

First Year Impressions: Using Low Tunnels to Improve June-Bearing Strawberry Yield

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June-bearing (JB) strawberry growers know that the first berries to market in the spring fetch the highest prices and draw in customers. With more and more high tunnels being constructed on farms every year, growers are interested in the utility of tunnels for strawberries versus tomatoes and other warm-season crops. We see a wide variety of strawberry production under cover around the state, ranging from sophisticated greenhouses with hydroponic production to high tunnels and smaller caterpillar tunnels. These structures help extend the season for JB strawberries, hastening maturity in May. They also protect plants from rain and extreme weather events, reducing disease pressure. Although larger tunnel structures are a more common site in NY farms, we seldom see low tunnels—waist-high plastic structures—on farms. These tunnels offer many of the same benefits as larger tunnels, but at a lower cost: approximately \$20,000 for materials to construct one acre of low tunnels (see *References*).

Benefits of low tunnel use

Low tunnels offer a variety of benefits for improving crop yield and quality:

- Season extension: earlier harvests in spring and later harvests in fall (for day neutral varieties)
- Larger fruit size
- Improved fruit quality
- Decreased disease pressure, including *Botrytis* and anthracnose
- Increased total yield

The plastic covering of tunnels creates a beneficial environment through increased daytime temperatures and protection from precipitation and wind. Keeping rain and hail off fruit decreases disease pressure, resulting in a higher percentage of marketable yield. In our experience, the tunnels are fairly simple to setup. They consist primarily of hoops, clear plastic, stakes, and bungee cords holding covering in place. In comparison to larger, more sophisticated structures, they allow for more flexibility for movement from field to field according to crop rotation. Growers and researchers report day neutral (DN) strawberry yields from low tunnels of up to nearly double that of unprotected culture. Results vary tremendously according to weather; in wet years, tunnels offer protection that greatly improves crop quality and overall marketable yield, whereas in dry years there may be less yield benefit. Despite these benefits, cons to the low tunnel systems include labor for installation, maintenance, and deconstruction, as well as initial material costs.

In 2021, we set up three low tunnels at two farms in the ENY region to gather grower input on whether they impacted maturity, yield, and quality of JB strawberries. While research has been done on DN strawberries in tunnels, little is known about whether low tunnels are worthwhile for JB production. At each site, the grower compared quantity and quality of berries grown under the tunnels versus in the open air in adjacent rows. At the end of the strawberry season, we recorded our observations and those of the grower host. Here, we discuss our findings from last season.

On-farm demonstrations

Farm A

Farm A is a diversified organic small fruit and vegetable farm that sells strawberries through farmers markets and CSA. The growers manage their small-scale production intensively, utilizing multiple high

tunnels for season extension. Grower A was intrigued by the use of high tunnels for earlier harvests of berries to bring to spring markets.

We installed low tunnels over three sections of their rows of 'Chandler' strawberries in late April. The plants had just started to bloom. Due to deer and bird pressure, grower A uses netting as a deterrent (Figs. 1 & 2). We draped the bird netting over the tunnels. Unfortunately, due to a freeze later in May (several hours of temperatures in the 20's), Farm A lost most of the primary blossoms. Due to the warming effect of the tunnels, the plants and flowers within the structures were slightly more mature, and therefore may have lost a higher number of primary blossoms than the uncovered plants.

Lessons learned from Farm A:

- Low tunnel structures do not provide protection from low nighttime temperatures. Additional frost protection (e.g. row cover or irrigation) is still needed to protect flowers from late frosts/freezes.
- Bird netting plus the tunnel structures created an overly complex harvesting environment for employees. Netting had to be removed, and the sides of the tunnels needed to be raised at each harvest.
- Despite yield losses due to the freeze, grower A observed improved fruit quality under the tunnels.

Conclusion: Low tunnels were not worth the management effort for Farm A.

Farm B

Farm B is a conventional diversified fruit and vegetable operation offering strawberries at their retail store and for pick-your-own. Grower B was interested in using low tunnels to determine whether the structures would hasten berry harvest; earlier berries in May would draw customers to their farm store.

On Farm B, we installed the low tunnels over 'Dickens' strawberries (Figs. 3 & 4). We were limited in where we could install the tunnels, because only one field had drip irrigation set up. Shortly after setup, we needed to replace and repair plastic over the tunnels due to ripping during spraying with a boom sprayer. In addition to the farm workers' harvests, we harvested some of the berries for comparison between the tunnels and adjacent bare rows.

Lessons learned from Farm B:

- Low tunnels require drip irrigation, which not all growers use.
- Strawberry yield early in the season was higher under the tunnels.
- Strawberry season was very dry in northern New York, thus there was little disease pressure from *Botrytis* and anthracnose overall. Workers reported firmer, higher quality berries under the tunnels nonetheless.
- Harvesting under the tunnels was less efficient. While workers typically straddle rows to harvest, one can only harvest one side at a time under a tunnel.
- Spraying with a boom sprayer is challenging with low tunnels. Tunnel plastic could be rolled up to its highest point on the hoops during spraying, but it is difficult to navigate the structures in the field.

Conclusion: Low tunnels would be useful for a small proportion of the farm's early strawberry varieties to achieve earlier harvests. They would be too challenging to implement on a larger scale.

Farmer B is interested in constructing more low tunnels in 2022 to give them a second chance, particularly for early varieties that could boost spring sales.

Low tunnels were evaluated in 2015 across NY, but in those field trials the low tunnels covered DN strawberries. The same advantage of increased marketable yield was found to be true with DN strawberries as was found with JB strawberries. On years with high pest pressure from SWD, tarnished plant bug and even anthracnose, growers would need to be prepared to improve their spray program to adjust for low tunnels. From the perspective of tunnel management, a longer DN production season allowed managers and pickers more opportunity to adjust work-flow to the low tunnels (see *References*).

Conclusions

While low tunnels are used in Europe and elsewhere with great success, they are not appropriate for all operations. The major challenges observed in our first year of trials included difficulty harvesting and applying pesticides, and overall increased labor requirements. We plan to conduct on-farm demonstrations again during the 2022 season, which may bring differing weather conditions to test the tunnels' effects on strawberry yield and quality. In a changing climate, the Northeast experiences an increase in extreme weather events. Low tunnels may be an important tool in mitigating effects of heavy rain, hail, and wind brought by spring and early summer storms. Additional research and grower input on utility of these systems for JB strawberries is needed to determine whether they are worth the added effort.

References

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Fig. 1. Three low tunnels draped in bird netting at Farm A in April 2021.



Fig. 2. Inner tunnel environment at Farm A, with plastic cover draped in bird netting



Fig. 3. Low tunnels installed at Farm B in May 2021.



Fig. 4. Sides rolled up to allow for air flow and temperature control at Farm B.