

NEWS RELEASE

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Organic Apples from High Tunnels

BELMONT, Wisconsin – Organic is a rapidly growing segment of the apple market, but apple growers in the eastern U.S. struggle to produce organic table grade apples for local markets. Humid, rainy climates in the east promote diseases such as apple scab, fireblight, cedar apple rust, sooty blotch and flyspeck, which are difficult to control using organic methods. Organic growers in the east generally rely on disease-resistant varieties and organically-approved fungicide sprays. But disease-resistant varieties such as Liberty and Enterprise can be difficult to market, and organic spray materials such as sulfur often require frequent reapplication and are only partially effective. Even with the best available disease control regimens, organic growers in the east often harvest a substantial percentage of blemished fruit which must be sold to lower-priced processing markets.

An alternative way to control diseases is to grow crops under cover, in plastic-covered “high tunnels” (unheated greenhouses). Polyethylene film over the tunnels blocks rainfall, keeping foliage dry and preventing most disease, while drip irrigation inside the tunnel supplies water to plant roots. High tunnels are an increasingly common sight on produce farms, partially because of cost-share funding from the USDA-NRCS Environmental Quality Incentives Program (EQIP), and tunnels are frequently used to grow vegetables, berries, and flowers. Researchers have found that tunnels work well for growing stone fruit and grapes. Innovative apple growers Chris and Juli McGuire at Two Onion Farm in southwestern Wisconsin decided to try raising organic apples inside tunnels. Chris McGuire says, “We had raised grafted nursery stock of apples in high tunnels for several years and were impressed by the vigorous growth and disease-free foliage. We wondered if high tunnels would allow us to harvest good quality organic apples from disease susceptible varieties without an expensive spray program. We have several high tunnels on our farm which we’d previously used for growing vegetables, and we were seeking another use for them.” To fund their trial, the McGuires applied for and received a small grant for on-farm research from the USDA-Sustainable Agriculture Research and Education (SARE) program.

The McGuires planted seven apple varieties on Geneva 41 and Geneva 11 rootstocks inside two tunnels in the spring of 2019 and trained the trees on a trellis using the tall spindle method. The trees grew vigorously, quickly reached their full size, and produced a crop in 2020 and 2021. As expected, the trees have been virtually free of disease. “This almost complete absence of disease was unprecedented in our ten plus years of organic apple growing,” Chris McGuire says. “Even without any disease sprays, there were hardly any spots and lesions on the foliage. We found zero sooty blotch and flyspeck while grading the fruit after harvest.”

Insect pests, however, were not deterred by the tunnels. Standard apple pests such as plum curculio and codling moth occurred at typical levels. The McGuires recommend, “Plan for a full regimen of the usual insect control measures, and also keep an eye out for aphids and spider mites – pests which rarely trouble our outdoor apple trees, but which we found could quickly explode inside the tunnels.”

A major issue in high tunnel production of fruit trees is the potential for extreme winter temperature fluctuations. If a tunnel is covered with clear polyethylene, temperatures inside can soar above 50 degrees on a sunny, cold winter day, and then crash below zero degrees at night: these extreme fluctuations will inevitably damage trees. To prevent this, one option is to uncover tunnels completely after harvest, and

then recover them in spring. The McGuires prefer an alternative approach: cover tunnels during winter with an opaque plastic film (black and white silage tarp works well). The opaque layer maintains a relatively even cold temperature inside throughout the winter.

During the growing season, the McGuires struggled with high temperatures in the tunnels. Their tunnels are ventilated through rollup sides, and they also covered the tunnels with Klerks SunView™ Cool film, a specially formulated polyethylene which lowers inside temperatures. Nevertheless, temperatures inside the tunnels are consistently higher than outdoor temperatures during the growing season. Higher temperatures caused sunburned fruit, soft flesh, and/or off-flavors in many varieties. Among the varieties they trialed, the McGuires found that Suncrisp and Hudson's Golden Gem suffered the fewest heat-related fruit defects, whereas Golden Russet, Ashmead's Kernal, and Winecrisp were more susceptible.

Yields per 3500 square foot tunnel were approximately 680 lbs in the second year of the planting, and 2460 lbs in the third year, which translate to approximately 200 bushels/acre in the second year, and 750 bushels/acre in the third year. Overall, the McGuires report that these yields are similar to, or slightly higher than, what they would expect in outdoor production.

The finances of high tunnel production are also difficult. The tunnels used in this trial each cost about \$10,000 in materials and 180 labor hours to construct in 2017-2018, and the covers must be replaced every four years at additional cost. Chris McGuire concludes, "Based on what we saw, it would be hard for apple production to justify those costs. We would need to select heat-adapted varieties, refine our growing techniques, and receive high retail organic prices to justify the costs of tunnel construction and maintenance."

The McGuires have shared their results with other farmers through the internet and conference presentations. They've received calls and emails from others interested in their findings. "We're really glad that this information is useful to other local growers looking to produce organic apples," says Chris McGuire. They've shared a full report of their project, including a detailed description of their growing methods, costs, and yields online at www.twoonionfarm.com/research.

