CALIFORNIA MELON RESEARCH BOARD ANNUAL REPORT

I. IDENTIFICATION

A. Project Title: Developing methods for virus incidence reduction using applications of materials acting as repellents or anti-feedants to aphid vectors.
B. Research Priority Area- 10.
C. Other Funding- None
D. **Annual Report** 2013

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G. Work will be performed on the UC Davis campus in Plant Pathology research fields (Armstrong Field Research Complex).

II. RATIONALE

A. **Significance and need.** Incidence of nonpersistently-transmitted mosaic viruses, including *Cucumber mosaic cucumovirus* (CMV), *Watermelon mosaic potyvirus 2* (WMV2), *Papaya ringspot potyvirus type W* (PRSV-W), and *Zucchini*

yellows mosaic potyvirus (ZYMV), has historically approached 100% in field-grown melons in California, resulting in losses in plant vigor and marketable yields. These viruses can be successfully transmitted by many different aphid species, the majority of which do not colonize melons and are therefore transients with the proclivity to sample melon plants as hosts while passing through. Insecticides cannot combat this type of vector relationship since infective virions are transmitted prior to the ingestion of a lethal dose by the aphid. Therefore there is a need for alternative protective measures such as repellants, antifeedants, and/or dissuadants, in order to reduce virus transmission, incidence and associated losses. Several commercially-available or experimental formulations of botanical essential oils or plant extracts have shown the potential to repel and/or reduce feeding in a wide range of arthropod pests.

Work in 2012 concentrated on the effect of repellents/antifeedants on aphid density and virus incidence. Results from a late planting trial identified nine products that significantly reduced the percentage of shoots showing mosaic virus symptoms compared to untreated. Aphid densities suggested some correlation with reduced virus incidence, with two treatments showing significantly lower average aphid density compared to the untreated in the late planting trial, though no treatments were found to be statistically different from the untreated aphid density in the early planting trial.

Trials were set up in Davis in 2013 We used the top 3 products from 2012 trials as antifeedants or repellants. Plots were set up as individual sites with 2 rows of honeydew planted on 80 in centers and on 30 foot beds. In order to reduce VOC contamination each 2 row planting was separated from any other 2 row planting by 50 feet on all sides. The three products brought forward from the 2012 trials included Joshua oil at 0.06% (v/v) applied on a 14 day schedule, Joshua oil at 0.06% applied on a 7 day schedule, IRF 161 at 0.375% (v/v) on a 7 day schedule and ORSA 076 at 0.25% on a 7 day schedule. Treatments were applied using a CO2 backpack sprayer at 40 psi in 100 gallons of water/A. Aphid counts were made once per week by collecting yellow sticky cards which were placed on a vertical wire 6 inches over the canopy of melons in each of the16 plantings. Aphids traps were evaluated for 6 weeks beginning 30 days after planting.

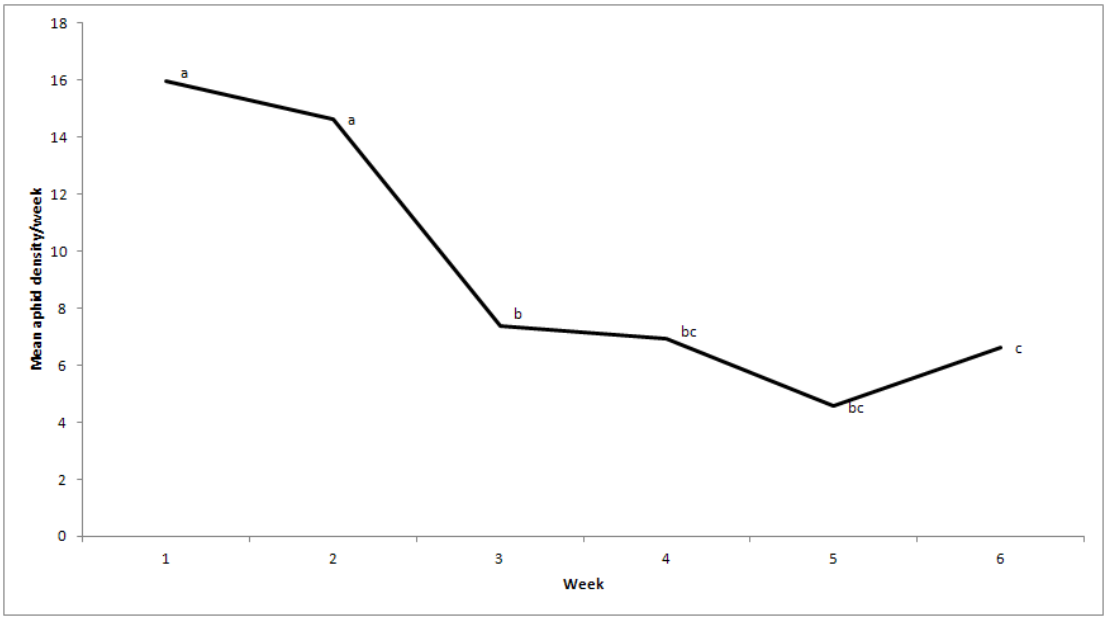
Figure 1: Mean number of aphids/treatment.

Table 1: Mean aphid count for repellency treatments and the treatments used. Means connected by the same letter are not statistically different according to Student's t test at $\alpha = 0.05$.

Treatment	Aphid Count Mean		Standard Error
Untreated Control	9.63	a	1.2
Joshua, 0.06% (v/v), 14d	10	a	0.99
Joshua, 0.06% (v/v), 7d	10.07	a	1.13
IRF161, 0.375% (v/v), 7d	8.33	a	0.98
ORSA076, 0.25% (v/v), 7d	8.7	a	1.21

There were no significant differences among the treatments used for repellency (Table 1). Aphid counts varied through the season but the products tested showed no differences in ability to repel aphids at any time during the season.

Figure 1: Mean aphid density/week. Letters represent Least Squares Mean separation by Student's t test at $\alpha = 0.05$. Population means followed by the same letter are not significantly different.

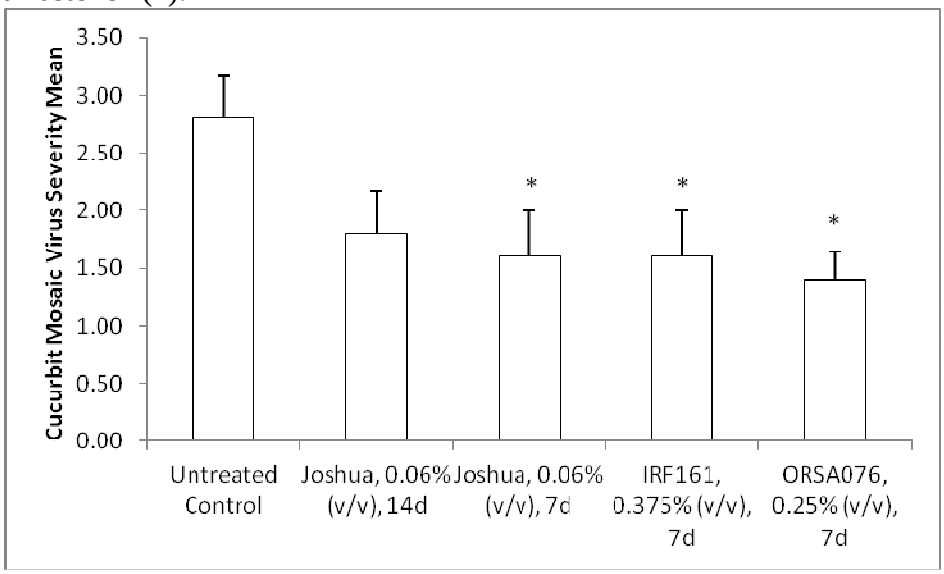


Aphid populations 30 days after planting were the highest of any point during the season (fig 1). At the end of the season aphid numbers were starting to increase slightly but were not significantly different over the previous 3 weeks. No attempts were made to identify aphid species

Virus incidence was relatively low in 2013. Incidence in the untreated control was 27 % (Fig 3). Severity was significantly reduced in the Joshua 7 day application, the IRF 161 7 day application and the ORSA 076, 7 day application. Severity in the Joshua Oil 14 day application was not significantly different than the control.

For the second straight year these treatments did reduce virus in late planted honeydew melons. Trials were again initiated late because that is when we see most virus infection. Treatments were started at a later growth stage to try to reduce cost of application. However, aphid counts were highest at that point and probably accounted for some of the virus severity observed later in the season. Had we started earlier we may have reduced disease even more. No virus symptoms were observed on fruit.

Figure 3: Average percent of leaves showing mosaic virus symptoms per treatment. Percent leaf infection was based on counting 100 leaves per 800 sq ft of row (20x4'). Treatments found to be significantly different from untreated control are designated with an asterisk (*).



III. SUMMARY OF 2013 Work

Each experimental unit was spatially separated by 20 feet of bare ground to avoid mixture of volatile-action products. Treatments included applications of three repellent/antifeedants (essential oils, plant extracts, amino acid extracts, and other classifications), and a nontreated control. Weekly assessments of alate (winged) aphid density were made using yellow sticky traps (one per experimental unit), starting after the first treatment application and continuing until harvest. Virus ratings were made near harvest time by assessing 100 leaves for virus symptoms. Fruit sizes showed no difference between treatme4nts. Most fruit were sized as 5's and 6's.No differences in soluble solids were noted. Aphid density measurements from the planting identified no products that reduced population levels in 2013. No phytotoxicity was observed throughout the trials.

CARRYOVER FUNDS-----NONE