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RESPONSE OF THE APPLE MAGGOT, *RHAGOLETIS POMONELLA*, AND THE CHERRY FRUIT FLY, *R. FAUSTA* (DIPTERA: TEPHRITIDAE), TO PROTEIN HYDROLYSATE BAIT SPRAYS[1]

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Abstract

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None of five mixtures of protein hydrolysate and azinphosmethyl which were applied as foliar sprays (1.0, 2.0, 5.0% yeast hydrolysate, 2.0% corn hydrolysate, and 2.0% soy hydrolysate) killed significantly more apple maggot flies, *Rhagoletis pomonella*, or black cherry fruit flies, *R. fausta*, than a spray of azinphosmethyl alone which was used as a control. This suggests that hydrolysate bait sprays would be no more effective than a toxicant alone in controlling these flies.

Introduction

Bait sprays containing protein hydrolysate mixed with an insecticide have been used successfully to control several species of tropical fruit flies in Hawaii (Steiner 1952; Steiner *et al.* 1958) and in the continental United States to control and eliminate introduced Mediterranean fruit flies, *Ceratitis capitata*, and melon flies *Dacus dorsalis* (Steiner 1969). These baits reportedly increase the effectiveness of insecticides by attracting the insect to droplets of the mixture where they feed and die. This allows the use of less persistent and toxic insecticides with less uniform coverage than might be needed in an application of insecticide alone (Chambers 1974).

I report here the attractiveness of sprays of azinphosmethyl baited with yeast, soy, and corn hydrolysates to *Rhagoletis fausta* and *R. pomonella*.

Materials and Methods

Protein hydrolysate–azinphosmethyl spray mixtures were tested in an unsprayed Montmorency tart cherry orchard near Sodus, N.Y., which was heavily infested with *R. fausta*. Five solutions, 5, 2, and 1% yeast hydrolysate, 2% corn hydrolysate, and 2% soy hydrolysate, were compared. A spray of the toxicant alone, azinphosmethyl, was used as a control (Table I). Azinphosmethyl used in the bait mixtures and the control was applied at the rate of 0.5 lb 50% W.P./100 gal as recommended in the New York 1974 Tree-Fruit Production Recommendations for Commercial Growers for control of cherry fruit flies. The terminal foliage of several small branches on each cherry tree was sprayed to run-off with 0.5 l. of each mixture. A square lath frame (76×76×3 cm) with a wire screen bottom was suspended parallel to the ground immediately beneath the sprayed branches to catch flies which were killed after landing on the treated foliage. The first spray was applied on 14 June, and followed 8 days later by another spray applied to the same foliage. The flies in each frame were counted, sexed, and removed daily or every other day until the termination of the test on 1 July. Each treatment was replicated 5 times, and treatments were arranged in a completely randomized block design with only one treatment applied/tree.

The same bait sprays except the 1.0% yeast hydrolysate mixture were also tested against apple maggot flies in 1975 (Table I). The experimental design and application

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Table I. Numbers of *Rhagoletis pomonella* and *R. fausta* flies killed on apple and cherry tree foliage sprayed with protein hydrolysate solutions. Sodus, N.Y., 1974–1975.

	Rhagoletis fausta				*Rhagoletis pomonella*				
	Av./flies/rep/day				Av./flies/rep/day				
Treatment	1st spray	2nd spray	Season's av.[a]	% ♀s killed/ season	1st spray	2nd spray	3rd spray	Season's av.[a]	% ♀s killed/ season
1.0% yeast hydrolysate	4.0	1.3	3.0[b]	85.2	–	–	–	–	–
2.0 yeast hydrolysate	4.3	1.4	2.8[b]	82.4	120.1	46.1	16.3	53.9[a]	60.9
5.0 yeast hydrolysate	3.1	1.4	2.2[b]	87.3	79.1	25.4	5.2	31.7[a]	60.5
2.0% corn hydrolysate	4.9	1.8	3.3[a]	77.7	73.8	12.4	6.5	26.4[a]	64.7
2.0% soy hydrolysate	4.6	3.7	4.1[a]	78.7	63.2	9.3	3.8	21.4[a]	57.7
Control (guthion spray)	8.7	2.7	5.5[a]	74.3	61.3	18.3	7.2	25.3[a]	39.1

[a]Means followed by the same letter were not significantly different.

techniques were those previously described. Tests were conducted in an unsprayed apple orchard containing trees of the Wealthy apple variety which were heavily infested with apple maggot flies. Three sprays were appled on 14, 17, and 22 July and the test was terminated on 28 July. The 17 July spray was applied after a heavy rainfall which washed off most of the materials. No rain fell during the remainder of the test.

The season's catch of each species was transformed (log X), submitted to an analysis of variance, and means were separated with a Duncan's multiple range test ($p < .05$). The percentages of females of both species killed by the treatments during the season were subjected to a χ^2 test ($p > .05$).

Results and Discussion

Bait sprays did not kill as many *R. fausta* adults as the azinphosmethyl control (Table I). However, the sprays containing 2.0% corn hydrolysate or 2.0% soy hydrolysate were not significantly less effective. Those with yeast hydrolysate killed significantly fewer flies than the toxicant alone which suggests that they may even have been slightly repellent. The relative effectiveness of the baits was consistent throughout the test although all treatments captured more flies/day after the first spray than later in the test following the second spray. Bait sprays with yeast hydrolysate killed a significantly larger percentage of *R. fausta* females than either the control or those with corn and soy hydrolysate.

The 2.0% yeast hydrolysate bait spray killed ca. twice as many apple maggot flies during the season as the azinphosmethyl control (Table I), but none of the differences among the treatments was significant. The higher concentration of yeast hydrolysate (5.0%) was less effective as the 2.0% mixture. Neither the corn nor soy hydrolysates killed as many flies as the control. All of the bait treatments killed a significantly higher percentage of females during the season than the azinphosmethyl control, although these percentages were still much lower than those for *R. fausta*.

None of the bait sprays was phytotoxic to the cherry tree foliage, but all of the materials caused some defoliation on treated apple tree branches, during the last several days of the test . The 5.0% yeast hydrolysate was more severe than the other treatments. In both tests the sprays were applied soon after adults of the respective species began to emerge, but no subsequent reduction in fruit infestation was observed in treated trees at the end of the test.

Although the apple maggot flies were slightly more responsive to the protein hydrolysate bait sprays than the cherry fruit flies, neither species was strongly attracted. This suggests that bait sprays would be no more effective in controlling these insects than sprays of a toxicant alone. Dolphin *et al.* (1970) reduced populations and subsequent fruit infestation by the apple maggot with frequent applications of protein hydrolysate bait sprays to limbs of apple trees and Buriff and Still (1973) also controlled *R. fausta* in a heavily infested cherry orchard with frequent, localized foliar applications of hydrolysate bait sprays. However, the effects of similar treatments with the toxicant alone were not tested in either study. Tests of dilute protein hydrolysate bait sprays in Nova Scotia, Canada, showed, as suggested by this study, that these treatments were no more effective during the season than the pesticide alone in reducing apple maggot infestations (Neilson and Sanford 1974).

Barnes and Ortega (1959) stated that screening materials as attractants in bait pans and traps could give misleading results concerning their utility in bait sprays because of the intimate bearing of the method of exposure upon their performance. This observation was supported in this study in which materials shown to attract apple maggots in sticky traps (Neilson 1960; Howitt and Connor 1965) were not very effective when sprayed on foliage.

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References

Barnes, M. M. and J. C. Ortega. 1959. Experiments with protein hydrolysate bait sprays for control of the walnut husk fly. *J. econ. Ent.* **52**: 279–285.

Buriff, C. R. and G. W. Still. 1973. Black cherry fruit fly: Bait spray for control. *J. econ. Ent.* **66**: 1350–1351.

Chambers, D. L. 1974. Pest control by attractants: a case study demonstrating economy, specificity, and environmental acceptability. *Bioscience* **24**: 150–152.

Dolphin, R. E., M. L. Cleveland, G. W. Still, and T. E. Mouzin. 1970. Reduction of populations of apple maggots with bait sprays. *J. econ. Ent.* **63**: 1878–1881.

Howitt, A. J. and L. J. Connor. 1965. The response of *Rhagoletis pomonella* (Walsh) adults and other insects to trap boards baited with protein hydrolysate baits. *Proc. ent. Soc. Ont.* **95**: 134–136.

Neilson, W. T. A. 1960. Field tests of some hydrolyzed proteins as lures for the apple maggot, *Rhagoletis pomonella* (Walsh). *Can. Ent.* **92**: 464–467.

Neilson, W. T. A. and K. H. Sanford. 1974. Apple maggot control with baited and unbaited sprays of azinphos-methyl. *J. econ. Ent.* **67**: 556–557.

Prokopy, R. J. 1975. Selective new trap for *Rhagoletis cingulata* and *R. pomonella* flies. *Environ. Ent.* **4**: 420–424.

Reissig, W. H. 1974. Field tests of traps and lures of the apple maggot. *J. econ. Ent.* **67**: 484–486.

Steiner, L. F. 1952. Fruit fly control in Hawaii with poison bait sprays containing protein hydrolysates. *J. econ. Ent.* **45**: 838–843.

——— 1969. Control and eradication of fruit flies on citrus. *Proc. 1st int. Citrus Symp.* **2**: 381–387.

Steiner, L. F., W. C. Mitchell, and K. Ohinata. 1958. Fruit fly control with poisoned bait sprays in Hawaii. USDA, ARS (ser.) 33-3.

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