# Managing Codling Moth with Granulovirus and Spinosad

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## *Cydia pomonella granulosis virus*, CpGV

- Safe and selective bioinsecticide
- Larvae are infected by ingestion = slow killing speed
- Target neonate (newly hatched) larva
- Dead larvae release an oozing substance full of virus particles
- High larval mortality = reduction in population of subsequent CM generation

### WSU Tree Fruit Research and Extension Center Virus testing program, 2003

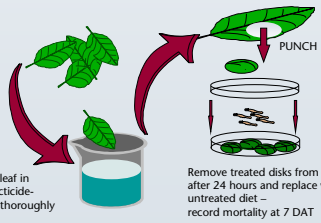
**Small-plot field trials**

- Replicated (5) single-tree plots – handgun applications
- Carpovirusine and Virosoft applied every 10 days, Cyd-X applied every 14 days
- Injury evaluated at the end of each CM generation
- Larvae from virus treated trees collected in cardboard bands to monitor moth emergence

**Laboratory evaluations**

- Leaf-Dip dose response bioassays for virus products
- Field-aged residue bioassays for virus products

## Leaf-dip Dose Response Bioassays




| Insecticide | $LC_{50}$ (x $10^{13}$ OB/1000L) | Field Rate (x $10^{13}$ OB/1000L) | Toxicity value ($LC_{50}$/field rate) |
|---|---|---|---|
| Carpovirusine | 0.003a | 0.71 | 0.004:1 |
| Cyd-X | 0.032a | 1.06 | 0.030:1 |
| Virosoft | 0.089a | 1.00 | 0.089:1 |

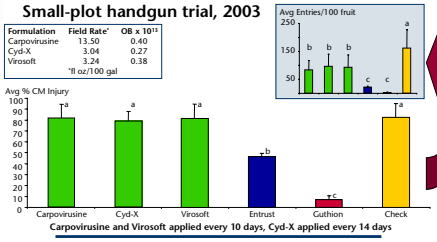
Lethal concentrations followed by the same letter are not significantly different

**CM larva removed from treated foliage after 24 hours**
**Mortality was recorded 7 days after exposure**

## Small-plot handgun trial, 2003

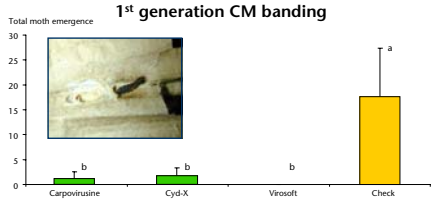
| Formulation | Field Rate* | OB x $10^{13}$ |
|---|---|---|
| Carpovirusine | 13.50 | 0.40 |
| Cyd-X | 3.04 | 0.27 |
| Virosoft | 3.24 | 0.38 |

*fl oz/100 gal



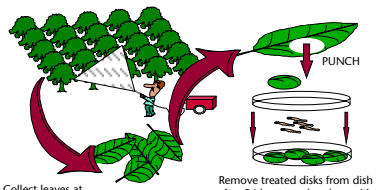

**Carpovirusine and Virosoft applied every 10 days, Cyd-X applied every 14 days**

### 1st generation CM banding




**Bands collected and replaced in the orchard for four consecutive weeks**
**Moth emergence monitored for four weeks from collection date**

## Field-aged Residue Bioassays




| Insecticide | Rate (OB/1000L) | Avg corr. % mort-CM (7d) 1 DAT | 3 DAT | 7 DAT | 14 DAT |
|---|---|---|---|---|---|
| Carpovirusine | 1.0 x $10^{13}$ | 70.6b | 56.3b | 50.0b | 33.3a |
| Cyd-X | 1.0 x $10^{13}$ | 58.8b | 43.8b | 71.4b | 22.2a |
| Virosoft | 1.0 x $10^{13}$ | 58.8b | 62.5b | 28.6ab | 11.1a |

Means followed by the letter 'a' are not significantly different than the untreated check

**Leaves collected at 1, 3, 7 and 14 days after treatment**
**Mortality recorded 7 days after exposure**

## Organically registered spinosad, Entrust

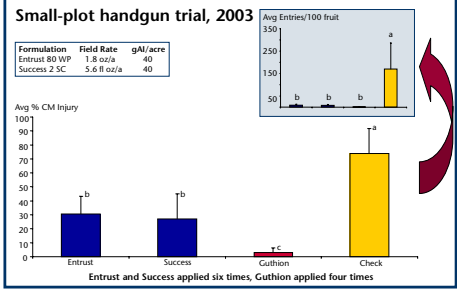
- Nervous system toxicant
- Active against neonate larva
- Must be ingested by CM larva before entering fruit

**Small-plot field trial**

- Entrust (organic) compared to Success and Guthion
- Replicated (5) single-tree plots – handgun applications
- Injury evaluated at the end of each CM generation

### Small-plot handgun trial, 2003

| Formulation | Field Rate | gAI/acre |
|---|---|---|
| Entrust 80 WP | 1.8 oz/a | 40 |
| Success 2 SC | 5.6 fl oz/a | 40 |




**Entrust and Success applied six times, Guthion applied four times**

### Entrust

- Reduced entries per fruit by 87 – 95% relative to the untreated check in two separate small plot trials
- Statistically equivalent to Success and Guthion in the reduction of CM entries per fruit

### Granulosis Virus

- No statistical difference between products in field or laboratory tests
- No product provides a reduction in percent fruit injury relative to the untreated check under high pressure
- All products provide a reduction in the number of entries per fruit relative to the untreated check
- Large proportion of fruit injury composed of 'stings' indicating that larvae die after injuring fruit
- Low moth emergence demonstrates a high level of delayed larval mortality which would result in a reduction of the subsequent CM generation
- $LC_{50}$ and the toxicity value suggest that all virus products are highly toxic to CM larvae at the recommended use concentrations
- Field-aged residue studies show significant larval mortality for at least seven days with all virus products

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