Developing Sustainable Pest Control Practices Against Major Pests in Papaya in Hawaii

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Introduction

Papaya is an economically significant crop for the State of Hawaii. This crop is attacked by a complex of pests. White peach scale (*Pseudaulacaspis pentagona*), papaya mealybug (*Paracoccus marginatus*), papaya thrips (*Thrips parvispinus*) and mites are major pre-harvest pests that can significantly affect tree health, reduce yields and increase production costs for farmers.

The objectives of this study were to:

- Develop management strategies that target multiple pests in papaya (listed above)
- Seek treatments that have minimal environmental and non-target impacts

Methods

The study was done on Hawaii Island from October 2011 to June 2012, testing three treatments: farmer's standard practice; kaolin clay (Surround WP at 25 lb /50 gal), and horticultural oil (Pure Spray Green at 0.5 gal/50 gal). The oil and kaolin treatments were sprayed every 2-3 weeks.

The kaolin and oil treatments did not receive any other pesticide treatment during the duration of the study and they were sprayed 13 times each. The standard practice used 8 sprays: Applaud (3 times), Provado (1 time), Vendex (2 times) and Sulfur (2 times) at manufactures recommended rates.

Pest density was assessed in new leaves (for mites and thrips), flowers (for mites and thrips), old leaves (for mites and mealybugs), and tree trunks for white peach scale. The pest monitoring was done at monthly intervals during the first seven months and weekly intervals during the last two months (harvest period for the study). Yield data were collected once a week for a total of 9 weeks.

The average cost per application was $12 for the oil, $36.25 for kaolin clay and $26.88 for the standard treatment. Yield data and cost per treatment were used for an economic analyses. Pure Spray green and Surround are labeled for organic agriculture.

Results

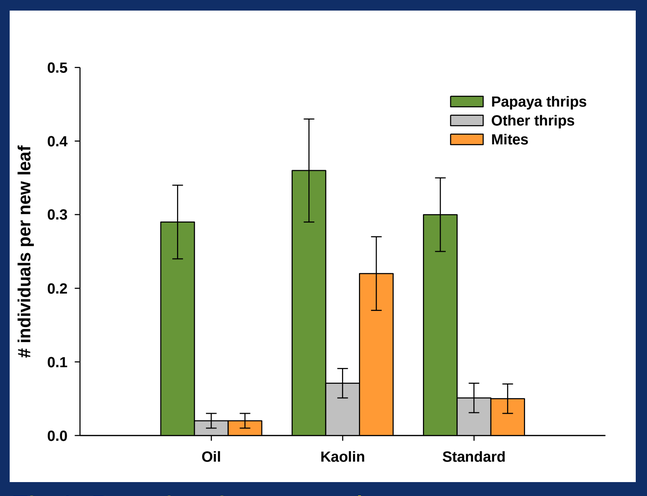

Fig 1. Pest density on new leaves

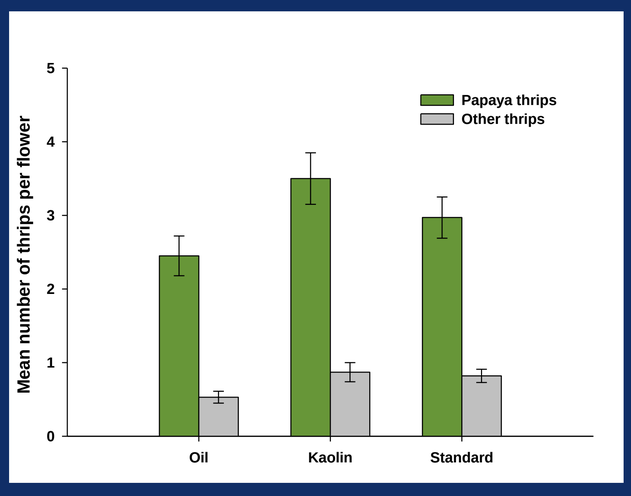

Fig 2. Pest density in flowers

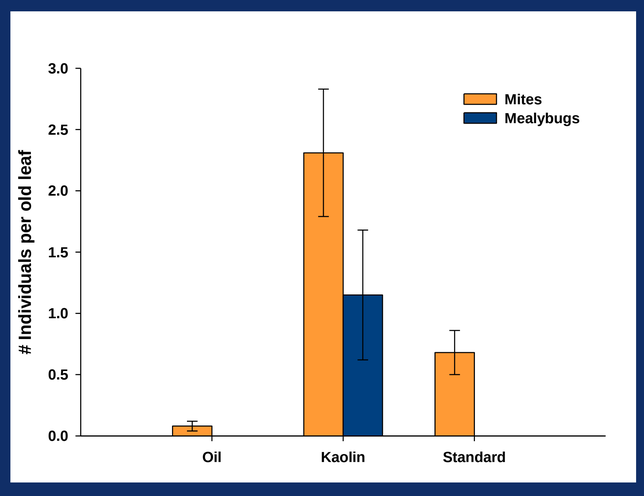

Fig 3. Pest density on old leaves

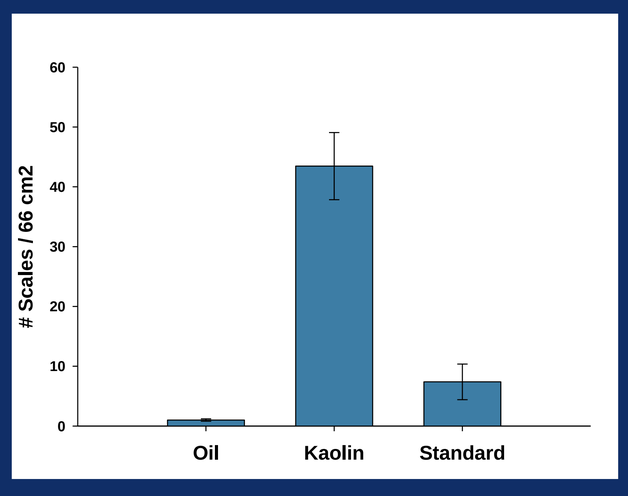

Fig 4. Density of scales on tree trunks

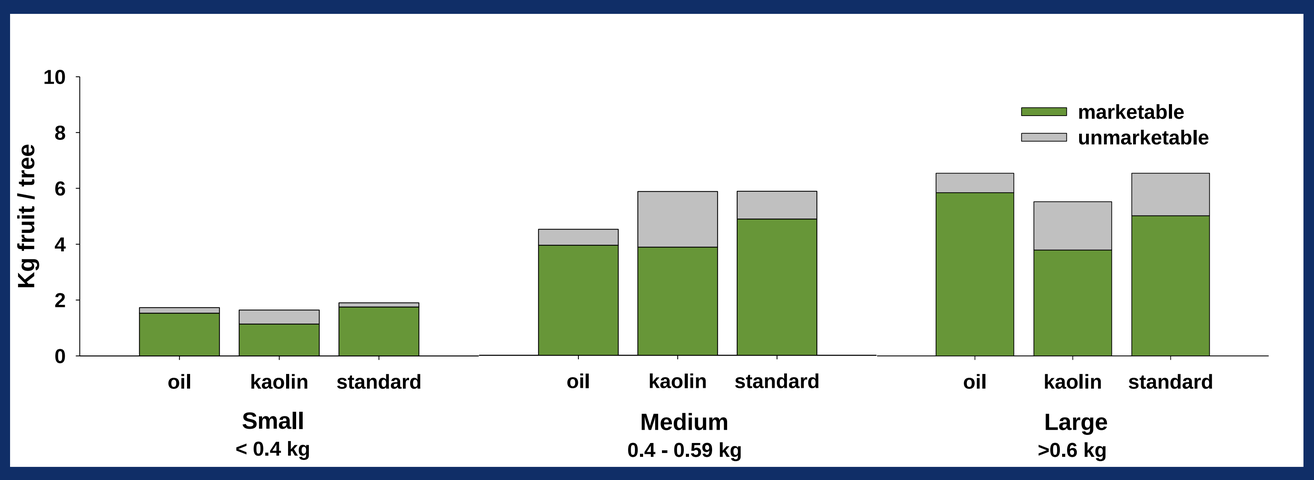

Fig 5. Marketable and unmarketable yield by fruit size

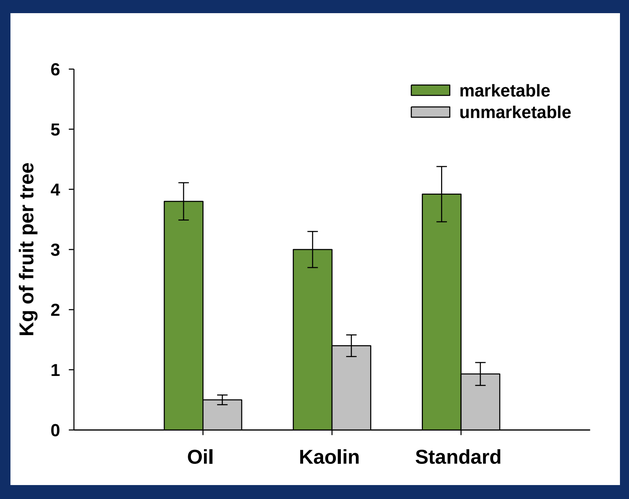

Fig 6. Total marketable and unmarketable yield

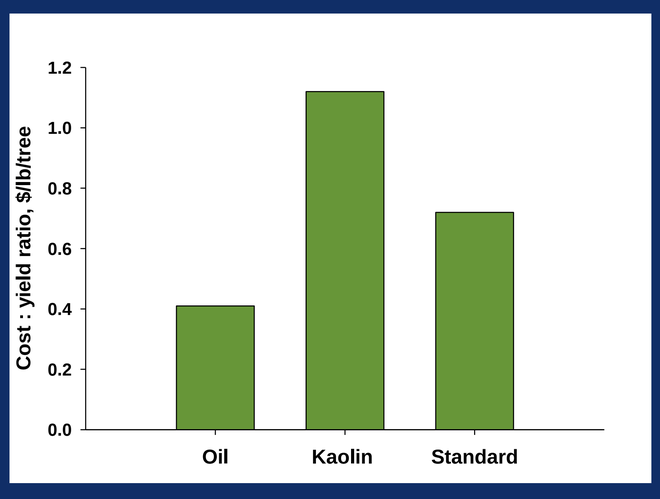

Fig 7. Cost to yield ratio per treatment

- All treatments had statistically similar levels of control of papaya thrips on new leaves (Fig. 1)
- The oil treatment had the lowest density of mites and other thrips in new leaves (Fig. 1), papaya thrips in flowers (Fig. 2), mites on old leaves (Fig. 3) and white peach scale on tree trunks (Fig. 4) compared to kaolin and standard treatments.
- The kaolin treatment had the highest density for all pests evaluated in this study (Fig. 1, 2, 3 & 4).
- All treatments had similar marketable yield for small fruit (Fig. 5)
- The standard treatment had the highest marketable yield for medium size fruit compared to the other treatments (Fig. 5)
- The oil treatment had the highest marketable yield and lowest unmarketable yield for large size fruit (Fig. 5)
- The oil and standard treatments had similar total marketable yield (Fig 6) and the oil treatment had the lowest total unmarketable yield (Fig. 6).
- The oil treatment was the most cost-effective treatment tested in the study (Fig 7).

Conclusions

- The oil treatment provided the best control against thrips, mites and white peach scale and mealybugs.
- The kaolin clay treatment did not provide good control against any of the pests evaluated in the study.
- Oil and standard practice treatments had similar total marketable yield.
- The oil treatment had the lowest unmarketable yield and the highest marketable yield for large fruit
- Horticultural oil provided the best (lowest) cost to yield ratio.
- Standard treatment required less applications, and had the highest yield, but the mean cost per application was ~$14 greater than the oil-only treatment.
- A regular IPM program may, however, include oil sprays and other pesticides, depending on pests present.

Acknowledgements

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