

Potential Opportunities and Challenges of Organic Apple Production

The Organic Growers of Maine and Renae Moran

Apple production using conventional methods is a complicated and not always profitable venture. To do it organically in New England only adds to the challenge, so only a few growers have attempted it. Maine has a small organic industry of a few farms attempting to grow fresh-market quality apples.



Production in Maine

2002

Acres: 134

Farms: 6

2007

Acres: 182

Farms: 7

Production is over 100 acres or about 9% of the total acreage in apples. The increase in production is mostly due to one large farm converting more of its acreage from conventional to organic. All other organic orchards are less than ten acres in size.

Five years ago, there were six organic apple farms, and now there are seven. There has been almost no change in the number of farms because as new ones were transitioned, others were abandoned or switched back to conventional production. Lack of workable solutions has been the main reason why people quit organic production.

In my estimation, three or four of the seven orchards produce varying but generally low yields of dessert quality apples. The others produce primarily processing apples.

Organic apples are marketed in the usual way, as PYO, at farmstands, or in local supermarkets, but also in their traditional home, the natural food stores.



Locally grown organic apples are available in some of Maine's supermarkets.

Orchard Establishment

Transitioned Existing Orchards: 182 acres

- Dwarf and semidwarf varieties
- wholesale and retail

Planted as organic: 1.5 acres

- Dwarf trees of scab resistant varieties
- retail

Current Obstacles

Expected Problems

Lack of Insect
Control

Biennial Bearing

Lower Yield

Higher Costs

Unexpected Problems

Insects and Disease

Poor Fruit Set

Poor Tree Growth

Winter Injury

Pitting, or dark green sunken areas on the surface of the apple, is caused by stink bug.



Organic growers face many of the same problems as conventional growers, but have fewer effective tools for dealing with them. Lack of insect control has been one of the biggest problems leading to lower yield and in some orchards to catastrophic losses caused by plum curculio and European apple sawfly. It is also expected that organic production costs more than conventional. High cost of production combined with lower yield can make it difficult to make money in a market that is easily saturated. Biennial bearing is a problem with some varieties, and appears to be more severe in organic orchards, but less so with McIntosh. One of its few advantages is its annual bearing habit.

There were unexpected problems in every orchard that have added to losses.

Pests and diseases that did not normally occur with more effective chemicals occur frequently in organic orchards. Brooks spot, stink bug and apple maggot are some that have been severe in some years and nonexistent in others. Because of their sporadic nature, they take us by surprise since we don't usually look for them.

One of the worst problems that was not expected has been consistently poor tree growth, poor fruit set and small fruit size. Trees in organic orchards have gradually declined in vigor, severe enough to decrease production. It is currently thought to be caused by frequent use of sulfur for scab control.

Problems that plague conventional orchards have also occurred in organic ones. Winter injury and hail are just as likely to occur in organic orchards.

Recent Advances

Two new products have been developed that can be used for organic insect control - Surround™ and Entrust™. When used with other insecticides, growers now have choices, and devastating losses occur less often.

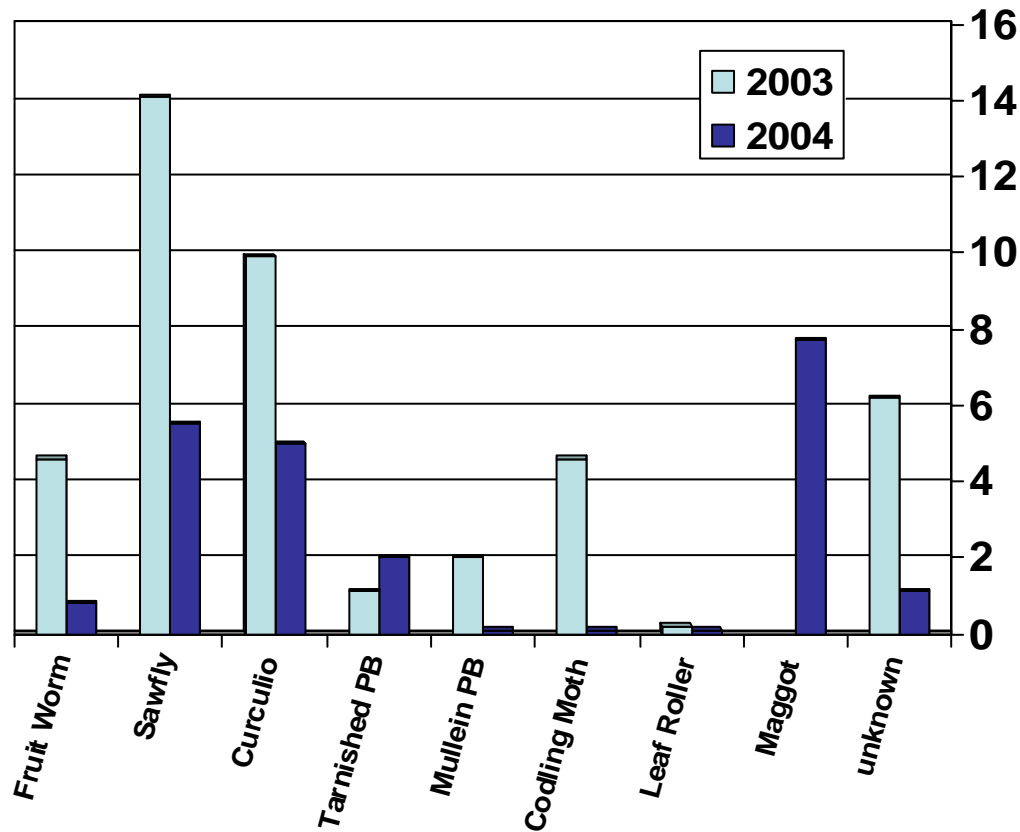
Improvements in chemical bloom thinning can enhance cropping consistency from year to year and reduce reliance on hand thinning.

McIntosh and Cortland are still the predominant varieties in New England, but change in consumer preference is an opportunity to grow new varieties with better scab resistance. However, choice of variety should not be based solely on resistance since no variety is resistant to all diseases. The ability to profitably market a variety should still be the number one reason for selecting it.

SnowSweet™



Insect Damage (%)



This graph shows the level of damage or relative number of fruit attacked by each listed insect in the two largest orchards in 2003 and 2004, starting with fruit worm in spring and ending with apple maggot near harvest. There is no data for maggot in 2003. Insect damage that I could not identify is listed as unknown.

The number of fruit attacked by insects was much higher than in conventional orchards, but less than in unsprayed orchards.

European apple sawfly and plum curculio caused severe damage in 2003 and 2004. There was a large amount of apple maggot damage in 2004, but most occurred in one block which has skewed the average.

From these observations it would appear that plum curculio and sawfly can consistently be a problem. Damage by other insects is more sporadic, but can be just as devastating.

There was a high degree of variability from year to year, between different farms and between different blocks on the same farm.

Insect Control Methods

Surround™

Spinosad

Pyrethrin™

Bt

Apple Maggot Traps

Mating Disruption

Neem-Based Products

The number of spray materials for insect control has increased in the last several years. Most of these methods have been used at some time in organic orchards.

Where company or brand names are used, it is for the reader's information. No endorsement is implied nor is any discrimination intended. Always consult product labels for rates, application instructions and safety precautions. Users of these products assume all associated risks.

Surround™ was developed in the 1990's and has been used in Maine for the last six or seven years. Surround leaves a white clay residue on fruit and foliage that repels insects.



Surround™ is one of the few options for plum curculio and sawfly control, so growers begin to apply it by petal fall and several more times after that.

Growers complain about its high cost, the difficulty in maintaining enough coverage in our wet climate, and the residue left on the apples at harvest.

More recently, there has been concern that it leads to spider mite flare-ups through its effect on beneficials. Even though it is a nontoxic material, some growers feel that this effect on beneficials is like taking a step backwards in pest management.



Spinosad (Entrust™)

Spinosad or Entrust™ is a relatively new material for insect control. It is produced by a microorganism and acts on insects through ingestion and direct contact. It controls many pests including codling moth, leaf rollers and apple maggot, so it is generally used later in the season at a time when growers wish to avoid applying Surround™. Because of the chance for resistance, the label restricts the number of applications per season.



Pyrethrin (Pyganic™)

Pyrethrin is a plant derived insecticide effective against many pests including beneficials.

It is a traditional type of insecticide, acting quickly against insects.

Its effectiveness is limited by its rapid degradation in light. Because of this, timing of application is very important, and repeat applications may be needed for a high degree of insect control.

Bt, *Bacillus thuringiensis* endotoxin, is effective for control of only a few pests, namely Lepidopteran larvae. Some Lepidopteran pests in New England are codling moth, oriental fruit moth and leaf rollers.

Bt has to be ingested in order to kill larva, so its action takes more time than traditional insecticides. Because of their feeding habits, codling moth may not be controlled by Bt. They are less likely to ingest it.

Rapid degradation in the environment limits its effectiveness making repeat applications necessary for a high degree of control.

Bt lacks toxicity for most other nontarget insects and wildlife, so it follows IPM principles as well as organic.

Bt



Codling moth larvae feeding on an apple.
Photo by Doug Wilson, Agricultural
Research Service, USDA.

Apple Maggot Trapping

The late Ron Prokopy developed the technique of using apple maggot traps, red spheres covered with sticky goo, to trap adult apple maggots. A large number placed in the orchard can be used to prevent maggot damage.

The large amount of damage in 2004 prompted one or two growers to use this method. Because of the labor needed in hanging and maintaining traps, and availability of cheaper materials, I am unsure if this practice still continues.

Traps are still useful for scouting in both conventional and organic orchards, and this does not require as many traps.



Mating Disruption

Mating disruption is not a general practice in Maine's orchards. To be effective, the land needs to be flat, but most orchards are located on hilly terrain. The surrounding area must also be free of unsprayed apple trees. Abandoned orchards and wild apple trees allow codling moth to mate outside the orchard, and then move into the orchard to lay eggs in apples. Unsprayed apple trees near the orchard defeat mating disruption.

Neem (Azadirachtin)

Neem extract or azadirachtin is considered ineffective against most apple pests, so it is not used in commercial production. Expensive products have to be effective if growers are going to use them.

Apple Scab

The major disease is apple scab. Few orchards grow varieties with complete resistance because of the greater demand for more well-known ones. Other varieties with greater resistance than McIntosh, such as Honeycrisp, Empire and now Snowsweet™, could make scab control easier.

Snowsweet™, the newest release from the University of Minnesota, is supposed to have better scab resistance than McIntosh. Initial evaluation of fruit quality has been good, but it is too early in the evaluation to know of its major flaws.

Some growers mow leaf litter in fall to reduce overwintering inoculum. This practice is done in some of the smaller orchards. Large-scale growers have not adopted this method.



Sulfur Fungicides

Sulfur and lime sulfur have worked well for scab control in most years. There have been instances where scab control was better in organic than in neighboring conventional orchards.

Organic growers are beginning to see sulfur fungicides as being detrimental to apple tree productivity. Previous research has documented that it inhibits photosynthesis of apple leaves on a long-term basis. This may be the reason for stunted growth, poor fruit set, small fruit size and a pale appearance of the foliage. Continued production of McIntosh and other highly susceptible varieties may be limited by the need for sulfur as a fungicide unless a nonphytotoxic alternative can be found.



Other Diseases

Sulfur does not control all diseases so organic orchards experience more severe outbreaks of common and uncommon diseases. Flyspeck, sooty blotch, summer fruit rots and Brooks spot are some diseases that sulfur controls poorly or not at all. Organic alternatives to sulfur fungicides have not yet been developed that can control some of these diseases.

Sulfur is not highly effective against flyspeck and sooty blotch. However, these diseases have not been severe in organic orchards.

Summer fruit rots are not a major problem in Maine because the climate is less favorable for their development. Organic control of summer rots is an ongoing area of research. The current recommendation for where it is a serious problem is to alternate summer fungicides between lime sulfur and low rates of copper. This increases the chance of fruit scarring, so it should be done with caution.

Brooks Spot is very sporadic in occurrence. It is not clear why it occurs in some orchards and not others, so it remains an unsolved problem.



Tree Nutrition

Managed organic orchards have similar nutritional problems as conventional orchards. Common problems in Maine are low Ca, Mg, B, Zn and Mn. There has not been a big problem in maintaining adequate nitrogen. In some cases the opposite has occurred in which trees have too much nitrogen. Low calcium seems to be a common problem made worse by insufficient weed control. However, long-term storage of organic apples is not occurring in Maine, so low calcium is not currently a big issue. At the moment, nutrition is not the most limiting factor in organic orchards.

Boron deficiency causes internal corking in fruit flesh. Calcium deficiency in fruit is associated with bitter pit.



In my opinion, weed control is underemphasized. The current practice is to allow weed growth, but to keep it mowed. Other methods such as flaming, mulching and shallow tillage have not caught on, indicating that they have not yet been demonstrated to be workable or cost effective methods.

Long term lack of weed control is detrimental to plant growth. It stunts trees, reduces fruit size and interferes with good nutrition.

Weed Control



Fruit Thinning

Crop load management is just as important in organic orchards as in conventional. Without thinning, biennial bearing occurs, and fruit size will be small.

Hand thinning, because it occurs too late, is not effective in promoting return bloom, but will benefit fruit size. It is expensive so growers avoid it as a method of crop load reduction.

Chemical thinning is possible using lime sulfur with some type of oil, but can be unpredictable. As with other chemical thinners, oil and lime sulfur will thin enough in some years, not at all or too much in others.

Organic thinning is an active area of research. In the future, we may have more materials for chemical thinning, as well as a better understanding of rates and timing for better predictability.



The Future Organic Apple Growing

A photograph of an apple orchard. The trees are in full bloom, with light pink and white blossoms covering the branches. The orchard is planted in neat rows, and the ground is covered in green grass. The sky is a clear, pale blue. The overall scene is bright and vibrant, suggesting a healthy and productive orchard.

In my opinion, the industry still grows for a niche market. To grow beyond this will require the development of techniques that increase yield and are adapted to large-scale farming. If research can solve some of the worst problems, organic apple production in New England could become more mainstream.