

Ohio Grown Strawberries under Controlled Environment – Towards Year-Round Local Production

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Objective

Strawberries are one of the locally grown fresh produce available during summer. Ohio strawberry production has traditionally been field-based using June-bearing (or short-day SD) cultivars in matted row production systems, but more recently using fall-planted plasticulture cultivation with increased introduction of day-neutral (or everbearing, EB) cultivars.

Regardless, the production season for Ohio fresh market strawberries is currently from late May through June for SD and EB cultivars and continuing on through September for EB cultivars. Compared with the large strawberry producers in California, Ohio strawberries have a fairly short season, and the production occurs when the market prices are the lowest due to overwhelming peak production in California and elsewhere. Ohio strawberry producers currently produce about 2.3 million pounds of fruit per year (USDA, 2015). However, Ohioans consume over 90 million pounds of fresh strawberries per year, suggesting the opportunity for increased regional fruit production is substantial. With the remaining outsourced 88+ million pounds arriving through a very long distance and long duration distribution chain, the resulting product is often at best of mediocre flavor.

Local, even regional production will allow more flavorful fresh fruit to be delivered to the market as fruit can be harvested riper and the distribution distance is minimal.

For Ohio strawberry growers to increase profitability, there is a need to enhance the productivity with greater value proposition, by extending the available season, producing off-season or even

year-round to capture higher prices during times of lower supply. Increasing production or reducing costs during the traditional, lowest priced season alone does not likely increase profitability. Growing through the winter captures the very high demand around holidays.

Growing under controlled environment can produce high quality fruits in Ohio, as demonstrated in our recent studies (McKean and Kubota, 2019).

Methods

Strawberry plug plants were produced to be planted in August 2020. Both Camarosa and Chandler were grown in Kubota lab located in Columbus, Ohio, each cultivar was conditioned to produce flower bud initiation. Half the plants we conditioned, and the others were not. Plug plants were planted in a unheated high tunnel on August 15, 2020. Substrate slabs filled with a strawberry soilless mix were placed on a commercially available trough system. Slabs are 3 feet by 8 inches with 8 plants per slab. All treatments were replicated within the growing system in

the high tunnel. December 30th 2020 all fruit was removed and foliage was cut back, slabs were placed on the ground and covered with row cover to protect over the winter.

Albion (OSU Albion) tray plants were produced in the Kubota lab located in Columbus, Ohio in 2021, Albion plants were also produced by Nourse Farm to be compared to the plants produced in Columbus. The Kubota lab plants were planted in the high tunnel trough system on August 19, 2021. The Albion plants produced by Nourse were planted on September 8, 2021. Substrate slabs filled with a strawberry soilless mix were placed on a commercially available trough system. Slabs are 3 feet by 8 inches with 10 plants per slab. All treatments were replicated within the growing system in the high tunnel.

Insect control: Strawberry crop was monitored weekly for insect pressure.

Disease control: Powdery Mildew fungicides were applied spring of 2021 and fall of 2021.

Irrigation: Micro irrigation was setup on the trough system and used to irrigate the crop.

Fertilization: Calcium Nitrate and Jacks 8-10-26 strawberry formula was injected at each irrigation cycle three times daily. Sulfuric acid was also injected to lower the pH of the irrigation water.

Table 1: Strawberry Fall Harvest Yields Piketon, Ohio 2020

<i>Treatment</i>	<i>Fruit per Plant</i>	<i>Pounds per Plant</i>	<i>Average Fruit Weight (ounces)</i>
<i>Camarosa Conditioned</i>	1.25 A	0.7864 A	0.31458 A
<i>Chandler Conditioned</i>	0.5563 B	0.6951 AB	0.27803 AB
<i>Camarosa Non-Conditioned</i>	0.05 C	0.2423 B	0.09692 B
<i>LSD</i>	0.3684	0.5162	0.2065

**Any means with the same letter are not significantly different.*

Table 2: Strawberry Spring Harvest Yields Piketon, Ohio 2021

<i>Treatment</i>	<i>Fruit per Plant</i>	<i>Pounds per Plant</i>	<i>Average Fruit Weight (ounces)</i>
<i>Chandler Non-Conditioned</i>	25.138 A	0.7518 A	0.47698 A
<i>Camarosa Conditioned</i>	23.394 A	0.5869 A	0.40097 B
<i>Chandler Conditioned</i>	23.394 A	0.6566 A	0.44661 A
<i>Camarosa Non-Conditioned</i>	22.288 A	0.6234 A	0.44706 A
<i>LSD</i>	7.5588	0.252	0.0376

**Any means with the same letter are not significantly different.*

Table 3: Strawberry Fall Harvest Yields Piketon, Ohio 2021

<i>Treatment</i>	<i>Fruit per Plant</i>	<i>Pounds per Plant</i>	<i>Average Fruit Weight (ounces)</i>
<i>OSU Albion</i>	5.7318 A	0.18307 A	0.50283 A
<i>Albion250 cc</i>	1.8944 B	0.06364 B	0.54301 A
<i>Albion150 cc</i>	1.5797 B	0.04731 B	0.47724 A
<i>LSD</i>	0.8383	0.0461	0.0835

**Any means with the same letter are not significantly different.*

Summary

Overall plant and fruit quality was good throughout the growing seasons. Plants that were planted August of 2020 did produce fruit. However with the lower light levels in December and colder temperatures the fruit failed to ripen. Table on shows number of fruit per plant and pounds per plant. Camarosa and Chandler plants were placed back on the troughs in April for a spring 2021 harvest. Harvest began May 7th and continued till May 26th. Fruit per plant ranged from a low of 22.28 (Camarosa Non- Conditioned) to a high of 25.13 fruit (Chandler Non-Conditioned). Pounds per plant ranged from a low of .58 lbs. (Camarosa Conditioned) to a high of .75 lbs. (Chandler Non-Conditioned).

Albion plants that were planted August and September grew well throughout the summer and fall. Harvest of ripe fruit began on September 13th OSU Albion was the first plants to have mature strawberries. The other Albion began to have mature fruit for harvest starting October 6th. Fruit per plant ranged from a low of 1.57 fruit (Albion 150cc) to a high of 5.73 fruit (OSU Albion). Pounds per plant ranged from a low of .047 lbs. (Albion 150 cc) to a high of .18 lbs.(OSU Albion). Plants were removed from troughs on December 9th, 2021, and covered with row cover to protect for the winter. Plants will be placed back on troughs in April for a Spring harvest.

Figure 1: Tunnel Temperatures 2020

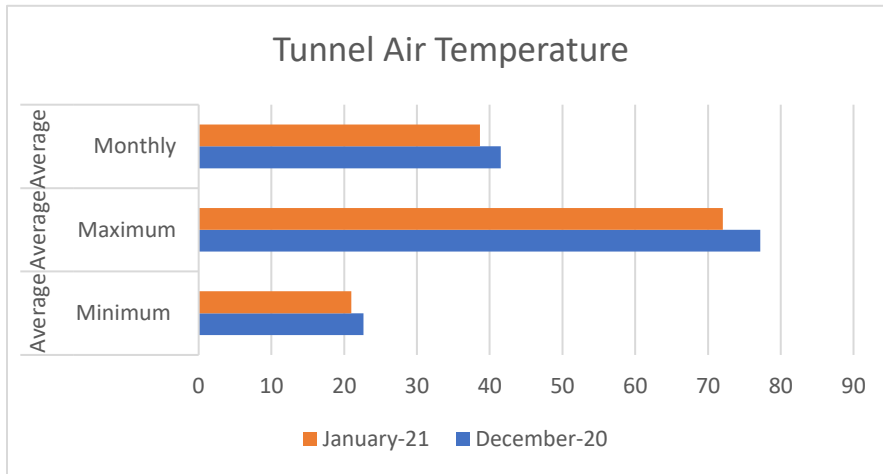


Figure 2: Plant Canopy Temperatures 2020

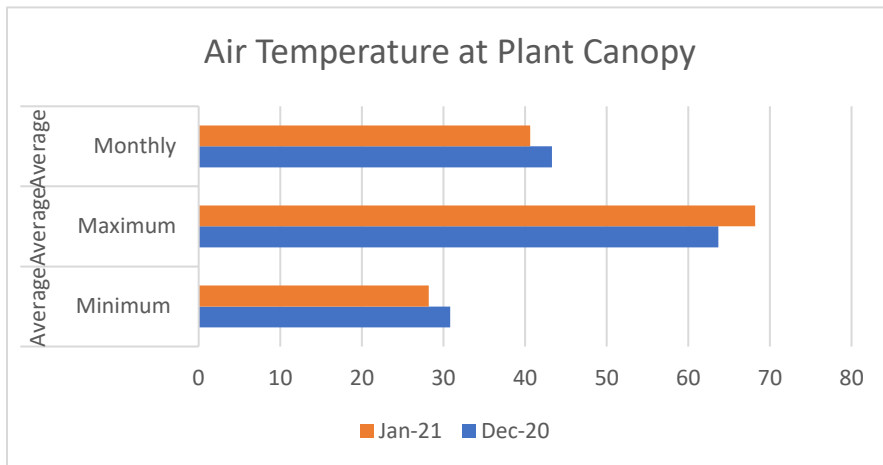


Figure 3: Tunnel Temperatures Fall 2021

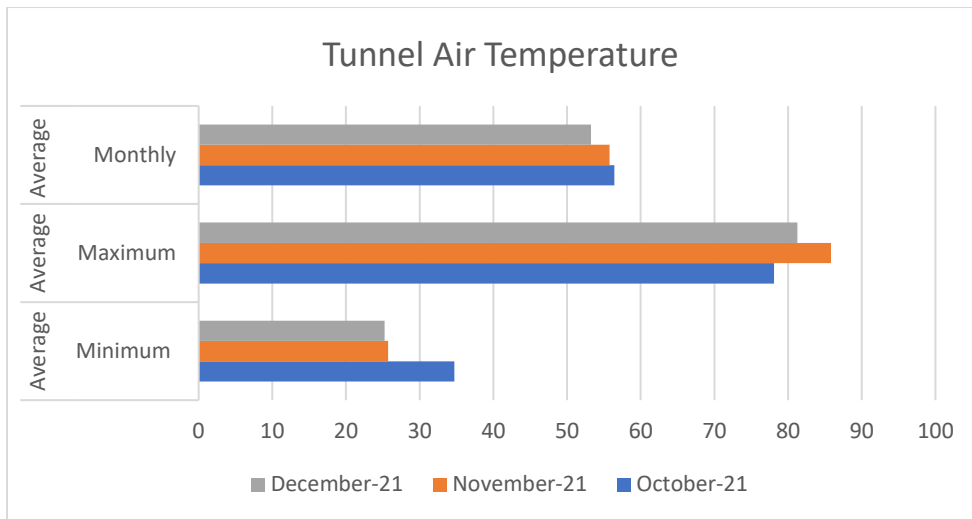


Figure 4: Plant Canopy Temperatures Fall 2021

