

“Organic Apple Production – The Pennsylvania Experience”

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The Pennsylvania tree fruit industry is at a point of transition. Apple production practices utilized over the last 40 years are being replaced by new organic and sustainable approaches to growing fruit. Cultural and pest management methods are being developed that are profitable for growers while being environmentally sound and focused on meeting consumers' expectations for food safety and quality. In 2004, an organic apple demonstration orchard was established at PSU Fruit Research Center to provide researchers and growers with the opportunity to observe best organic practices for local organic apple production (Fig. 1). The first certified organic fruit was produced and sold in 2006. The organic apple project was named (PROFIT) PA Regional Organic Fruit Industry Transition. "GoldRush" and "Enterprise" apples were planted in a 2 acre research and demonstration orchard. These two apple cultivars "Enterprise" and "GoldRush", were selected for the demonstration block for their resistance to diseases and for their potential as processing or fresh market varieties.

A spray program consisting of NOP / OMRI / PCO (National Organic Program / Organic Material Review Institute / Pennsylvania Certified Organic) approved organic pesticides and herbicides were utilized. In 2007 growing season, Copper, Sulfur, Lime Sulfur and JMS Stylet oil were applied early in the season to protect the trees from diseases. There was no major occurrence of diseases except powdery mildew and cedar apple rust. Neem (Azadiract), B. t. (Dipel), CYD-X, Pyganic and Kaolin clay (Surround) were applied to control insects (Fig. 2). Rosy and green aphids and Japanese beetle were prevalent during the early and middle crop seasons, respectively. Organic insect management observations made as a result of this project include;

1. The secondary insect pests need to be monitored but in most cases no pesticide treatment was necessary;
2. New pests, not observed so far in the orchard, might pose the biggest challenge, although new tools are also available;
3. Controlling insect pest in organic orchard require a change in mind set about various treatment thresholds;
4. Monitoring is the most important, single element necessary to successfully manage possible insect pests.

Weed management alternatives were evaluated and demonstrated in the orchard including; hand hoeing, weed mowing and "mechanical hoeing", i.e., Weed BadgerTM and propane weed burner. The use of organic herbicides containing vinegar/acetic acid was evaluated but not effective.

Disease management studies have focused on the efficacy of sulfur and lime sulfur applied alone, in combination or in rotation with other organic or alternative fungicides to evaluate for effectiveness on apples (Table 1). Six of the treatment programs (Trts. 3-5, 7-9) reduced the incidence of scab on shoots and fruit compared to the untreated trees (Fig. 2, 3). Citrex (not yet labeled for organic - Trt. 2) and EF 400 (Trt. 6) did not control scab. Scab on shoots and fruit were significantly reduced when Citrex was tank mixed with Micro Sulf at a low rate (Trt. 3), or when EF 400 was rotated with Micro Sulf at a recommended rate (Trt. 7). Sulfur applied alone, Sulfur combined with Citrex, and Lime Sulfur plus Vigor Cal programs provided comparable control on scab incidence on shoots and scab incidence and severity on fruits. Slight

phytotoxicity due to Sulfur applied to young trees at high temperatures was observed but was reduced when Sulfur was tank mixed or rotated with Citrex or Vigor Cal. All treatment programs with sulfur and lime sulfur reduced the incidence of scab on shoots and fruit as well as powdery mildew and cedar apple rust compared to the untreated trees. This project demonstrated that high quality organic apples can be grown in the eastern United States with existing and alternative fungicides currently approved for certified organic fruit.

Studies conducted at the PSU Fruit Research and Extension Center on organically-acceptable fruit thinners in crop season 2006 included the following treatments:

1. Hand thinned control;
2. JMS Stylet oil plus Lime Sulfur (LS) followed by hand thinning;
3. Crocker's Fish oil plus Lime Sulfur, followed by hand thinning.

Oils were applied at 2% and Lime Sulfur at 2.5% by spray truck at 100 GPA. These treatments were applied twice, at petal fall and PF+ 5 days to 7 tree plots. Treatments were applied to plots in both the Surround- and non-Surround-treated plots, with 4 replications in both. Set and yield data collected from the center 3 trees of each plot, while the time required for hand thinning was collected from all 7 trees in the treatment plot. The weather was cool at the time of treatment, which makes chemical thinning more difficult. Nevertheless, Stylet oil and LS thinned trees reduced the time required to hand thin trees. The effects of Fish oil/ LS were milder in 2006 than in previous studies; however both thinners increased production of large fruit by 8%. There were no treatment trends for pack-out or fruit finish. The primary causes of grade-out were, in order of importance:

1. Sunburn
2. Cracking
3. Cedar Apple Rust

The presence of Surround on half the thinning treatment plots made no difference in the tree response to the treatments.

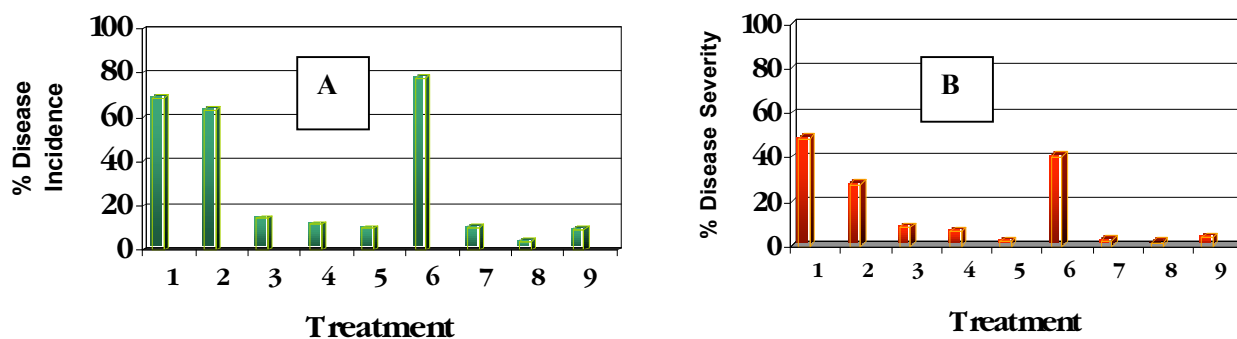


Fig. 1 Penn State Fruit Research & Extension Center Organic Apple Demonstration Orchard.

Table 1. 2006 Organic Fungicide Program.

<u>Treatment & Rate/A</u>	<u>Timing</u>
1. Nontreated CK	
2. Citrex 8 oz	P-H
3. Citrex 8 oz + Micro Sulf 15 lb	P-H
4. Micro Sulf 15 lb	
5. Micro Sulf 15 lb Lime Sulfur 2% + JMS Oil 2%	P-B
6. MicroSulf 15 lb	PF
7. EF-400 OM 32 oz	1C-H
8. EF-400 OM 32 oz Rot. w/ Micro Sulf 15 lb	P-H
9. Lime Sulfur 1.5% + Lime Sulfur 2.0 % + JMS Oil 2%	P-B
10. Lime Sulfur 1.0% 14 da	PF
11. Micro Sulf 15 lb + Vigor Cal 1 gal	1C-H
	P-H

Fig. 2. Scab incidence on leaves (A) and severity (B) on fruits on ‘Golden Delicious’ apple.



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