Chemical Control/New Products

# EVALUATION OF APPLE MAGGOT CONTROL AND AN ORGANIC INSECTICIDE PROGRAM

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*Keywords:* Actara, thiamethoxam, Calypso, thiacloprid, Avaunt, indoxacarb, Surround, kaolin, Spintor, spinosad, Aza-Direct, Neem oil, volatile bait, Guthion, azinphosmethyl, apple maggot, *Rhagoletis pomonella*, internal lepidopotera, codling moth, *Cydia pomonella*, oriental fruit moth, *Grapholita molesta*, lesser appleworm, *Grapholita prunivora*, plum curculio, *Conotrachelus nenuphar,* obliquebanded leafroller, *Choristoneura rosaceana,* tarnished plant bug, *Lygus lineolaris*, apple, handgun application, chemical control, insecticide

*Abstract:* The objectives of this study were to determine the efficacy of current organic insecticides, while also evaluating organic and standard materials against apple maggot. Treatments were 1) Surround (50 lb/acre) starting at petal fall applied weekly until last cover; 2) Surround (50 lb/acre) starting at petal fall applied weekly five times, followed by weekly sprays of AZA-Direct (32.0 oz/acre). Both treatments provided similar levels of control, but the seasonal program of Surround had a slightly higher percentage of clean fruit due to better control of internal lepidoptera and plum curculio.

Two rows in this orchard were set up to conduct apple maggot trials. Hand applications were applied (450 psi) either weekly or bi-weekly depending on material. Bi-weekly treatments were: Avaunt (1.9 oz/100), Calypso (1.0 oz/100), Actara (0.46 oz/100) and Guthion (8.0 oz/100). Weekly applications were Surround (25 lb/100), AZA-Direct(11.0 oz/100), Spintor (2.5 oz/100) and a volatile bait containing spinosad (32.0 ml/tree). The poison bait was applied using a backpack $CO_2$ sprayer. Surround gave complete control, while the standard Guthion had less than 0.5%. Calypso also gave good control, but the remainder of the materials tested were similar in damage to that of the untreated control.

# COMPARISON OF INSECTICIDES FOR APPLE MAGGOT CONTROL

A western New York apple orchard which has been in organic production for several years was selected for use in this trial because high levels of apple maggot and internal lepidoptera damage were observed in fruit harvested during the previous season. Dilute to runoff sprays were applied with a handgun sprayer (450 psi) on either a weekly or bi-weekly basis depending on the material used. The Spinosad volatile bait was applied with a MeterJet™ spray gun (Model 2362, Spraying Systems Company, North Avenue, Wheaton Illinois 60188) connected to a $CO_2$ backpack sprayer at 40 psi. All applications were started several days after the first flies were captured on monitoring traps in the orchard on 6 Jul and continued on 12 Jul, 19 Jul, 26 Jul, 1 Aug, 9 Aug, 18 Aug and 21 Aug. Treatments were replicated four times and included an untreated check on single 'Cortland' trees and arranged in a RCB design. Treatments were separated with unsprayed buffer trees within each row. Red sphere traps with

volatile bait were hung in each of the check treatments, as well as in one tree, two rows to the west of the test rows. Traps were checked on a weekly basis and cumulative counts were recorded throughout the season. Fruit was harvested on 29 Aug by randomly selecting 200 fruits per tree in each replication. Damage from AM as well as internal lepidoptera was taken upon fruit inspection and was subjected to an AOV with SuperAnova (Abacus concepts). Means were separated with Fisher's Protected LSD Test ($P<0.05$). Data were transformed arcsine (Sqrt X) prior to analysis.

Guthion 50 (8.0 oz form/100), Actara 25W (0.46 oz form/100), Calypso 4F (1.0 oz form/100) and Avaunt 30WG (1.9 oz form/100) were applied on a bi-weekly schedule. Surround WP (25 lbs form/100), Aza-Direct EC (11.0 oz form/100), Spintor 2SC (2.5 oz form/100) and Spinosad Volatile Bait (32 ml form/tree) were applied each week throughout the season. The Spinosad Volatile Bait was applied with the metered sprayer in 8.0 ml aliquots. One aliquot was applied to each of the 4 directional quadrants of the outside of the tree canopy.

AM and internal lepidoptera pressure in the test orchard was extremely high as indicated by the damage levels found in the untreated check plots and by high trap catches of flies throughout the season. The grower standard material of Guthion gave excellent control of both pests with less than 0.5% AM and internal lepidoptera damage. The weekly application of Surround also provided excellent control of AM damage (0.0%). The exact mode of action of this material against AM is not known. However, the coverage of kaolin reduces visual stimuli and may affect the ability of the flies to recognize and orient to apples. Also, the buildup of clay on the apple may act as a deterrent to females attempting to oviposit. Surround was also quite effective in controlling damage from internal lepidoptera. The other organically approved material in this test, Aza-Direct, was not effective in reducing AM damage, but did significantly reduce damage from internal lepidoptera. Avaunt, Actara, Spintor, and the Spintor bait all were relatively ineffective in preventing apple maggot damage. However, Avaunt and Spintor were quite effective against internal lepidoptera. Actara also significantly reduced damage from internal lepidoptera, although it was not as effective as Avaunt and Spintor. Calypso was the only non-organophosphate material that controlled both AM and internal lepidoptera, although it was not as effective against lepidoptera as the Guthion standard.

**Table 1.** Shows the fruit damage from both AM and internal lepidoptera, as well as the percentage of injury-free apples

| Material | Rate form/100 | Timing | Mean % fruit damage | | |
|---|---|---|---|---|---|
| | | | Apple maggot | Internal lep. | % clean |
| Surround WP | 25 lb. | Weekly | 0.0 a | 3.5 c | 96.4 c |
| Avaunt 30WG | 1.9 oz | Bi-weekly | 40.1 c | 2.9 c | 57.9 ab |
| Calypso 4F | 1.0 oz | Bi-weekly | 2.5 a | 2.0 bc | 93.4 c |
| Aza-Direct EC | 1.0 oz | Weekly | 42.0 c | 6.9 d | 51.6 a |
| Actara 25W | 0.46 oz | Bi-weekly | 18.0 b | 6.9 e | 70.0 b |
| Spintor 2SC | 2.5 oz | Weekly | 28.1 bc | 1.1 ab | 71.5 b |
| Spinosad Bait | 32.0 ml* | Weekly | 34.3 bc | 5.8 ef | 51.6 a |
| Guthion 50 | 8.0 oz. | Bi-weekly | 0.4 a | 0.4 a | 98.5 c |
| Untreated Check | | | 35.1 bc | 20.1 f | 47.4 a |

*applied @ 32.0 ml/tree with $CO_2$ backpack sprayer.
Means within a column followed by the same letter are not significantly different (Fisher's Protected LSD Test, $P<0.05$). Data transformed arcsine (Sqrt X) prior to analysis.

**Table 2.** Shows the date and number of AM flies caught during the trial

| Date | # of traps | # of flies |
|---|---|---|
| 6 Jul | 5 | 8 |
| 12 Jul | 5 | 12 |
| 19 Jul | 5 | 36 |
| 26 Jul | 5 | 190 |
| 1 Aug | 5 | 196 |
| 9 Aug | 5 | 183 |
| 13 Aug | 5 | 41 |
| 21 Aug | 5 | 13 |

Traps placed in each check tree (4) and two rows to west (1) of test rows on 29 Jun.