

# Low Tunnels for Strawberry Production

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## Low Tunnels for Plasticulture Strawberries

June-bearing (short-day) strawberries are a high-value crop, but their brief harvest season severely limits the window of opportunity for making a profit with this crop. At most, with a combination of cultivar and production methods, the harvest season might last 6 weeks, but for most growers, it is only about half this long. Rainy weather during these three weeks, especially if it occurs on weekends, can have a significant negative financial impact on growers, particularly if they market through pick-your-own. It would greatly benefit growers if strawberries could be produced over a longer season, into the summer and fall, as this would extend the season and open up new markets.

In the 1980s, varieties of strawberries (day neutral) with the capacity to produce flowers during all day lengths (spring, summer and fall) were released to the public. While there was initial excitement with these new varieties and their flavor was excellent, grower interest waned because 1) yields were low, 2) fruit size was small, 3) berries were expensive to pick, and 4) tarnished plant bugs (TPB) damaged the ripening fruit.

A new generation of day neutral varieties was released in 2004. Although these originated from California, they were relatively well adapted to the Northeast, producing much larger fruits and higher yields than earlier releases. They produce fruit the year of planting and continue fruiting into the fall. After overwintering, they produce another flush of fruit in spring. The fall crop and the second-year spring crop can be protected from rain and cold temperatures by covering rows with plastic on metal hoops – a technology called “low tunnels.” The tunnel plastics not only exclude rain but they can decrease the amount of ultraviolet light and infrared radiation - reducing spore germination and heat load on the plants. The combination of day neutrals and low tunnels has the capacity to extend the strawberry season from 3 weeks to 5 months.

Establish raised beds (18 inches or wider) in late fall or early spring so they can be planted as soon as possible in spring. Delaying planting until May or Jun will significantly decrease yields. Each bed should have a trickle irrigation line attached to a fertilizer injection system. Cover each bed with white plastic and plant ‘Albion’ in a staggered double row, with plants 9 – 12 inches apart in each row. Use a tool that will insert roots into the bed while disturbing the plastic as little as possible. ‘Albion’ is the variety that has the best flavor and performs consistently well in our climate.

Remove the flowers for the first three weeks, or until vigorous new leaves appear from the crown. Plant grass seed between the rows, or at a minimum place straw mulch along the edges of the plastic beds to prevent mud from splashing on the berries. Fertilize the planting with 1-2 lbs of actual nitrogen per planted acre per week.

Install tunnels when plants begin to throw new flower trusses. Cover the tunnels with 4 to 6 mil plastic. Dubois Agrinovation (<http://www.duboisag.com/>) sells kits with plastic that has predrilled holes for ventilation when the plastic is lowered. This cost is recovered in the first year.

At least one side of the plastic should remain up under normal weather conditions to allow for pollination and to prevent heat build-up. Lower the sides when the weather is cold or stormy. A benefit of the plastic is the near elimination of common diseases such as botrytis (gray mold) and fruit anthracnose.

Fertilize with nitrogen according to local recommendations. In NY, it is recommended to increase the nitrogen to 5 lbs/acre per week once the plants begin to set fruit. Failure to provide weekly applications of nitrogen was a major reason why NY grower-cooperators had lower yields than expected.

Harvest the fruit at least twice a week. Peak yields will occur in late August-early September, with production occurring through October.

Once the temperature falls below 40F, lower the tunnel sides. If the temperature falls below 30F in mid-October, cover the entire field with row cover for the night to continue fruiting. This will extend the harvest season should the weather warm again.

Once harvest is over, lower or remove the plastic and cover the beds with straw. 'Albion' does not overwinter well in cold weather. Remove the straw in late March/early April and allow these plants to fruit again. The tunnel can be used to protect from late spring frost.

Over the course of the first year with an April planting date, we harvested 20,000 lb/acre, which is as much as a good June-bearing cultivar will produce in one season. Average berry size of 'Albion' was 15 grams, which is the size of a medium king fruit on a June-bearer. Flavor is excellent. Production peaked in early September with two quarts (four pints) of berries per 10 feet of row, but in October plants consistently produced about a quart of berries every 10 feet of row until a hard frost.

In spring of the second year, a large flush of fruit is produced about the same time as that of early June-bearers. Tunnels can be used to accelerate flowering if desired. Spring yields can be almost as much as the previous year's yield. We have not found it to be economical to hold over these plants into a second summer and fall. Rather, we grow them for about 15 months and then remove them. This past summer, in particular, with 26 days above 90F was not conducive for second-year production.

We found that, while attractive, growers may not be able to "fit" such a crop into their farm operation since day neutrals require constant attention. Plastic has to be raised and lowered, plants have to be fertilized weekly, and once harvest begins, it lasts for months. However, the rewards can be great. Growers have reported gross sales of \$50,000 per acre from Albion in New York State. Given that the cost of materials for an acre is about \$44,000, sales can pay for the materials in the first year. In the second year, costs include plants, fertilizer, labor and harvest. Conservatively, this can be \$20,000, but with sales approaching \$30,000 or more, the margins are quite good.

Spotted winged drosophila damage has been minimal in our trials provided that fruit is harvested regularly and not left rotting in the field. In one trial we used netting in place of plastic to determine how it would perform when the sides were down continuously throughout the fall to exclude spotted winged drosophila. Surprisingly, the netting had many of the benefits of the plastic. Sufficient air movement occurred so that flowers were pollinated without bees. Enough moisture was excluded so that fruit rot was low, and enough heat was retained on cold nights to prevent early frosts and extend the season. There was no SWD damage on those fruit, but damage levels were low throughout the plantings.