

# 2014 Empire Producers EXPO Berry Session Presentation Summaries

## Day Neutral Strawberry Intensive Session Wednesday January 22, 2014, 3:30 -5:30 PM

### **General Principles of Day Neutral Production** – *Kathy Demchak, Department of Plant Science, The Pennsylvania State University*

#### Understanding the Plant

In general, it helps to understand what triggers growth in the strawberry, as this explains why and how certain production practices work. Strawberry growth is very dependent on temperature and daylength. In general, short days and cool temperatures, as occur in Fall and early Spring, trigger growth of branch crowns and flowers buds, while long days and warmer temperatures trigger growth of runners, and leaves to a lesser extent. Our typical June-bearing strawberry varieties produce their crop in the spring because they initiate flower buds during conditions of short days and cool temperatures in the fall and early spring; these flower buds then grow when plants resume growth after winter dormancy, resulting in only a spring crop.

Day-neutral strawberry varieties differ from June-bearing (short-day) varieties in that they have the ability to initiate flower buds regardless of daylength, within certain temperature parameters. This ability allows fruit production to continue throughout the entire growing season, unless temperatures become too hot (upper 80's or warmer). Typically flowering and fruiting will occur in flushes, though the exact pattern varies with variety. Generally the highest production occurs during the fall in the Mid-Atlantic region, except for high elevation areas above 2500 feet where summer temperatures remain cool and fall arrives early. There, fruit production is highest during the summer. There are several different mechanisms that negatively affect fruit production during warm spells with both air and soil temperatures playing a role.

Day-neutrals are also referred to as "everbearers", and this is often how they are listed in nursery catalogs. Another terms that that you may see – primarily used in research – to describe day-neutrals is "remontant strawberries", which simply means that the plants flower more than once, derived from the French language, meaning "to rise again" (i.e., to mount again).

#### Production Systems

Day-neutral strawberries can be grown in many different systems. In open fields, they can be grown successfully on plastic-mulched raised beds, or on bare ground. Day-neutral strawberries can be grown in high tunnels usually in plastic-mulched raised beds, or in containerized systems - horizontally in gutters or in vertically in pots. Finally, production in greenhouses either for fruit production, or for hanging basket sales, is also possible. Most growers currently find field production to be more economically feasible than high tunnel or greenhouse production, as the increase in yields from protected culture either does not offset the additional costs of the structure, or other crops such as tomatoes or cut flowers return more per square foot of space.

In field production, the majority of day-neutral production is on plastic-mulched raised beds, where irrigation and fertilization can be more closely controlled, plants dry faster following rains, weeds are more easily controlled, and harvest generally proceeds faster. Most recently-introduced day-neutral varieties were developed for plasticulture production. Information is generally limited on performance of new day-neutral cultivars in bare ground production. However, information will be presented in this talk that will be applicable to either system.

#### Site Selection

Appropriate sites for day-neutral varieties are the same as for June-bearing varieties, with the exception that frost pockets are somewhat less of a concern since the plant will continue to produce new blossoms. A well-drained soil with a pH of 6.0-6.5 or slightly higher is ideal. Following other fruit crops or plants in the solanaceous plant family (tomatoes, potatoes, etc.) should be avoided. Well-aerated soils such as sandy loams or soils with a high organic matter content generally produce the highest yields. Heavier soils are more of a challenge, but production can be equally high with good management. Strawberries should be rotated out of a given field for at least 3 to 5 years and the longer the time between strawberry crops, the better. Many growers come back to the same fields to grow strawberries because of location, but plant performance often worsens over time.

#### Planting

Day-neutral plantings can be established in either the spring or fall, though spring planting is most frequently used. In the spring, a greater selection of varieties is available, mostly as dormant bare-root plants, which can be planted in bare ground plantings as for June-bearing strawberries. Dormant bare-root plants can also be easily planted through plastic in soils that are relatively rock-free by using a V-shaped metal planting tool to hold the roots, and then inserting plants into the soil through the plastic. If using a water-wheel planter, "plugs" can be created from dormant bare-root plants by trimming the roots and growing the plants in 32-cell trays in a greenhouse, or outdoors if temperatures are mild. This method is labor-intensive, but gives the plants a head-start, allows easy

## 2014 Empire Producers EXPO Berry Session Presentation Summaries

removal of blossoms, and makes timing of planting less critical should field preparation be delayed. A limited number of nurseries provide plug plants for fall planting.

In bare ground production, a close spacing of 5" to 10" apart in single rows, or 7" x 7" apart in double rows is recommended. On plastic, staggered double rows with plants 12" apart in each row has worked well.

### Blossom and Runner Removal

Our current recommendation is to remove blossoms for 3-4 weeks after planting, which generally means removing the first flush of blossoms plus some stragglers. Research at the Univ. of Maryland with plugged plants showed that yields were very similar over the course of an entire season whether blossoms were removed following planting or not. Plants began fruiting sooner, but subsequent harvests were slightly reduced, and berry size was slightly reduced. This also meant that there was no yield loss from removing the first blossoms, and there is still some question as to whether the stress of fruiting could reduce later yield especially if establishment conditions are poor.

Runners remain in bare-ground plantings, and are usually removed in plantings on plastic to improve air flow and foliage drying, and to prevent daughter plants from rooting in the row.

### Planting Life and Harvest

Traditional recommendations were to fruit day-neutral plantings for 2 or 3 years. However, given labor concerns and the consumer appeal of large berries, most growers keep day-neutral plantings for only a portion of the second harvest season, especially when growing on plastic.

Typically, harvest will take place from late June through the first hard frost the first year, and plantings are kept for the second spring. Growers generally find that berry size becomes too small to continue harvest beyond that point, as the number of branch crowns produced and thus the number of berries exceeds the plant's ability to size the fruit. If plug plants were planted in late summer or early fall, harvest occurs earlier in the first spring, but fruit size may only be acceptable for one harvest year.

### Plastic Color

Aluminized plastic can result in higher yields (15-20% higher), presumably due to decreased soil temperatures and reflected light early in the season. However, so far aluminized plastic has been difficult to obtain and relatively expensive, so standard black plastic (embossed, 1.25 mil) is used. Results in PA with other plastic colors have been inconsistent.

### Irrigation

Because the plants are continually fruiting, irrigation – preferably trickle – is considered a necessity whether on bare ground or plastic. Dry conditions can result in a complete lack of fruit production.

### Fertilization/Nutrition

The traditional recommendation for bare-ground production of day-neutrals was to apply nearly 1 pound of nitrogen per acre per day on average. This may have been to account for leaching from rain, or to ensure that sufficient nutrients were available. However, when plants are grown on plastic, leaching from heavy rains is not an issue.

In research with 'Seascape' on plastic in 2006-07 in both PA and MD, 1 pound of nitrogen per acre per week as 20-10-20 fertilizer (calculated on a mulched acre basis), following pre-plant incorporation of 60 lb of nitrogen/acre prior to bed-making, produced high yields, a reasonable amount of foliage, and high-quality fruit, with little additional increase in yields from higher nitrogen rates. Regression analysis showed that both nitrogen and potassium likely contributed to higher yields.

### Varieties

Please note that comments below reflect performance under PA conditions. Varieties often perform better or worse in other locations, so small trials on your farm are recommended.

*Albion* – Produced firm, elongated, large fruit. Moderate yields were produced on different plants at different times. Produced many runners. Was moderately susceptible to fruit anthracnose.

*Evie 2* – Produced large uniform fruit that was light in color, soft, and tended not to sweeten. Plants were very vigorous, and fruit production was low relative to the amount of foliage.

## 2014 Empire Producers EXPO Berry Session Presentation Summaries

*Mara Des Bois* – Considered a "gourmet" berry by chefs. Fruit was small, so yields tended to be low, but was very flavorful and aromatic. Performance has been better in tunnels due to high susceptibility to fruit anthracnose in the field.

*Monterey* – Produced large fruit with good color and very good flavor. Yields were good. Was extremely susceptible to fruit anthracnose and susceptible to powdery mildew.

*Portola* – Produced high yields of soft large fruit with little flavor.

*San Andreas* – Had a great combination of large fruit size (28g/berry, or 16 berries/pound), nice color, nice flavor, and good, but not great, yields. Some berries were asymmetrical in shape.

*Seascope* – Considered the eastern standard for Mid-Atlantic day-neutral production for the past 6-7 years. Very productive, berries were sweet and medium-sized, and split in the slightest amount of rain. Was extremely susceptible to powdery mildew.

### Marketing/Economics

In New York and Pennsylvania, only 3-4% of the strawberries purchased are actually grown in-state. Despite this, grower experiences with selling off-season day-neutral varieties vary widely, with some growers reporting that they can't sell the crop, and others having a waiting list for berries. Sales are often higher at farmers markets than on the farm. Whether this is due to different clientele (i.e., urban and suburban customers who may be more familiar with purchasing berries year-round in supermarkets), or a matter of convenience is not yet known.

### Diseases and Pests

The most common diseases encountered in day-neutral production are powdery mildew and fruit anthracnose. The higher powdery mildew incidence is in part due to cultivar susceptibility, but also probably because fruit is present during hot humid spells in the summer, unlike with June-bearing cultivars. Fruit anthracnose can become very widespread in a planting if susceptible cultivars are grown, and fungicides are likely to be needed. Use of straw mulch helps with minimizing rain-splash of anthracnose spores.

Two insects that become more problematic as the summer and fall progress, and hence are problematic in day-neutral plantings, are tarnished plant bugs and spotted wing drosophila. Both pests have multiple generations, and increase in numbers during the growing season. To help with control of tarnished plant bugs, weeds should be closely controlled, and the area around the planting kept mown. At least one insecticide spray is likely to be needed specifically for tarnished plant bugs. Difficulties with spotted wing drosophila have varied widely, ranging from no larvae present in research plantings, even without sprays, to 80% of fruit lost in grower fields. Cultural practices probably played a role, as the research plantings with few SWD were surrounded by agronomic crops and harvested very cleanly. It should also be noted, however, that raspberry and blueberry plantings used for SWD studies - where no insecticides being applied - were approximately 800 feet away. In two instances with high losses to SWD on farms, muskmelon fields with cull fruit between the rows were present in nearby fields. Growers should be prepared to spray for SWD.

### Additional Reading:

Season-Long Strawberry Production with Everbearers for Northeastern Producers. 2010. W. Lantz, H. J. Swartz, K. Demchak, and S. Frick. EB-401, Univ. of Maryland. 70 pages. Available on-line from the SARE Web site at <http://www.sare.org/Learning-Center/Project-Products/Northeast-SARE-Project-Products/Season-Long-Strawberry-Production-with-Everbearers-for-Northeastern-Producers> and at <http://www.fruit.cornell.edu/berry/production/strawberryproduction.htm>.

Day-Neutral Strawberry Production Guide. 1989. M. Pritts and A. Dale. Available on-line at <http://hdl.handle.net/1813/3275>

### Acknowledgements:

Much of the above work was conducted as part NE-SARE Project LNE06-241 "An integrated approach to developing a day neutral strawberry production industry", W. Lantz, K. Demchak, and H. Swartz. Additional funding for cultivar trials was provided by the Pennsylvania Vegetable Growers Association.