



## Examining the potential for organic apple production—the Homestead Orchard Project

**Abstract:** *Organic orchard management is not new, however, Midwest apple growers lack information and models on how to make their operations work well. This project tests various organic orchard management tools at an orchard operated by people with developmental disabilities.*

### Background

The Homestead is a private, non-profit, agricultural-based living and learning community for Iowans with autism. Located just east of Des Moines, it provides education, training, and consultation for people coping with this disability. The Homestead staff uses gardening and other horticultural activities as a way to reach and help clients. The type of labor required to train, prune, maintain, and harvest organic apples could be accomplished by residents of The Homestead. The work experience at the Orchard was expected to provide residents with meaningful employment, vocational skill development, education, and a sense of accomplishment.

The concept of an organic apple orchard appeared to be a good way to mesh the needs of Iowa State University faculty and staff and the residents of The Homestead community. Even though the demand for organic produce is increasing, few growers are willing to produce apples organically due to the amount of hand labor required and the limited amount of information available on production strategies. The ISU horticulture department did not have the time or resources to examine some of these strategies.

Objectives for the project were to:

1. Develop a model for a sustainable production system that preserves Iowa's natural resource base, conserves water resources, and diversifies Iowa's agricultural production;

2. Serve as an exemplary model of a commercial organic apple production system for residential facilities for people with developmental disabilities and other special needs;
3. Offer student learning and internship opportunities in horticulture and special education;
4. Provide a site for public education and demonstration in sustainable agriculture; and
5. Encourage cooperation between the business and academic segments of our communities.

### Approach and methods

Work on the one-acre orchard was begun in the spring of 1998. The Homestead residents and staff planted 360 dwarf apple trees, 120 of each of three disease-resistant varieties: 'Redfree,' 'Jonafree,' and 'Liberty.' The young trees were trained to a three-wire trellis system so that the crop would be supported and the fruit could be harvested without the need for ladders. Early deer grazing in the orchard caused minor damage but signaled the possibility of potential problems later. To avoid significant damage or loss of trees, an eight-foot fence was installed around the entire orchard. A drip irrigation system was added in 1999. The orchard produced its first crop in summer 2000.

Various methods and materials were used for insect and disease control. Six treatments were

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**Budget:**  
\$8,100 for year one  
\$5,950 for year two  
\$8,045 for year three

**Question:** *Can an organic orchard succeed?* **Answer:** *Yes, it provided valuable employment opportunities for people with autism and met local demand for organic produce. There were many new connections made with community members.*

assigned randomly throughout the orchard; Kaolin particle film, Kaolin particle film plus sticky red spheres, fugi bags, fugi bags plus red spheres, sticky red spheres, and a control.

Kaolin particle film, sold under the name Surround™, was applied to some apples. It consists of 95 percent kaolin clay suspended in water for application by a sprayer. When it evaporates, it leaves a protective powdery film on the surface of leaves, stem, and fruit. The tiny particles of clay repel insects and make insect feeding and egg laying difficult.

Sticky red spheres were placed in the orchard to attract apple maggot flies. Three codling moth pheromone traps were placed in the orchard to serve as a mating disruption and help reduce codling moth populations. Pheromones are chemicals produced by insects as a means of communication. By releasing pheromones in the orchard, growers can confuse and disrupt mating cycles of the moths.

Fugi bags are double bags that were placed manually over the some of the young developing fruit to prevent insects and diseases from reaching the fruit. The outside fugi bags were removed one month before harvest to allow light to reach the fruit for color development and the inside bag was removed two weeks before harvest. Fugi bags were very effective, but also are extremely labor intensive.

## Results and discussion

Untreated 'Redfree' apples and untreated 'Jonafree' apples harbored significantly greater numbers of insect pests compared with the apples treated with Surround™ and Surround™ plus apple maggot ball treatments. There were no diseases observed on any of the 'Redfree' apple in any of the treatments, perhaps because the very early harvest date for 'Redfree'. Flyspeck and sooty blotch were observed on

'Jonafree' apples. All three varieties—'Jonafree,' 'Redfree,' and 'Liberty'—experienced foliar diseases such as cedar apple rust and fire blight. The diseases appeared on all cultivars at similar levels.

'Liberty' apples and leaves exhibited no significant differences among treatments for insect pest occurrence. The 'Liberty' apples treated with Surround™ and Surround™ plus apple maggot ball treatments had a significantly lower disease rating than the control treatment.

At harvest, there was no significant difference in yield among all of the treatments in the 'Redfree' cultivar. The highest yielding treatment in the 'Jonafree' cultivar came from trees treated with Surround™, although the variations among treatments were not significant. Weather conditions made collection of data on the 'Liberty' variety harvest problematic.

## Conclusions

This study showed that Surround™ and fugi bags were effective in protecting against codling moth damage in the 'Redfree' and 'Jonafree' cultivars. Trees with fugi bags and Surround™ plus apple maggot ball treatments had significantly fewer apples than other treatments, but a higher percentage of marketable fruit. The value of the Surround™ treatment may not have been fully revealed in 'Redfree' because of the late starting date of the applications and the early harvest date of the cultivar. Overall quality was greatest in the 'Jonafree' cultivator where the fugi bags or Surround™ were used. One reason could be the maturity dates of these cultivars. Since 'Redfree' is an earlier maturing cultivar, it is exposed to fewer insects and diseases and therefore might experience less damage from insects and diseases.

This study showed that insect pests such as plum curculio, apple maggot, and codling moth

may be effectively controlled by using various combinations of pest management strategies and cultivar selection. The treatments did not affect total yields of the cultivars, however, there was significant evidence that insect damage was reduced on the fruit resulting in less need to cull fruit and a larger crop of marketable fruit. Growers need to consider efficiency and cost of labor when selecting control measures. Although fugi bags effectively controlled the pests studied, the cost of labor to apply and remove the bags may discourage their use.

### **Impact of results**

The study provides a foundation of information for organic apple growers to build on as they design and develop an insect management program for their orchards. Using a combination of control measures, such as Surround™ plus apple maggot balls, and planting cultivars such as ‘Redfree’ that mature early, will significantly reduce the incidence of plum curculio, apple maggot, and codling moth.

Organic apple growers can use the information learned at The Homestead to develop their

own pest management strategies. Each year The Homestead staff and residents will learn to develop a more effective pest management program for their orchard. Future apple crops will supply fresh apples to The Homestead residents and will be marketed at The Homestead and through their Community Supported Agriculture (CSA) marketing program. Steve Muller already has received many inquiries about the orchard and the potential of organic orchards at other institutions.

### **Education and outreach**

The orchard was used as an outdoor laboratory for ISU students as they learned to install an orchard irrigation system and practiced proper pruning and training techniques on young apple trees. Central College (Pella, Iowa) students researched and wrote information guides for pest management strategies as part of their environmental studies senior honors projects. As a class project, ISU marketing students developed a marketing plan for organic apples produced at The Homestead. The pest management research in the orchard was conducted by Heather Friedrich, a graduate student in horticulture, as part of her thesis research.

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