

REPORT #:**SECTION A: INSECT PESTS OF FRUIT
STUDY DATA BASE:****CROP:** Apples**PEST:** Codling moth, *Cydia pomonella* (Linnaeus)**NAME and AGENCY:**

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TITLE: SEMI-FIELD TRIAL OF VIROSOFT CP4[®] AND CARPOVIRUSINE[®] VERSUS CODLING MOTH LARVAE**MATERIALS:** Virosoft CP4[®] (*Cydia pomonella* granulovirus; BioTepp Inc.) and Carpovirusine[®] (*Cydia pomonella* granulovirus; Natural Plant Protection)**METHODS:** Two blocks of 5 rows of high density MacIntosh apple trees at the Pacific Agri-Food Research Centre were treated with Virosoft CP4[®] at 239 ml/ha (original preparation: 4×10^{13} Obs/946.34 ml) or Carpovirusine at 1L/ha (original preparation: 10^{13} Obs/L) on June 12, 2003 using an air-blast sprayer set at high volume. A spatially separated block of trees in the same plot was used as the control. Two hours after application of the virus preparations, 10 leaves and apples were randomly collected from each treatment and the control. Similar collections were made one, four, six, eight and 12 days after application of the treatments. The entire trial was replicated July 3, 2003.

Codling moth neonates used in the assays emerged on the same day from egg sheets obtained from the colony of the Okanagan-Kootenay Sterile Insect Release Program (Osoyoos, BC). Five neonate codling moth were placed on each collected apple. The apples were confined within plastic cups and incubated at 24°C for seven days before codling moth mortality was assessed by cutting open the fruit. One disc (1 cm diameter) was cut from each leaf and placed on a layer of sticky-trap (Stikem Special) in a small plastic petri dish. Ten codling moth neonates were placed on each leaf disc. The dishes with the codling moth were placed in the dark for 60 minutes to encourage feeding. Five larvae per leaf which showed evidence of feeding, were then transferred to the surface of a pinto-bean based diet within individual plastic cups. The cups were sealed and incubated at 24°C until mortality was assessed on days 7 and 14. Percent mortalities were modified using an arcsine transformation before analysis of the data and comparison of the means using Tukey's studentized range test.

RESULTS: The virus in the products tested was virulent and caused significantly higher codling moth mortality after larvae fed on apples from trees treated with the virus compared to untreated apples, up to, and including, eight days post-treatment in the Virosoft CP4 treatment and up to day one in the Carpovirusine treatment (Table 1). The leaf disc assay was used to determine if the technique could be accurately used to reflect mortality recorded in the apple assay (Table 2). Apple bioassays are problematic as the apples frequently exceed the size of available plastic containers, they must be carefully sectioned to find the larvae and long term larva mortality data is influenced by rotting apples. Codling moth mortality recorded on leaf discs was consistently lower than the mortality recorded on treated apples. The decrease in product virulence was similar to that recorded on the apples. The increase in codling moth mortality recorded 14 days after exposure (Table 2) may be due to the latent CpGV infection in the colony from which the codling moth neonates were obtained, as the control mortality consistently increased by more than 10% by day 14.

Table 1. Mean percent codling moth mortality after 7 days when neonates were placed on treated or control apples.

Replicated twice over time; n = 10 apples; 5 codling moth per apple.

Treatment Mean percent mortality and day apples were collected from trees

| | Day 0 | Day 1 | Day 4 | Day 6 | Day 8 | Day 12 |
|---------------|---------------------------|---------------|---------------|---------------|--------------|-------------|
| Virosoft CP4 | 61.0 " 9.0 A ¹ | 38.9 " 9.8 A | 21.7 " 6.0 A | 21.7 " 5.4 A | 17.2 " 5.6 A | 7.5 " 5.5 A |
| Carpovirusine | 43.3 " 8.9 A | 23.8 " 9.2 AB | 15.8 " 14.3 A | 12.5 " 5.9 AB | 3.3 " 2.3 B | 5.0 " 3.4 A |
| Control | 2.9 " 2.0 B | 7.1 " 3.4 B | 0 " 0 A | 1.7 " 1.7 B | 3.9 " 2.2 B | 1.3 " 1.3 A |

¹means within columns followed by the same letter are not significantly (P>0.05) different as determined with Tukey's studentized range test after arcsin transformation of the percentage.

Table 2. Mean percent codling moth mortality after 7 and 14 days when neonates were placed on leaf discs. Replicated twice over time; n = 10 leaf discs; 5 codling moth per leaf disc.

Treatment Mean percent mortality and day leaves were collected from trees

| | Day 0 | Day 1 | Day 4 | Day 6 | Day 8 | Day 12 |
|---------------|---------------------------|---------------|--------------|--------------|---------------|---------------|
| After 7 days | | | | | | |
| Virosoft CP4 | 42.0 " 6.6 A ¹ | 16.5 " 3.8 A | 15.0 " 3.8 A | 5.0 " 2.5 A | 9.0 " 3.1 A | 8.5 " 3.4 A |
| Carpovirusine | 18.0 " 4.1 B | 9.3 " 2.8 AB | 9.3 " 3.1 A | 9.0 " 2.7 A | 2.00 " 1.4 A | 15.0 " 3.5 A |
| Control | 15.0 " 4.3 B | 5.0 " 2.5 B | 8.0 " 2.7 A | 5.0 " 2.5 A | 10.0 " 3.4 A | 9.0 " 3.1 A |
| After 14 days | | | | | | |
| Virosoft CP4 | 55.0 " 6.5 A | 31.3 " 5.1 A | 33.0 " 5.5 A | 18.0 " 3.5 A | 19.0 " 3.7 A | 17.8 " 4.6 A |
| Carpovirusine | 28.0 " 4.0 B | 22.00 " 4.8 A | 18.5 " 4.3 A | 17.0 " 3.3 A | 16.00 " 3.1 A | 24.00 " 3.7 A |
| Control | 29.0 " 4.3 B | 17.0 " 3.6 A | 21.5 " 4.4 A | 21.5 " 4.8 A | 22.0 " 5.2 A | 22.0 " 3.2 A |

¹means within columns and week of assessment followed by the same letter are not significantly (P>0.05) different as determined with Tukey's studentized range test after arcsin transformation of the percentage.

CONCLUSION: Both *Cydia pomonella* granuloviral products resulted in significant codling moth mortality on the day of treatment. Virulence of both products decreased quickly. The leaf disc technique could be used as a good indication of virulence but a day zero apple trial would be recommended to determine the potential difference in mortality due to the assay technique.