Extending the Strawberry Production Season in the Northeastern US

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For the last two years at the University of New Hampshire we have been working with plastic-covered low tunnels and day-neutral strawberry varieties with the objective of extending the region strawberry production season and improving berry quality. We are a collaborator on the USDA-funded TunnelBerries project, where researchers at multiple universities are investigating the role protective structures, such as low and high tunnels, can play in supporting the berry industry in the Northeast and Upper Midwest. Grower resources and more about the project can be found at www.TunnelBerries.org.

Day-neutral Strawberries

Day-neutral strawberry varieties differ from June-bearing in that they continue to produce flowers and fruit throughout the summer and fall months. Years ago, some Northeastern growers were quick adopters of early day-neutral varieties, but report being disappointed by low yields and small fruit. However, a new generation of varieties has been available for years now and several appear suitable for Eastern production. Many were bred for west coast production, but produce high yields and fruit quality in the Northeastern climate. Additionally, regionally adapted cultivars are being developed and released periodically by breeding programs in the Northeast and Mid-Atlantic.

Dormant bare-rooted plants are planted in early spring into raised beds covered with plastic mulch and drip irrigation (currently using dormant bare-rooted plants). Many varieties will begin producing fruit within 10-weeks and will continue to produce through the end of October, allowing for approximately four months of continuous production. Production patterns vary significantly by variety and year, depending on environmental conditions, pest challenges, etc. (Figure 1).

Why Low Tunnels?

Plastic covered low tunnels protect fruit during precipitation, and further prolonging production in the fall months (and possibly spring). Recent studies in Maryland and Minnesota have shown low tunnels can also increase marketable yields and fruit size, as well as reduce runner production (which is desired in plasticulture strawberry production).

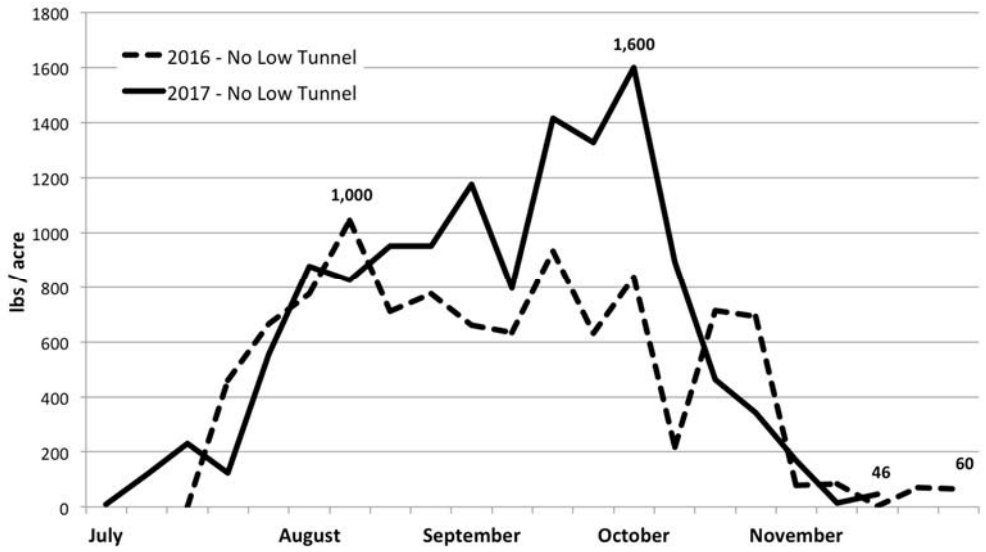

Figure 1. Season-long production pattern of the day-neutral variety 'Albion' in Durham, NH, shown in lbs/acre per week. Yield shown for two separate experiments conducted in 2016 and 2017. Plants were planted Early-May in 2016, and late-April in 2017, the first flush of flower trusses were removed, and fruiting began within 10-weeks of planting, in both years. Plants were fertilized with 60lbs N and 60lbs K pre-plant, and an additional 2-5lbs N/acre per week through the drip irrigation system and harvested twice per week.

Low tunnels have not been widely adopted in the U.S., possibly since the majority of strawberry production occurs regions with optimum growing conditions, but are pervasive in other parts of the world, including France, Australia, Brazil, Israel and India. In NH, low tunnels have helped us to extend the production season later into the fall months (Figure 2).

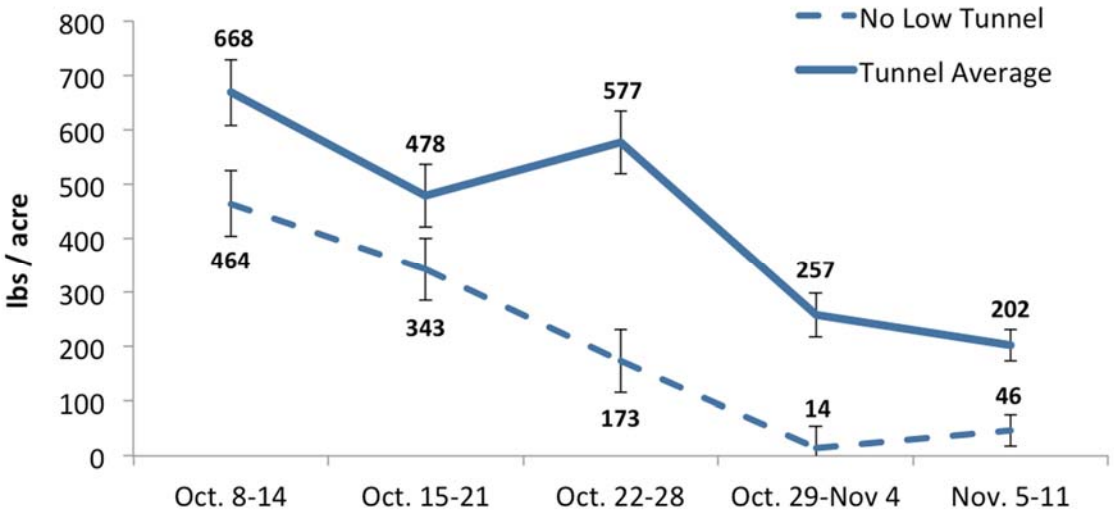

Figure 2. Weekly yield (lbs/acre) during the last five weeks of the season in 2017 in Durham, NH under low tunnels (solid line) and open field/no low tunnel (dashed line). Yield was significantly higher under low tunnels in all five weeks during this period of the season.

While we observed low tunnels to increase marketable yield late season in New Hampshire, total season-long yields were similar between plants covered with low tunnels and open field production, possibly because both years were generally dry. However, plants without low tunnels produced nearly double the unmarketable yield, resulting in a higher percentage of marketable fruit from low tunnels (Figure 3).

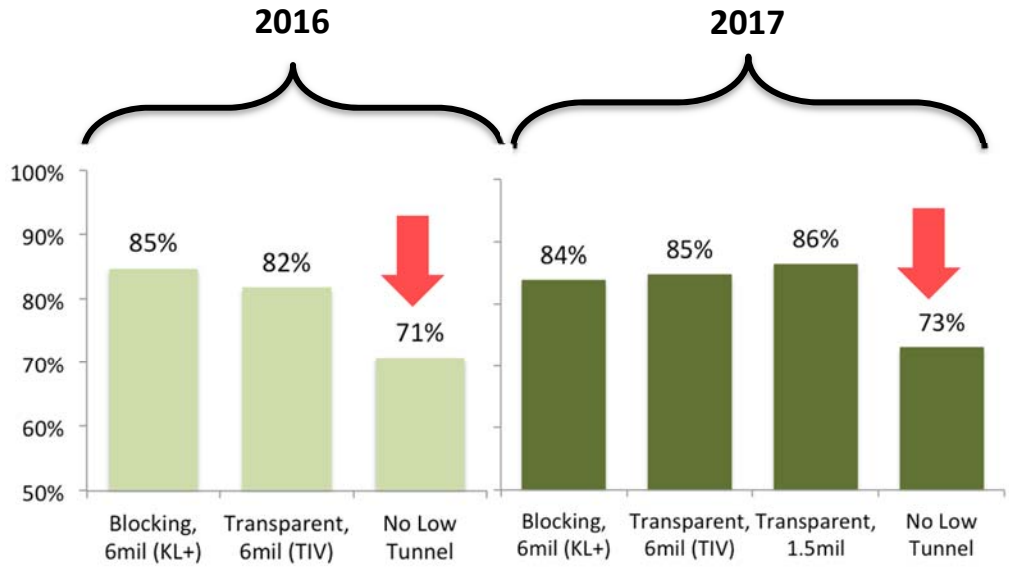

Figure 3. Total marketable yield for the DN variety 'Albion' in two years in Durham, New Hampshire during two years. Low tunnels increased the percent marketable from plants within them by up to 15%.

Total annual yield of the day-neutral variety 'Albion' averaged 10-14,000 lbs/acre (Figure 4), greater than the annual yield reported for June-bearers in the region. With production beginning after the June-bearing season ends, the variety complements June-bearing production well.

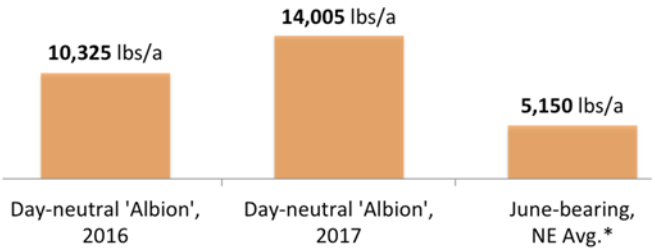

Figure 4. First year production of the day-neutral variety 'Albion' in Durham, NH in 2016 and 2017 alongside average annual June-bearing yield. Yield is an average of multiple cover and mulch treatments. *Reported by USDA-NASS, 2016.

Potential Pest Challenges

Aphid, leafhopper, various caterpillars, and tarnished plant bug have required management in New Hampshire. Additionally, Oriental Beetle grubs (white grubs) have been the most significant pest we have encountered, requiring management with Imidacloprid in early-August when adult beetles were found at the base of plants depositing eggs in soil. Ideally, this pest would be managed early spring or late season so that preharvest intervals do not interfere with fruit harvests. Spotted Winged Drosophila (SWD) was found in NH in only one of two years of experiments.

Low tunnel cost & benefits

A complete low tunnel system (steel hopes, plastic, bungee elastics, grounding pipes, etc.) requires an initial investment of approximately $20,000 per acre. NY State growers report gross sales from 'Albion' of $50,000 per acre per year. Access to direct market sales at a minimum of $4/lb could certainly increase gross revenue up to $80,000/acre (assuming 20,000 lbs harvested). Thus, the investment in a low tunnel system should pay for the materials in the first year, with second year costs including plants, fertilizer and labor. Plastic will need to be replaced periodically, depending on product used. The direct financial benefits of investing in a low tunnel system will certainly be affected by the environmental conditions of a given year and location, as well as the value a given producer places on protecting the crop. Low tunnels may be considered a form of crop insurance, as they are likely to pay off during precipitation, poor weather, and late season.

Tips

For the earliest fruit production and longest season, it is very important to plant early spring (late April in NH). It may be possible to use 12-14" plant spacing with the variety 'Albion' because the plants tend to be somewhat compact. Both day-neutral cultivars and low tunnels require management throughout the growing season (runner removal, fertility, raising/lowering sides for rain protection, etc.). Proper installation of low tunnels is key to easier management throughout the remainder of the year. UNH will be releasing a low tunnel strawberry production guide in the coming months, which can be found at: **https://extension.unh.edu/Grower-Resources/Research-Reports**

Valuable Resources

Season Long Strawberry Production with Everbearers
http://www.sare.org/Learning-Center/SARE-Project-Products/Northeast-SARE-Project-Products/Season-Long-Strawberry-Production-with-Everbearers-for-Northeastern-Producers

Extending Local Strawberry Production with Day-neutral Cultivars and Low Tunnel Technology
http://www.hort.cornell.edu/expo/proceedings/2016/Berries.Extending%20local%20strawberry%20production%20using%20day%20low%20tunnel%20technology.Pritts.pdf

TunnelBerries Project: www.tunnelberries.org

UNH Strawberry Research Blog: www.kaitlynorde.com

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