EVALUATION OF DIFFERENT PHEROMONE DISPENSING TECHNOLOGIES FOR MATING DISRUPTION OF ORIENTAL FRUIT MOTH IN PEACHES / DEVELOPMENT OF A PRELIMINARY 1ST BROOD EGG HATCH MODEL

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Abstract: Mating disruption was evaluated as a control tactic against oriental fruit moth in peaches using twist-ties (Isomate-M), paraffin-based liquid (Confuse-OFM) and sprayable pheromone (3M) formulations in commercial orchards. Pheromone trap catches of male moths were low in the disrupted plots throughout the entire season, remaining essentially at or near zero in most cases, despite considerable population pressure. In one case, however, there was breakthrough in the traps of a Confuse plot that was directly adjacent to an apple planting, which likely had its own population of OFM that was being attracted into the peach plots. Pre-harvest fruit inspection showed fruit damage from OFM feeding and infestation to be quite low in most of the treatments, except in the aforementioned Confuse site, where it surpassed 10%. In summary, all treatments appear to have the potential for acceptable control within plot interiors, but border sprays may need to be incorporated to forestall infestations by moths immigrating from non-disrupted areas when these products are used in typical commercial production areas in western N.Y.

Materials and Methods

This trial was conducted in mixed plantings of fresh and processing peaches on 4 commercial farms in Niagara Co., NY. Three types of pheromone dispensing technology were evaluated for efficacy in controlling oriental fruit moth (OFM) infestations when applied against the 2nd and 3rd generations of this pest; the 1st generation was controlled by grower-applied sprays of Asana or Imidan, during the petal fall and shuck split period, directed primarily against plum curculio, *Conotrachelus nenuphar*. Peach varieties included 'Babygold 5', 'Babygold 7', 'Red Haven', 'New Haven', 'Bellaire', 'Jay Daylee', 'Loring', and 'Crest Haven'.

The following treatments were tested in single-plot replicates (ranging in size from 2.5–6.0 acres) at each of the 4 sites:

1 – Isomate M-100 ties, applied 6-11 June at a rate of 150/acre

2 – 3M Sprayable Pheromone, applied by the growers at a rate of 1.7 oz/acre + NuFilm 17 at a rate of 1 pint/acre, on the following dates: Kappus: 17 June, 2 & 18 July, and 3 August; Topp and Murray: 18 June, 3 & 18 July; Niagara: 18 & 29 June, 17 July, and 2 August.

3 – Confuse-OFM paraffin, applied at a rate of 30 g a.i./acre (1-2 squirts/tree from a plastic squirt bottle), on the following dates: Kappus: 6 June, 9 July, and 13 August; Topp: 6 June and 2 August; Murray: 8 June and 2 August; Niagara: 11 June (only once, because the peaches in the

Confuse plot at Niagara were early varieties that already had been harvested by the time of the second application).

Two grower standard blocks (Transit and Storage), which were used as check plots, had no pheromone treatments, but received the following pesticide sprays:

- Azinphosmethyl 50WP (1.5 lb/A) on 6 June, 20 July and 1 August;
- Asana 0.66EC (10 oz/A) on 14, 21 & 29 June, and 12 July (every other row).

Treatment efficacy in depressing adult male trap catch was monitored using 3 Pherocon I wing traps per plot, each baited with a standard Scentry oriental fruit moth lure, and checked twice weekly from 11 June to 16 August. Traps were also placed in two nearby orchards not being treated with pheromones, to serve as a check. Fruit damage was evaluated at harvest by inspecting 100 fruits from each of 4 trees per plot, and graded as either Clean, Sting (nominal minor damage consisting of evidence of only slight feeding), Internal (more serious damage consisting of tunnelling, or presence of frass or live larvae); incidence of cat-facing caused by tarnished plant bug (*Lygus lineolaris*) or other hemipterans was also recorded.

Mean percent fruit damage was transformed using arc-sine square root and an analysis of variance plus Fisher's Protected t-test was used to compare treatment means (Abacus Concepts 1991).

Results and Discussion

Pheromone trap catches of OFM adult males in the disrupted plots were very low throughout the entire season, essentially remaining at or near zero in most cases despite considerable population pressure, as reflected in the check (Transit and Storage) plots. In one case, at the Kappus site, there was breakthrough in the Confuse plot traps, which occurred at two times, in each case approximately 3 weeks after the treatment's application date. Following re-application, moth numbers returned to zero in both instances. This level of breakthrough was not seen any of the other plots, and it is assumed that the problem was caused by the fact that the Confuse plot at Kappus was directly adjacent to an apple planting, which likely had its own population of OFM that was being attracted into the traps of the pheromone plot. In general, the growers did a good job of applying the MEC sprayable formulation at the appropriate schedule timings, which is a particularly important aspect of using these products at their highest level of effectiveness.

Results of the pre-harvest fruit inspection showed fruit damage from OFM feeding and infestation to be quite low in most of the treatments. The occurrence of "stings" was generally in the range of 1.5-3.5% in all plots; this category represents skin puncturing or nominal pitting progressing less than a few millimeters into the fruit, attributable to either OFM or some other undetermined cause. An "internal" injury category was reserved for actual tunnelling in the fruit flesh, with either the larva or its trail or frass evident when the fruit was cut. Few major differences among treatments were seen except for the Kappus site, where internal larval infestation surpassed 10% in the Confuse plot. This corresponds with the pheromone trap

results, and corroborates the assumption of mated female immigration from the apples, as the injury level was 3.3% in the Isomate plot (next in line after the Confuse plot) and only 1% in the 3M Sprayable (the plot farthest from the apples). Also, the 3 plots at this site had different harvest dates because of variety differences, and later dates of harvest corresponded with higher fruit damage levels (3M Sprayable, 6 Aug; Isomate M, 16 Aug; Confuse, 27 Aug). Fruits harvested later in the month would have had a longer period of exposure to potential infestation by any immigrating moths.

In summary, all treatments appear to have the potential for acceptable control within plot interiors, but border sprays may need to be incorporated to forestall infestations by moths immigrating from non-disrupted areas when these products are used in typical commercial production areas in western N.Y.

References Cited

Abacus Concepts, Inc. 1991. SuperANOVA v1.11. Berkeley, CA.

Predictive OFM Egg Hatch Model

A second study was conducted to develop an egg hatch model for OFM on peaches based on degree days. This information could be used to determine the optimum application times for different insecticides in orchards, thereby increasing the efficacy of these compounds and reducing resistance of OFM to these compounds.

A plot of 19 unsprayed peach trees located in Appleton (Niagara Co.), New York, was selected for this study. Inspection of these trees for newly laid eggs began in early May, shortly after the April 28 biofix (first male moth catch in a pheromone trap) and was continued through the second flight (July), as well as into the third flight in mid-August. Terminal shoots on each tree in the block were checked for OFM eggs for five minutes, and checks were made twice a week. Unhatched eggs were collected and recorded before they were brought to the lab in Geneva. They were then placed in a petri dish with a source of humidity and stored in an insectary under ambient temperature. Eggs were checked daily and hatches were recorded along with the daily degree day (base 45°F) accumulation. This information was then combined with moth biofix, moth trap capture, and degree day caculations to develop an egg hatch model. Information for this study relies on the data from the first flight in Niagara Co., which occurred from late April until June 25.

A total of 300 OFM eggs were collected and held until hatch during the first generation flight in 2001. The data from of this cohort of eggs was used to construct a curve showing the relationship between cumulative percent hatch and total degree days accumulated since the biofix (Fig. 3). From this graph, it was possible to derive a table of estimated hatch progression in

increments of 5% (Table 1), which can be used to help time insecticide applications for most efficient management of this pest.

Attempts to construct a similar degree-day model for the 2nd brood hatch were not successful, as egg deposition on the terminal leaves fell off to nearly zero during the second flight. It was assumed that the eggs were instead being laid on the fruit surfaces, which would have been impractical to sample. However, researchers in NJ and PA determined that oviposition had shifted instead to fruit cluster leaves. Sampling procedures will be modified next season to take this fact into account in developing a hatch model for the 2nd brood hatch.

Table 1. Predicted 1st brood OFM hatch using data from 2001.

% Cumulative Egg Hatch	Degree Days (Base 45°F) from Biofix
0	0
5	230
10	245
15	260
20	275
25	285
30	295
35	305
40	307
45	310
50	315
55	318
60	320
65	325
70	330
75	340
80	345
85	360
90	390
95	425
100	510

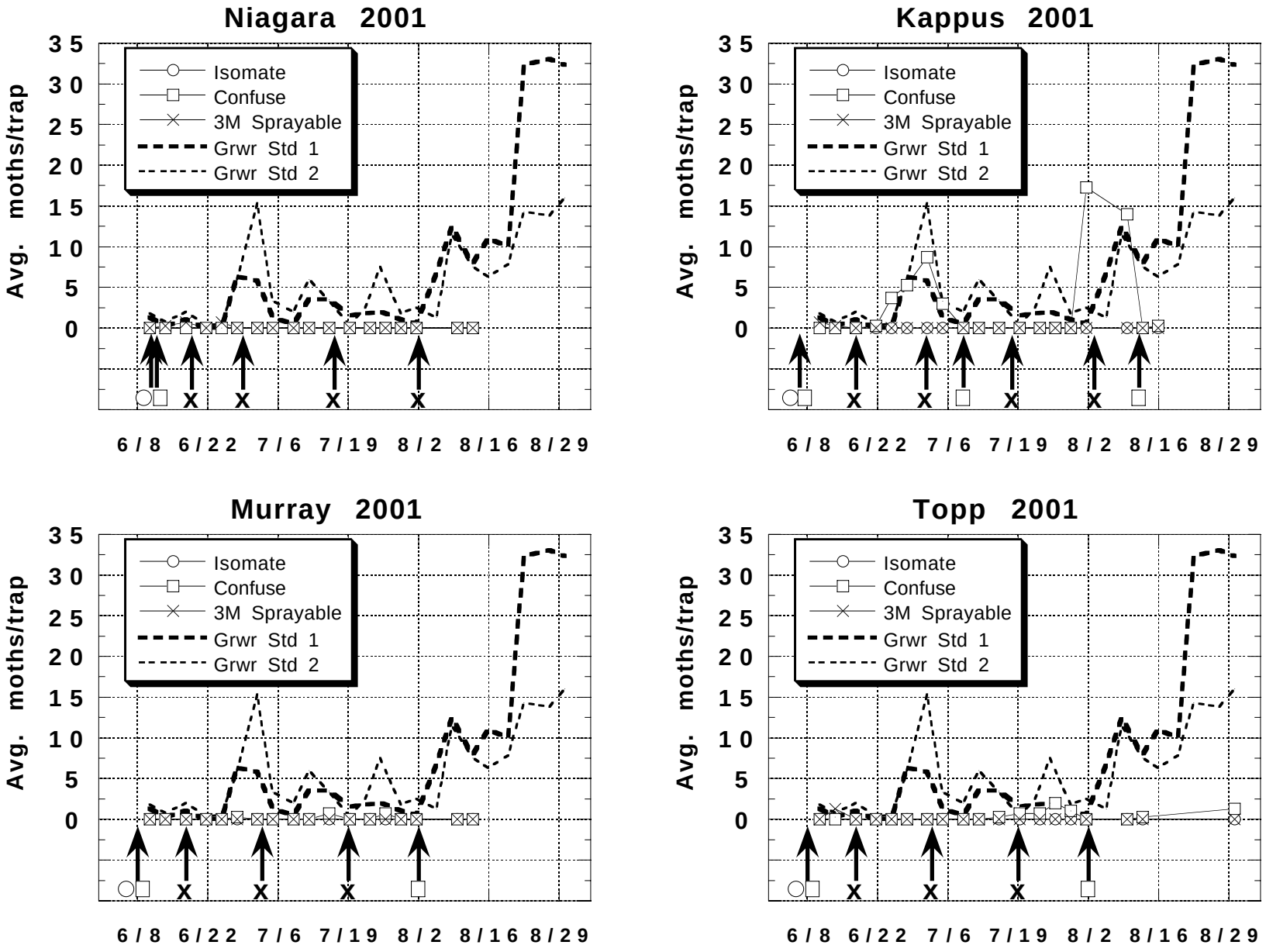

Fig. 1. Oriental fruit moth pheromone trap catches in plots treated with different pheromone disrupt ion techniques, Niagara Co. 2001

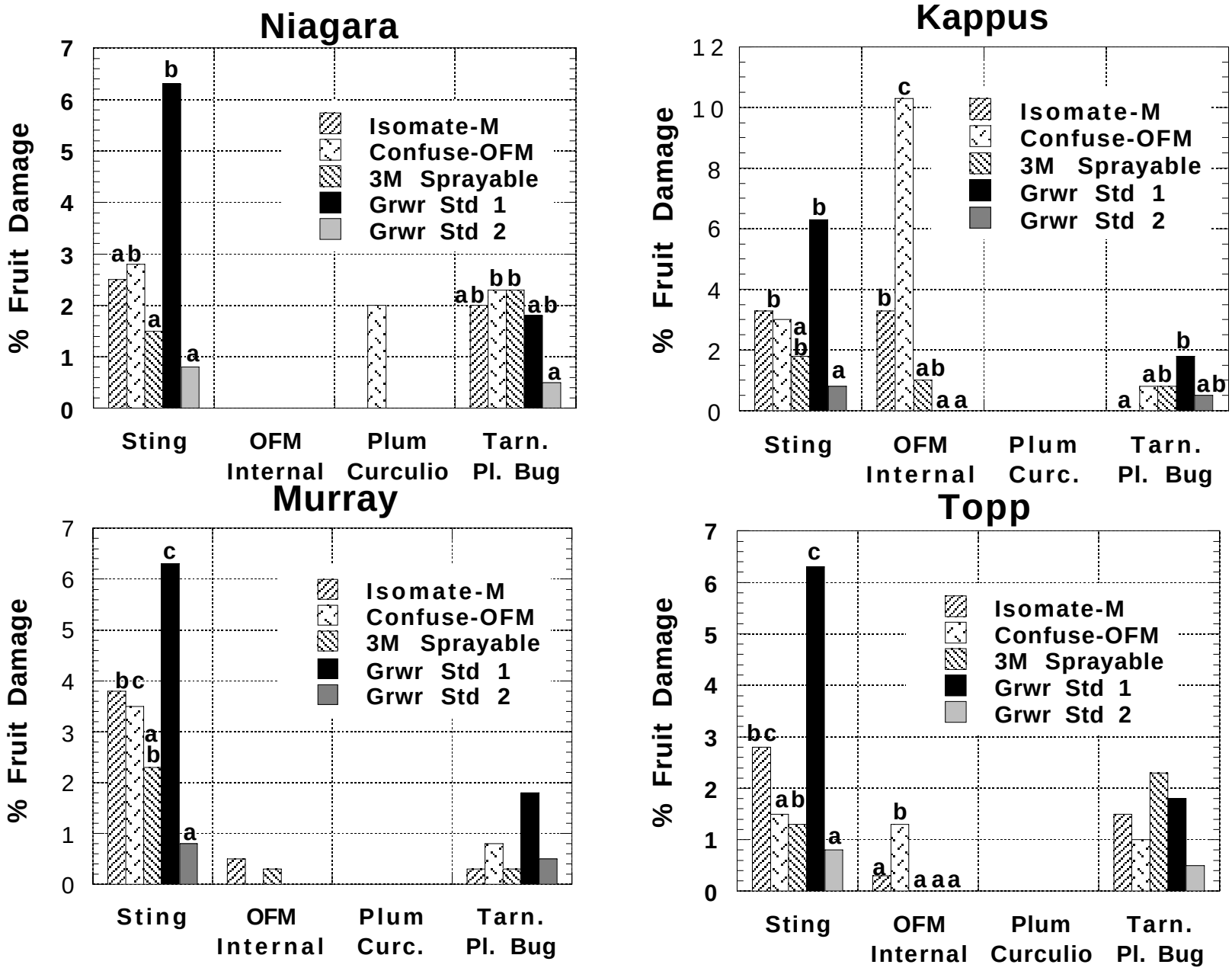

Fig. 2. Fruit injury in peach plots treated with different oriental fruit moth pheromone disrupt ion techniques, Niagara Co. 2001

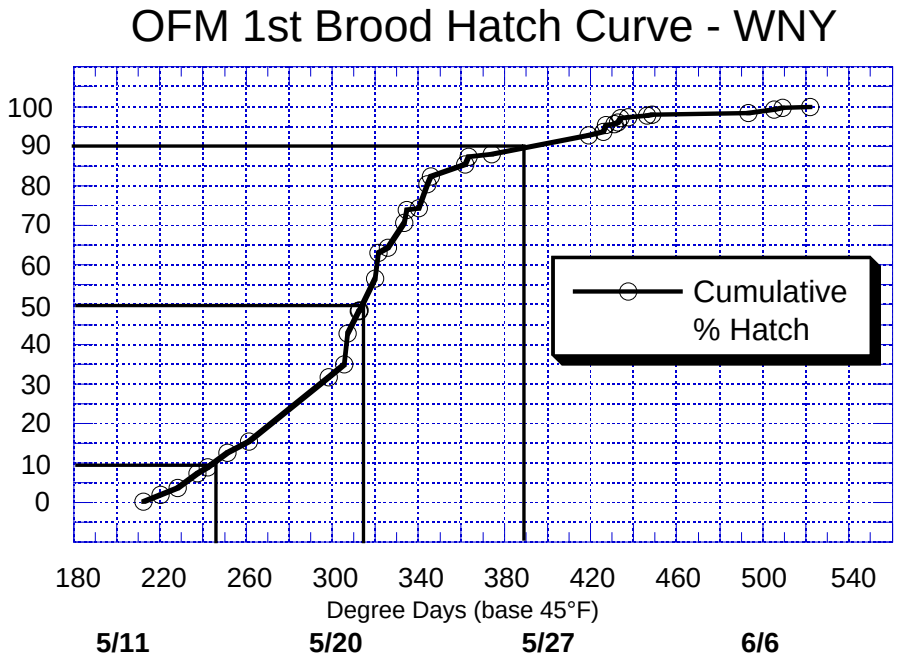

Fig. 3. Relationship between cumulative percentage of first generation OFM egg hatch and degree days (base 45°F) since first adult catch in a pheromone trap, Niagara Co. 2001.

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