Developing Sustainable Pest Control Practices Against Major Pests in Papaya

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Objectives

- Develop management strategies that target multiple pests in papaya

- Seek treatments that have minimal environmental and non-target impacts

Pests targeted

- ***Thrips parvispinus*** - causes foliar and fruit injury as well as flower drop

- **Spider mites** – fruit scarring, leaf drop and loss of plant vigor.

- **Papaya mealybug** – chlorosis, leaf deformation, early fruit and leaf drop

- **White peach scale** – infests tree trunks and presence in fruit can lead to rejection of export shipments

Treatments

- Farmer's standard practice (Applaud, Vendex, Provado, Sulfur)
- Kaolin clay – Surround WP (50 lb/50 gal)
- Horticultural Oil – Pure Spray Green (1 %)
- Botanigard – *Beauveria bassiana*

Horticultural Oil

- Trade name: Pure Spray Green
- Labeled for organic production
- Low risk of phytotoxicity
- Miticide, insecticide and fungicide
- It biodegrades, leaving no harmful residues
- Safe to use throughout the entire growing season including harvest
- Kills mites and insects through suffocation

Kaolin clay

- Trade name: Surround WP
- Natural occurring clay
- Labeled for organic production
- Several modes of action: physical barrier, repellent, disrupts host finding behavior, and interfere with movement and feeding
- Environmentally safe

Data collection

- 2012 study : Big Island
- 2013 study : Big Island and Oahu
  - Pest monitoring done at monthly intervals for 7 months & weekly intervals at harvest period
  - Harvest period – 8 weeks

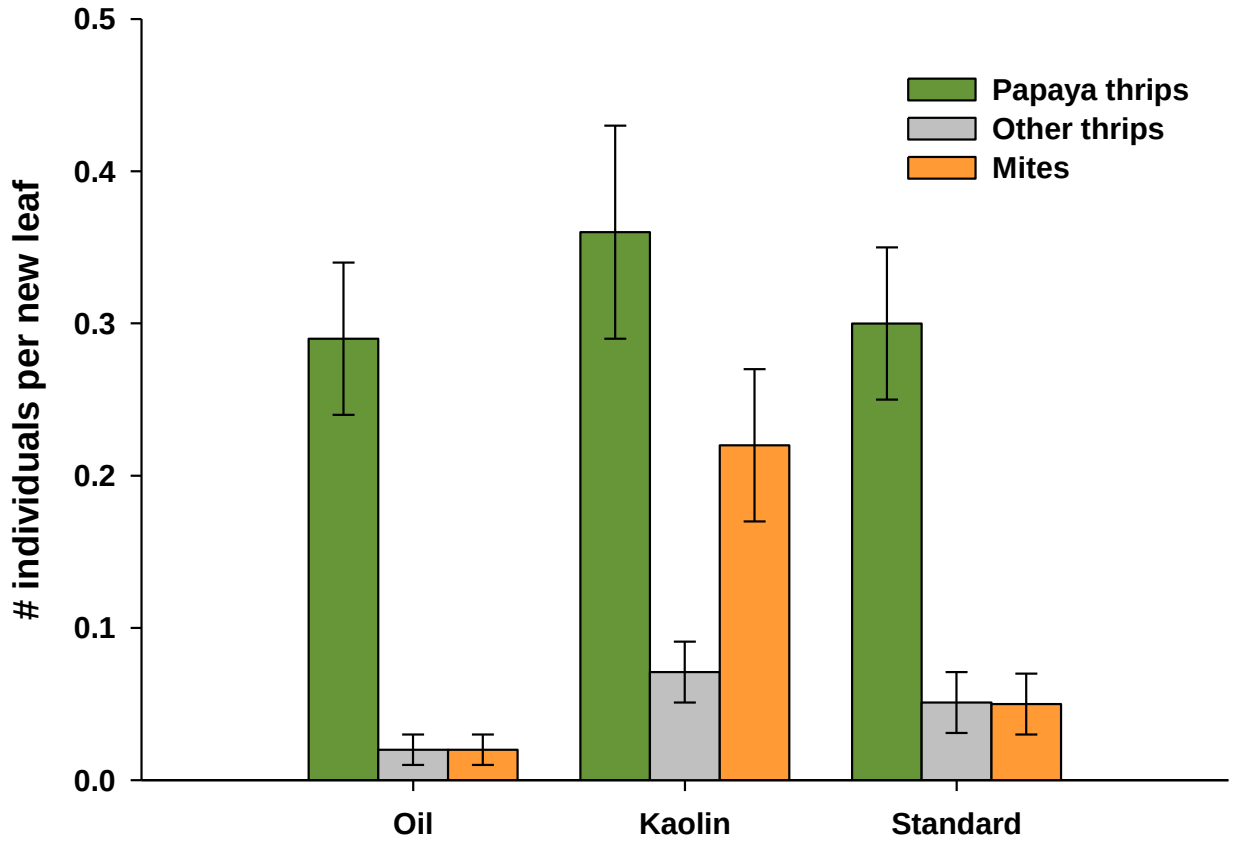
Harvest period

- Fruit classified by size and by insect damage:
  - Small: < 0.4 kg; medium: 0.4-0.59 kg; large: >0.6 kg
  - If > 10% surface scarred by thrips: thrips damage
  - If presence of scale: scale damage

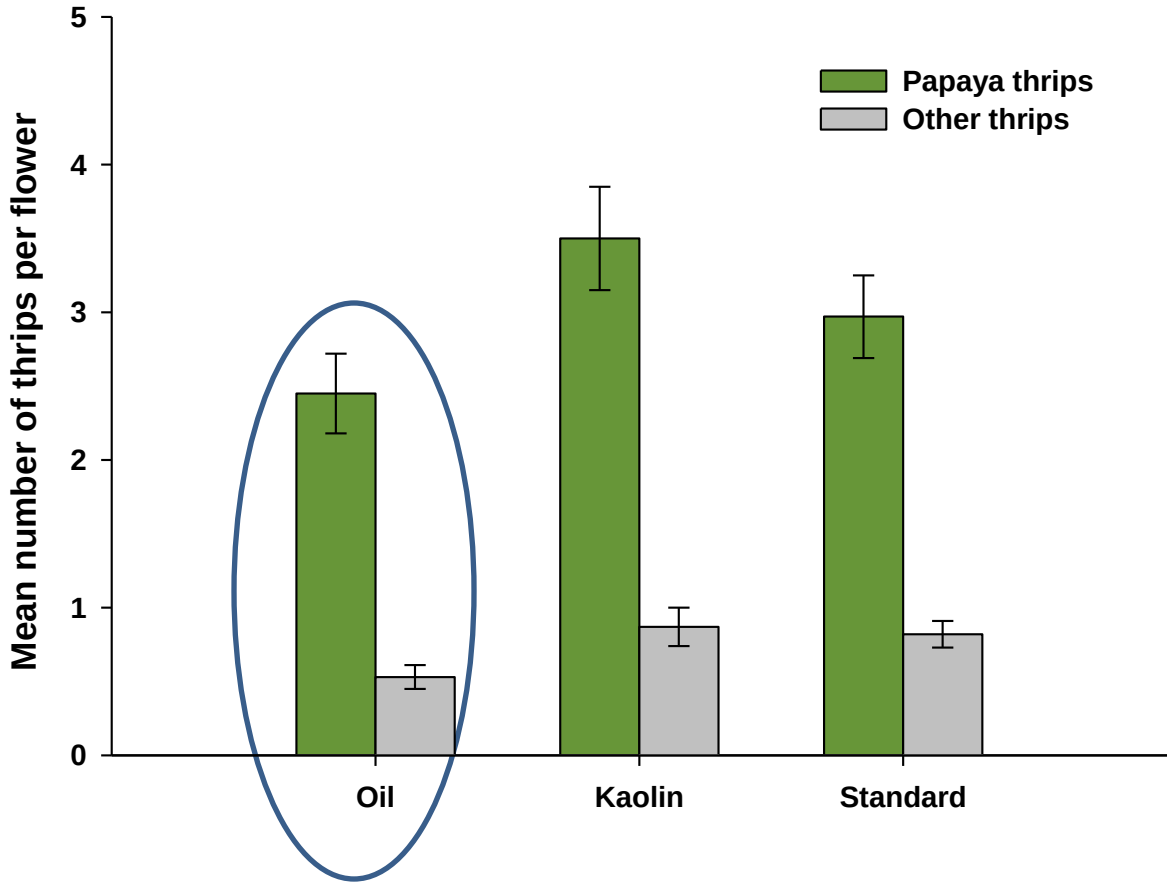
Sampling

- New leaves – Thrips & mites
- Flowers – Thrips & mites
- Old leaves – Mealybug & mites
- Tree trunk – White peach scale

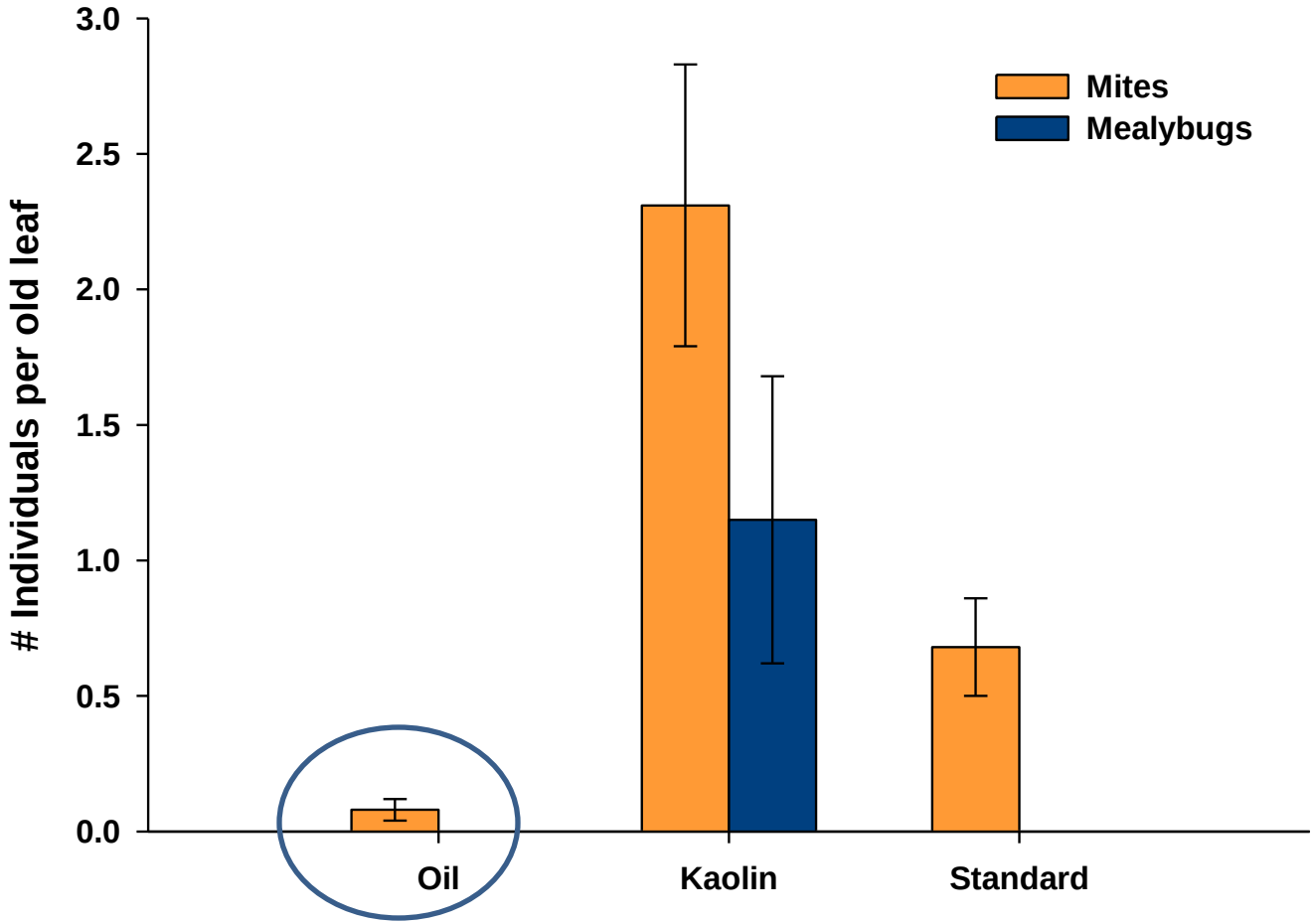
Pest density on new leaves - 2012



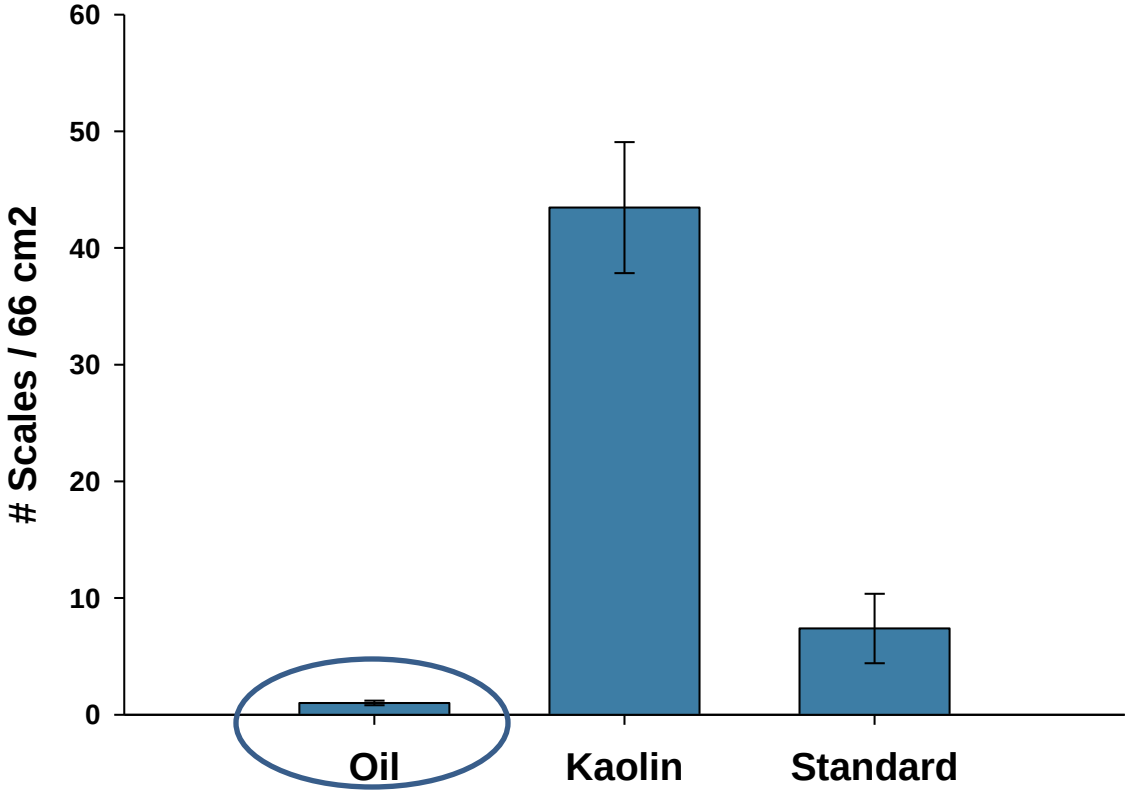
Pest density in flowers - 2012



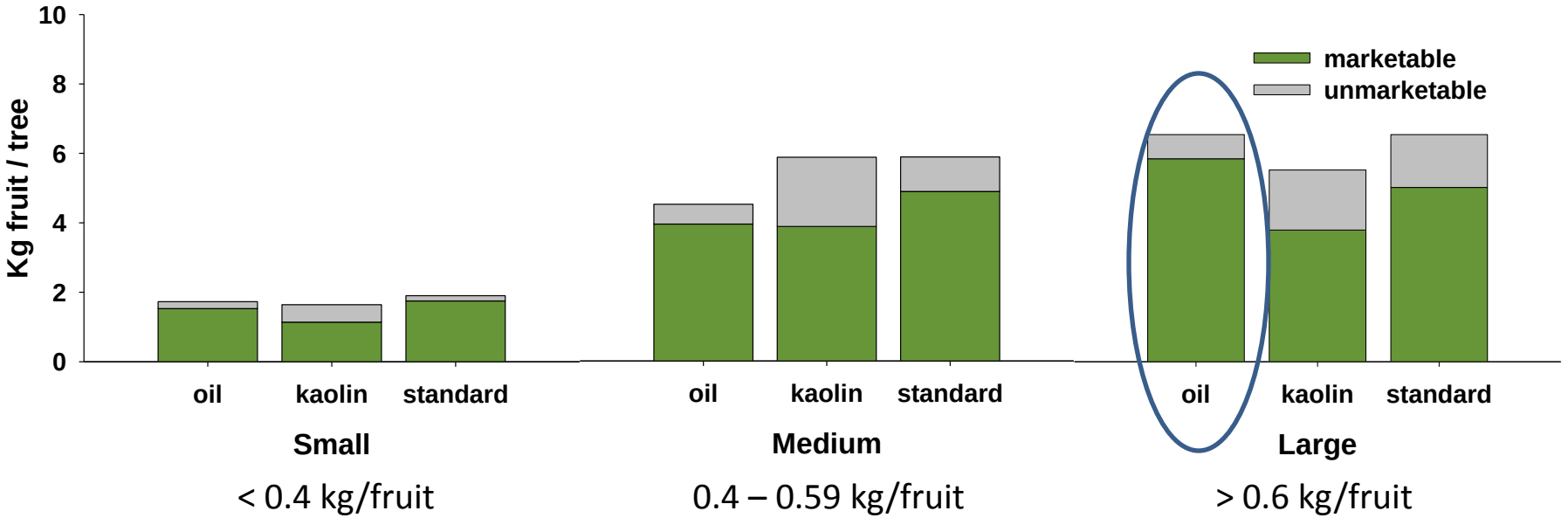
Pest density on old leaves - 2012



Pest density on tree trunks - 2012



Yield by fruit size -2012

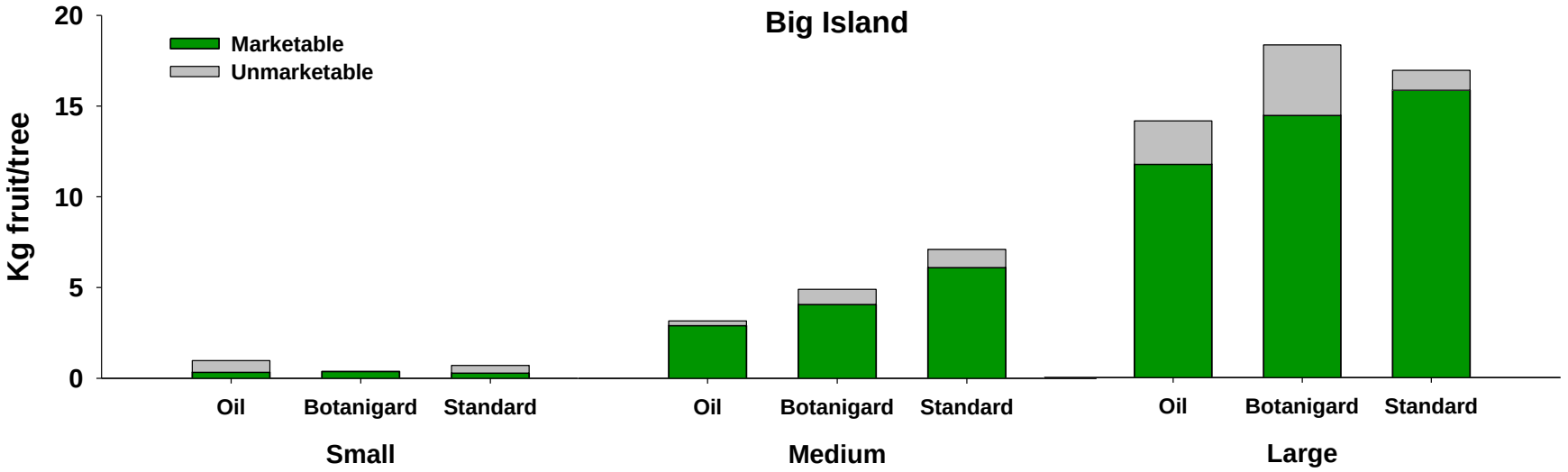


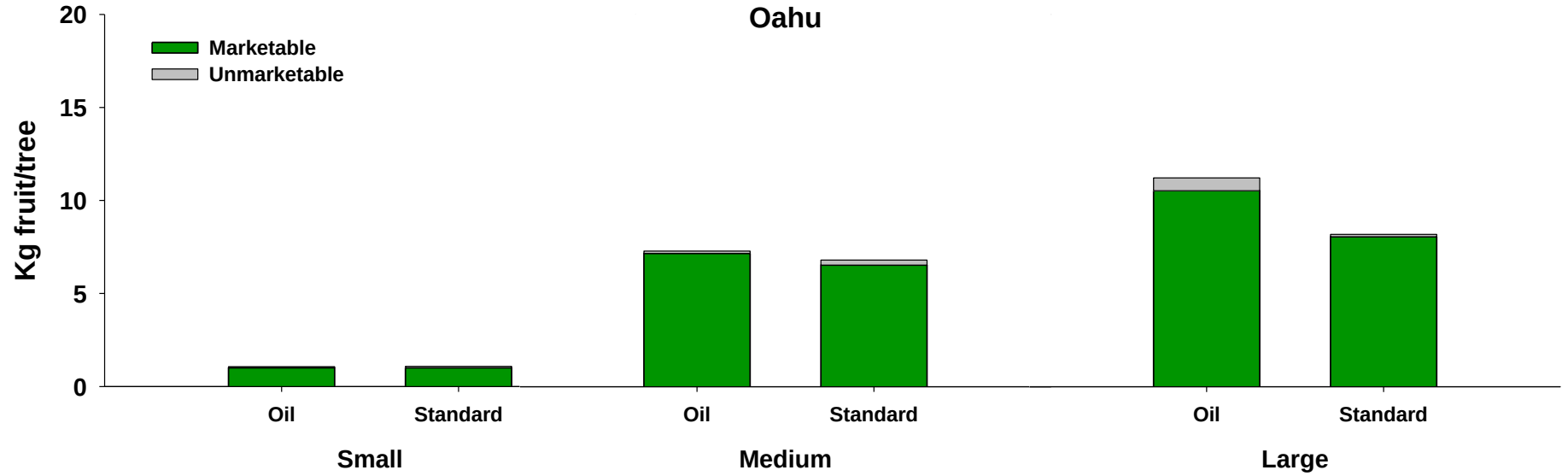
< 0.4 kg/fruit

0.4 – 0.59 kg/fruit

> 0.6 kg/fruit

Yield by fruit size - 2013





Economic analysis – standard treatments, kaolin barrier and horticultural oil - 2012 study

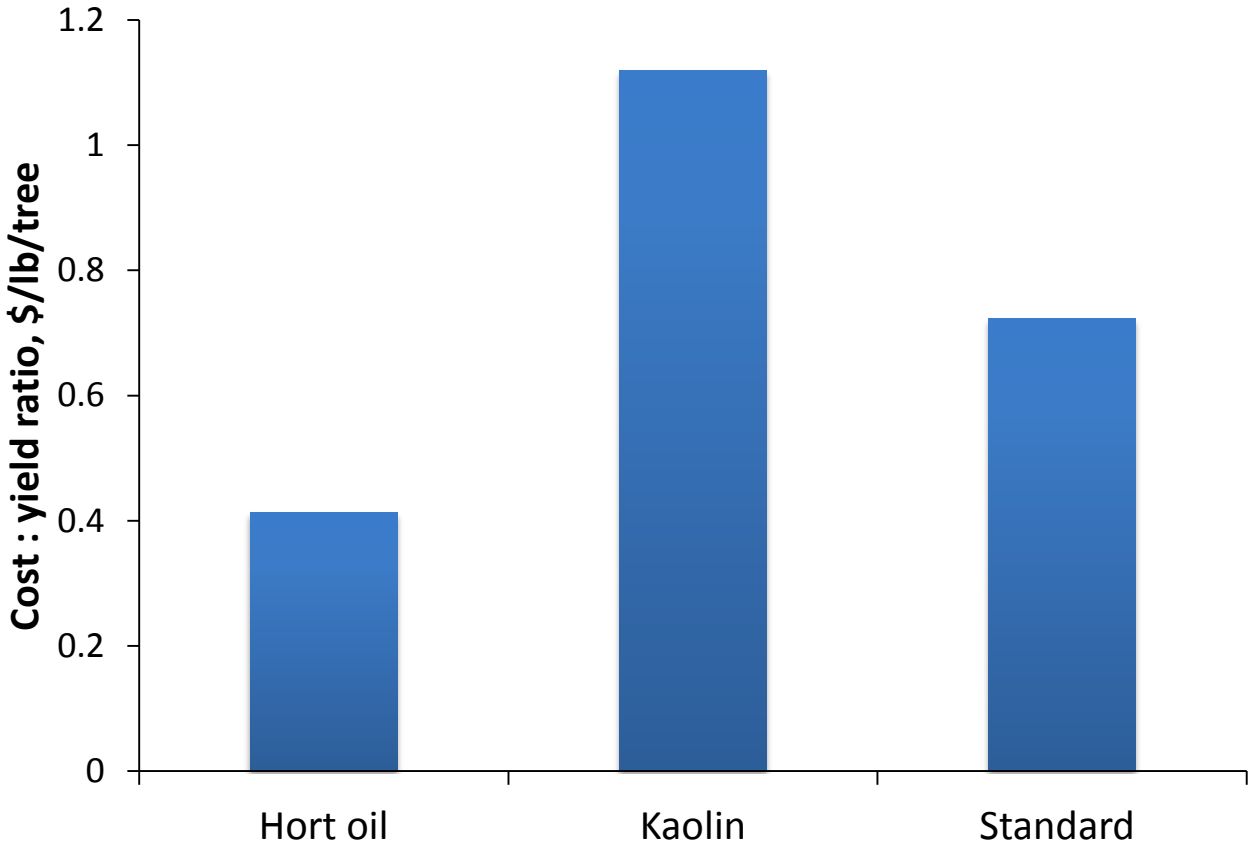
- Estimate total costs of each treatment regime;
- Mean cost per treatment, and number of applications;
- Calculate cost : yield ratio ($/lb)

Trade name	Active ingredient	Price
Applaud	Buprofezin	$39 per lb
Vendex	Hexakis	$30 per lb
Provado	Imidacloprid	$196 per gallon
Sulfur	S	$1.50 per lb
Kaolin	Kaolin	$1.45 per lb
Pure Spray	Hort oil	$24 per gallon

Pesticides applied, and costs

- Pure Spray: 13 applications, $12 per application.
- Kaolin: 13 applications, $36.25 per application.
- Standard: 8 applications (average $26.88 per application)
  Applaud x3
  Provado x1
  Sulfur x2
  Vendex x2

Treatment	Total cost, $	Mean yield, kg/tree	Mean yield, lb/tree	C:Y ($/lb) /tree
Hort oil	156	3.80	8.38	0.41
Kaolin	435	3.00	6.61	1.12
Standard	215	3.92	8.64	0.72



Conclusions

- Oil provided the best control against thrips, mites and white peach scale in 2012 study
- Mixed results in 2013. Big island oil treatment had the lowest yield (high scale infestation). Oahu oil treatment was superior than standard practice.
- Timing of preventive treatment – key to prevent pest build up. Plants in 2013 study on Big Island older than plants in 2012 study.

Conclusions

- Horticultural oil provided the best (lowest) cost to yield ratio in 2012 study.

- A regular IPM program may, however, include oil sprays and other pesticides, depending on pests present.

Acknowledgments

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