Cornell University
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Field & Laboratory Tests of Pre-Mixed Insecticide Combinations Against Apple Maggot, 2013.

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PRE-MIXED INSECTICIDES COMBINATIONS ARE BECOMING INCREASINGLY MORE COMMONLY USED IN APPLE ORCHARDS

- Most tree-fruit entomologists would rather growers would tank mix as necessary rather than use pre-mixes.
- Some growers are definitely using pre-mixes because they perceive them as being very reasonably priced.
- Some pre-mixes combine non-IPM compatible insecticides such as pyrethroids with newer, more selective materials.
- Rates of insecticides in some pre-mixes are lower than recommended labeled rates of materials alone for some insect pests.
- Very little is know about additive effects or potential synergism of insecticide combinations in premixes

PRE-MIXED INSECTICIDE COMBINATIONS TESTED IN THE FIELD AND LABORATORY IN 2013

Product Name	Insecticide 1	Insecticide 2	Rate (oz form/100 gal
Calypso Std.	Thiacloprid (40.4%)		8
Voliam Xpress	Lambda-cyhalothrin 4.63%	Chlorantraniprole (9.26%)	12
Endigo	Lambda-cyhalothrin (9.48%)	Thiamethoxam (12.6%)	5.5
Voliam Flexi	Thiamethoxam (20.0%)	Chlorantraniprole (20.0%)	7
Leverage	Imidacloprid (21.0%)	B-cyfluthrin (10.5%)	2.8
Agri-Flex	Abamectin (3.0%)	Thiamethoxam (13.9%)	4.95

LABORATORY TESTS, 2013

- In laboratory tests, Red Delicious apples were dipped into an insecticide solution, and after residues were dry, placed in a plastic cup with 5 gravid AM females
- After 24 hr, mortality of females was monitored, puncutures were counted, and larval emergence from infested apples was compared.
- Egg deposition was estimated on treated apples by dissecting punctures on 1 treated apple/replication.

Bioassay Schematic

COMPARISON OF THE TOXICITY OF PRE-MIXED INSECTICIDES TO ADULT FLIES

Product Name	Insecticide 1	Insecticide 2	Avg. % Adult Mortality
Calypso Std.	Thiacloprid (40.4%)		33.1d
Voliam Xpress	Lambda-cyhalothrin 4.63%	Chlorantraniprole (9.26%)	28.6d
Endigo	Lambda-cyhalothrin (9.48%)	Thiamethoxam (12.6%)	80.0a
Voliam Flexi	Thiamethoxam (20.0%)	Chlorantraniprole (20.0%)	81.7a
Leverage	Imidacloprid (21.0%)	B-cyfluthrin (10.5%)	54.8c
Agri-Flex	Abamectin (3.0%)	Thiamethoxam (13.9%)	66.5b
Check			2.1e

EFFECTS OF PRE-MIXED INSECTICIDES ON APPLE MAGGOT OVIPOSITION

Product Name	Insecticide 1	Insecticide 2	Avg. Punct/apple
Calypso Std.	Thiacloprid (40.4%)		2.9cd
Voliam Xpress	Lambda-cyhalothrin 4.63%	Chlorantraniprole (9.26%)	7.3b
Endigo	Lambda-cyhalothrin (9.48%)	Thiamethoxam (12.6%)	3.1cd
Voliam Flexi	Thiamethoxam (20.0%)	Chlorantraniprole (20.0%)	1.7d
Leverage	Imidacloprid (21.0%)	B-cyfluthrin (10.5%)	1.7d
Agri-Flex	Abamectin (3.0%)	Thiamethoxam (13.9%)	5.5bc
Check			32.8a

EFFECTS OF PRE-MIXED INSECTICIDES ON TOTAL LARVAL EMERGENCE FROM APPLES

Product Name	Insecticide 1	Insecticide 2	Avg. # larvae emerged/apple
Calypso Std.	Thiacloprid (40.4%)		0.0c
Voliam Xpress	Lambda-cyhalothrin 4.63%	Chlorantraniprole (9.26%)	1.8b
Endigo	Lambda-cyhalothrin (9.48%)	Thiamethoxam (12.6%)	0.4c
Voliam Flexi	Thiamethoxam (20.0%)	Chlorantraniprole (20.0%)	0.3c
Leverage	Imidacloprid (21.0%)	B-cyfluthrin (10.5%)	0.2c
Agri-Flex	Abamectin (3.0%)	Thiamethoxam (13.9%)	0.3c
Check			9.3a

EFFECTS OF PRE-MIXED INSECTICIDES ON EGG DEPOSITION IN PUNCTURES

Product Name	Insecticide 1	Insecticide 2	Avg. # Eggs/ puncture
Calypso Std.	Thiacloprid (40.4%)		0.8ab
Voliam Xpress	Lambda-cyhalothrin 4.63%	Chlorantraniprole (9.26%)	0.7ab
Endigo	Lambda-cyhalothrin (9.48%)	Thiamethoxam (12.6%)	0.6ab
Voliam Flexi	Thiamethoxam (20.0%)	Chlorantraniprole (20.0%)	1.0a
Leverage	Imidacloprid (21.0%)	B-cyfluthrin (10.5%)	0.5b
Agri-Flex	Abamectin (3.0%)	Thiamethoxam (13.9%)	0.6ab
Check			0.9a

FIELDS TESTS, 2013

- Materials were applied with an airblast sprayer (150gpa) to 12-tree plots along the edge of an orchard
- Treatments were replicated 3X and arranged in an RCB
- Sprays were applied on 19 Jul, 30 Jul, 12 Aug and 27 Aug
- Fruit was evaluated on 12 Sept. and rated for stings (<1/8 in.) or tunnels (brown trails within fruit).

AM Stings

Treatment	Rate/A	% AM Stings
Voliam Xpress	12.0 oz	3.3 bc
Voliam Flexi	7.0 oz	4.0 bc
Agri-Flex	8.5 oz	8.3 ab
Endigo ZC	6.0 oz	3.0 c
Leverage 360	2.8 oz	4.0 bc
Calypso 4F	8.0 oz	11.3 a
Untreated Check		4.3 bc

Means within a column followed by the same letter are not significantly different (Student's t Test, $P \leq 0.05$).

Data was transformed arcsine (Sqrt *x*) prior to analysis

AM Tunnels

Treatment	Rate/A	% AM Tunnels
Voliam Xpress	12.0 oz	0.7 c
Voliam Flexi	7.0 oz	2.3 bc
Agri-Flex	8.5 oz	3.7 ab
Endigo ZC	6.0 oz	0.7 c
Leverage 360	2.8 oz	0.3 c
Calypso 4F	8.0 oz	2.0 bc
Untreated Check		7.7 a

Means within a column followed by the same letter are not significantly different (Student's t Test, $P \leq 0.05$).

Data was transformed arcsine (Sqrt *x*) prior to analysis

Total AM Damage

Treatment	Rate/A	% AM Stings	% AM Tunnel
Voliam Xpress	12.0 oz	3.3 bc	0.7 c
Voliam Flexi	7.0 oz	4.0 bc	2.3 bc
Agri-Flex	8.5 oz	8.3 ab	3.7 ab
Endigo ZC	6.0 oz	3.0 c	0.7 c
Leverage 360	2.8 oz	4.0 bc	0.3 c
Calypso 4F	8.0 oz	11.3 a	2.0 bc
Untreated Check		4.3 bc	7.7 a

Means within a column followed by the same letter are not significantly different (Student's t Test, $P \leq 0.05$).

Data was transformed arcsine (Sqrt *x*) prior to analysis

SUMMARY

- Calypso and the mixtures tested were not highly toxic to AM flies
- All treatments were statistically as effective in preventing AM infestation (tunneling) as the Calypso standard except for Agri-Flex.
- All treatments allowed some stings (superficial ovipisition punctures), particularly Calypso.

CONCLUSIONS

Laboratory and field tests show that Calypso and the mixtures tested have several modes of action against AM:

- Toxicity to flies
- Reduction of numbers of oviposition punctures
- Toxicity to eggs and/or newly hatched larvae.

Thanks

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