

Virosoft™ CP4

Bio-Insecticide for Control of Codling Moth Larvae
on Apples, Pears, Tree Nuts and Stone Fruits

1- Product Identification

- Commercial name: Virosoft™ CP4
- Active ingredient : Cydia Pomonella Beta-granulosis virus - Strain CMVG4
- Recommended use: Biological control of codling moth larvae on tree fruits and nuts crops.
- Restrictions on use: None
- Canada Pest Management Regulatory Agency (PMRA):
 - Registration No.: 26533
- US Environmental Protection Agency (EPA):
 - Product Registration No.: 72898 – 4
 - Establishment Registration No.: 72898 - CDN – 001
- Product Supplier:
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2- Codling Moth

The codling moth *Cydia pomonella* is part of the Lepidopteran order and Tortricidae family. It is one of the most widespread pests in orchards of apples, pears and nuts all over the world where it causes considerable losses, especially in apple and pear production. In addition, wounds caused by codling moth larvae provide entry sites for fungal diseases which also reduce fruit quality in the fresh juice as well stewed fruits markets.

Organic grade fruits or near zero pesticide residue is an increasingly important issue for growers, as well as market pressure to supply top quality while maintaining low production costs. Integrated Pest Management (IPM) strategies, which seek to integrate the best of conventional chemistry with effective biological controls, are seen as a mean to provide built-in anti-resistance and pesticides residue reduction. Virosoft™ CP4 delivers a dependable solution to growers when it comes to build their IPM strategies against codling moth

3- Virosoft™ CP4

Virosoft™ CP4 is a suspension of a BioTepp's exclusive *Cydia pomonella* granulovirus (CpGV) strain isolated in the Northern part of the North American climatic hardiness zone number 4. Virosoft™ CP4 is highly selective, host range being actually limited to *Cydia pomonella* and a few tortricidae.

Virosoft™ CP4 is registered in Canada and USA as a treatment against codling moth in apples, pears, tree nuts such as walnuts and stone fruits such as plums and prunes. It is formulated as a suspension concentrate which contains the higher viral occlusion bodies of CpGV on the market. 4×10^{13} OBs per litre.

Virosoft™ CP4 is non-toxic to birds, bees, invertebrates, fish, mammals, as well as plants as the active substance does not penetrate into the plant tissue.

Virosoft™ CP4 does not affect the taste or the appearance of the crops.

4- Mode of Action

The codling moth females lay their eggs on the foliage near a young fruit and when the grub hatches it crawls to the fruit and eats its way inside. Once inside it is very hard to control. After a period of time of feeding it emerges and forms a cocoon in the loose bark or under the tree, where it will winter over to emerge as a moth in the spring/summer and start the cycle again. A female moth can lay up to 300 eggs during her short life.

Virosoft™ CP4 is targeting the newly hatched insect larva which has not yet molted, named a first-instar nymph or neonate larva. To reach this newly hatched larva, Virosoft™ CP4 has to be sprayed on the trees at the time of hatching. The active granulovirus occlusion bodies suspended in the small drops of Virosoft™ CP4 settled on the foliage and fruits are ingested by the young feeding larvae. The protective virus protein matrices are dissolved in the gut, releasing the active virus particles (virions). These pass through the peritrophic membrane and invade gut cells by fusion with the microvillus membrane. The virus multiplies and affects various organs of the larva (haemocytes, tracheal cells, fat body and hypodermis), where it destroys cells as it reproduces itself. Larvae stop feeding at this time.

This results in the larvae dying and releasing yet more viral particles to be ingested by other larvae. Consequently, within a period of a week or so, the number of codling moth larvae is reduced and, over a period of time, overall populations of codling moth are significantly reduced as the virus becomes endemic in the background population.

5- Efficacy and Trials Results

Over the years, several trials have been undertaken to demonstrate Virosoft CP4™ efficacy in the field. (Washington State University, Yakima USDA Laboratories, Pacific Agri-food Research Center in Summerland, British Columbia, Horticultural Research and Development Center in St-Jean-sur-Richelieu, Quebec).

Results showed high codling moth larvae mortality. As an example, in one of the works the count of adult moths trapped in control plots both after first and second generation were as high as 270. In plots treated with Virosoft™ CP4, the count of captured adults were as low as 3 to 30 after the first generation and only 0.5 to 4.5 after the second generation. A more than 98% codling moth population reduction.

Even if the recommended dosage is up to 250 ml/ha(or 3.2 ounces/acre) performance studies have shown that Virosoft™ CP4 is efficient at dose rates as low as 145 ml/ha. (2 ounces per acre) for well pruned trees.

A significant residual activity of Virosoft™ CP4 against codling moth of up to 7-10 days after spraying has been shown.

6- Integrated Pest Management (IPM)

Beside the traditional economic criteria of the market-oriented agriculture, sustainable agriculture includes the assessment of the environmental impact of the agronomic practices within the societal context where they take place. As a consequence of the raising consumer concerns about environmental impacts generated by the fruit production, Integrated Fruit Production (IFP) certification over product standards, including process aspects, are frequently required by consumers and supermarket chains.

Even though most of the pest management strategies still rely on the use of synthetic pesticides, a wide array of innovative and environmentally friendly tools are now available to growers within the modern fruit production system, including the use of biological pesticides.

An example of IPM strategy would be:

- Use of pheromone traps is paramount for efficient use of Virosoft™ CP4 as well as monitoring day-degrees between threshold levels and egg hatch stage.
- Use an Insect Growth Regulator (IGR) that does not affect insect nervous system and that is more worker-friendly to treat the first generation flights.
- Use Virosoft™ CP4 for second generation, particularly near harvest, to reduce larvae numbers and pesticide residue on crops.
- In organic orchards use Virosoft™ CP4 alone. Virosoft™ CP4 is OMRI listed.
- In both conventional and organic orchards, it has been shown that continual use over several years will lead to an overall drop in the background population of codling moth, reducing the severity of future outbreaks. Virosoft™ CP4 is also a good tool for pesticide resistance management.

7- Instructions for Use

Virosoft™ CP4 can be used against codling moth larvae on apples, pears, tree nuts such as walnuts and stone fruits such as plums and prunes

The product is sprayed on trees using conventional spraying equipment following dilution of the recommended dose in water. Spraying is done after oviposition of the eggs of codling moth on leaves, branches and fruits, when larvae begin to hatch. Use of pheromone monitoring and following egg-laying patterns will allow the targeting of neonate larvae. The high level of activity shown by CpGV to first instar larvae means that if the product is applied at the correct time, good control is achieved with very low dose rates.

The success of a granulovirus application is directly dependent on a precise spraying schedule. The first application of Virosoft™ CP4 must take place just as first larvae (0-5%) hatch

The recommended dose rate is 125 to 250 ml/ha (1.6 to 3.2 fl. oz. per acre) in sufficient water to achieve good coverage of the whole tree. Even if lower dosages can be applied according to the severity of the outbreak, a minimum of 145 ml per ha or 2 fl. oz. per acre is recommended. Two sprays at that rate will give longer protection than 1 spray at full rate. In orchards with high codling moth populations, applying Virosoft™ CP4 at lower rate like 145 ml per ha or 2.0 fluid ounces per acre more often like every 7 days will provide the best protection. Spraying late afternoon or early evening is better than in the morning. Up to 3 applications may be made to the crop. Spray intervals should be based on 8 sunny days maximum.

Always follow the label instructions.

8- Other Information

Disclaimer:

WARRANTY: To the extent consistent with applicable law, BioTEPP Inc. warrants that the material herein conforms to the description on the label and is reasonably fit for the purposes referred to in the directions for use. Timing and method of application, weather, watering practices, nature of soil, the insect problem, condition of the crop, incompatibility with other chemicals not specifically recommended and other influencing factors in the use of this product are beyond the control of the seller. Buyer assumes all risks of use, storage or handling of this material not in strict accordance with directions given herein. **NO OTHER EXPRESS OR IMPLIED WARRANTY OF THE FITNESS OR MERCHANTABILITY IS MADE.**

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