruses are sensitive to UV radiation, spray applications should have an interval of every 6-8 days to assume the full coverage of the larval hatching period. For crops with a high leaf area index, such as cotton, maize and sorghum, application should be repeated after every 8th day with a water volume from 200-600L/ha.

Spray volumes

Ensuring good leaf coverage improves the efficacy of the application of baculoviruses. Baculoviruses need to be ingested to control larval populations and therefore application equipment should guarantee a good coverage. For ground application, application spray volumes may vary between 200-600L/ha of water.

Application Strategies

Use in Integrated Pest Management

Loopovir® can be used as a part of a successful Integrated Pest Management (IPM) program, which may include chemical and cultural practices, aimed at preventing economic pest damage. IPM principles and practices include field screening and monitoring systems (pheromone traps), correct target pest identification, population monitoring, rotation of insecticides with different modes of action and treating when target pest populations reach determined economic thresholds.

Resistance Management

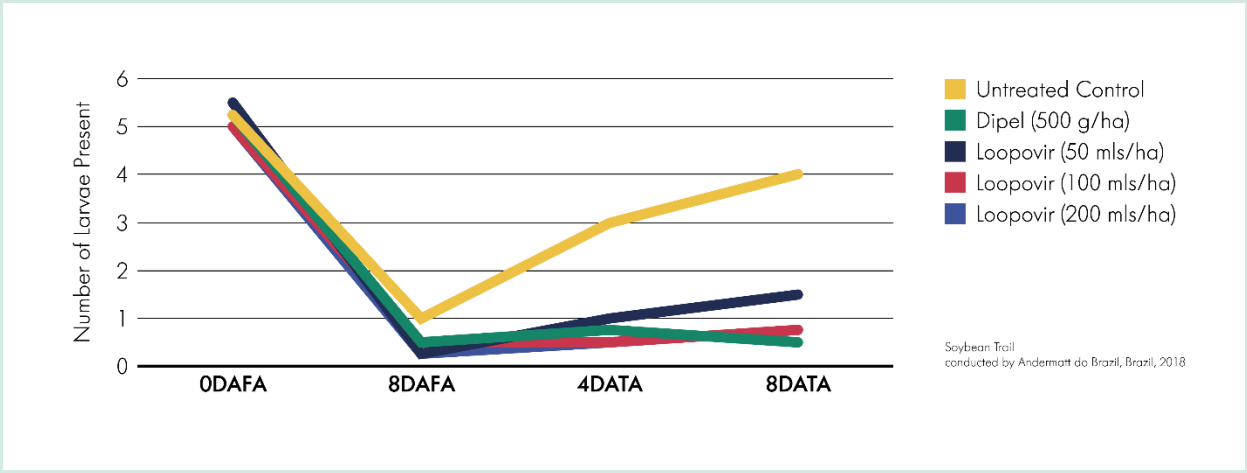
C. includens has the ability to develop pesticide resistance to numerous control products. To effectively control *C. includens* populations and to delay development to resistant populations to new active substance, a spray program incorporating the most efficacious insecticides and alternating modes of action against consecutive pest generations is recommended. Resistance management in South America is an important factor as *C. includens* can have up to 4 generations per growing season. Alternating modes of action is very important to reduce the potential of resistance development.

Added Advantages for Loopovir

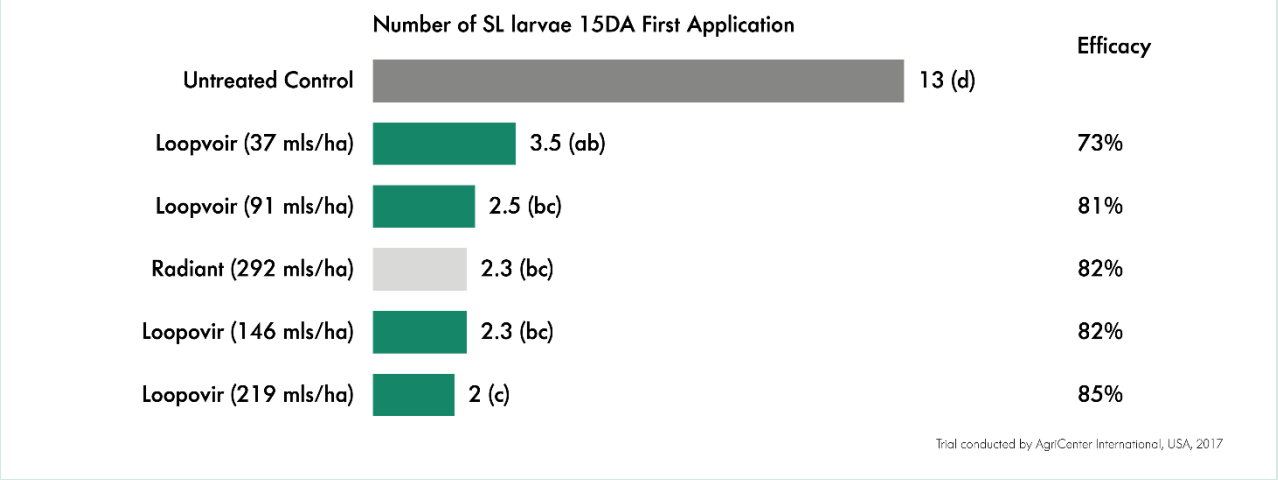
- ✓ Efficient *C. includens* population and damage control
- ✓ Excellent Resistance Management tool
- ✓ Non-Toxic and safe for beneficial insects (OECD, 2002)
- ✓ No Maximum residue level, minimal re-entry period
- ✓ Applicable in Integrated Pest Management (IPM) and Organics
- ✓ High compatibility with other products
- ✓ Good Storage Stability
- ✓ Good Rainfastness

Loopovir® Efficacy Trials

Control of *Chrysodeixis includens* in soybeans, Brazil 2018
Loopovir® applied at 50 mls/ha, 100 ml/ha and 200 mls/ha compared to Dipel (Btk, 500 g/ha) and an untreated control



Control of *Chrysodeixis includens* on soybeans, USA 2017
Conducted in the Southern USA, in the state of Tennessee with soybeans. Performance of Loopovir at rates from 91-219 mls/ha were excellent and very similar and some point of time a bit better than the standard treatment, Radiant (Spinetoram).



Loopovir® - Canadian Made

Loopovir® is produced by Andermatt Canada Inc. in Fredericton, New Brunswick, Canada. Loopovir® has been produced since 2018.

Andermatt Canada Inc., is committed to highest quality of it products. Every batched of Loopovir® which is produced undergoes a systematic bioassay process. The virulence of each batch is tested against the standard reference batch within the Andermatt Canada laboratories. Only batches which fulfill the high-quality standard criteria will be released into the market.

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