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**Optimizing Day Neutral Strawberry Growth**

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**ABSTRACT**

Growing day neutral strawberries in an annual plug plant system is a relatively new system for strawberry production in the United States. Production recommendations for this system have been adapted from other planting systems or other parts of the world. This research looked at two such production recommendations: blossom removal for two to four weeks after planting and the use of aluminized reflective mulch. Two separate research projects were set up to determine if the production recommendations were applicable to strawberries produced in an annual plug plant system. To determine if removing flower blossoms for two or four weeks after planting affected fruit size of fruit production per plant, two research plots were established with three replications in each plot. The three variables were no blossom removal, removal of blossoms for two weeks after planting and removal of blossoms for four weeks after planting. The data showed no significant difference in fruit production or fruit size in any of the treatments. In the second research, fruit production per plant and fruit size where compared between plants grown on aluminized, white and black plastic mulch. While no significant differnce was found between fruit produciton and fruit size between the colors of plastic mulch, production in August was significantly higher alumnized mulch which is important for growers trying to produce a consistant crop throughout the summer months.

**Optimizing Day Neutral Strawberry Growth**

Strawberry production using new varieties of day-neutral strawberries has provided an opportunity for growers to market a fresh local product at a high retail value. A survey was conducted at the local farmers market in 2005 in which customers indicated they were interested in purchasing more fruit. This survey, in addition to growers realizing the importance of having locally-produced fruit at the marketplace has created much interest in producing summer fruit.

Day neutral strawberry varieties have performed well in annual plasticulture systems, but little research has been conducted on managing annual day neutral plants. Beginning in 2006, growers in Garrett County, Maryland began using cultivars such as ‘Seascape’, ‘Evie 2, ‘Evie 3’ and ‘Everest’ to produce summer fruit. They are using an annual system starting with a large plug plants which are planted in the field at the end of April. The plants are set in a typical double row raised bed plasticulture system. The plants are planted 12 inches apart in the row and the rows are 12’’apart. Fruit production in these systems has been as high as 27,000 pounds per acre (1.8 pounds per plant). Fruit production generally begins the first part of July and will continue until the ended by frost. In the high elevation (2600’) of Garrett County, cool summers provide ideal growing conditions and producers do not experience the summer shut down often associated with trying to produce day neutral strawberries elsewhere east of the Rocky Mountain  
states.

Since producing annual planted day neutral strawberries from plug plants is a relatively new production method in the US, many of the production practices recommended to growers were based on methods that have worked well in other locations or systems. One practice often recommended to producers is to remove blossom trusses after planting for a period of time (Jauron 1992). Theoretically, this practice would be to allow the plant to establish well before fruit production begins. In 2007, two research plots were established to determine the effect of flower blossom removal after planting on total fruit production and fruit size. The variety ‘Seascape’ was used for this research. The plants were planted on May 14th. After planting, three groups of 20 plants were randomly selected from each of three rows. Blossoms were removed up to three different dates after planting as follows:

Treatment #1 = no blossom removal  
Treatment #2 = blossom removal for 2 weeks  
Treatment #3 = blossom removal for 4 weeks

While the treatments had no effect on total annual fruit production per plant (Table 1); treatments did have an affect on when plants started to fruit (Table 2). The only significant difference found was that of mean berry weight at site 101. At this site, the mean berry weight was significantly (by ANOVA) lower for treatment #3.

Table 1 - Blossom Removal Experiments

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Site 101 | |  | Site 102 | |  | Combined\* | |
|  | Wt per plant (g) | Mean Berry Wt. (g) |  | Wt per plant (g) | Mean Berry Wt. (g) |  | Wt per plant (g) | Mean Berry Wt. (g) |
|  |  |  |  |  |  |  |  |  |
| #1 Removed until June 1 | 835 | 9.0a |  | 413 | 10.5 |  | 624 | 9.8 |
| #2 Removed until June 14 | 845 | 8.7a |  | 440 | 9.7 |  | 642 | 9.2 |
| #3 Removed until July 2 | 815 | 8.3b |  | 481 | 11.1 |  | 648 | 9.7 |
|  |  |  |  |  |  |  |  |  |
| p(F) | 0.79 | 0.016 |  | 0.29 | 0.28 |  | 0.68 | 0.33 |
|  |  |  |  |  |  |  |  |  |
| Site 101-all treatments |  |  |  |  |  |  | 832a | 10.4a |
| Site 102-all treatments |  |  |  |  |  |  | 445b | 8.7b |
|  |  |  |  |  |  |  |  |  |
| p(F) |  |  |  |  |  |  | <0.0001 | 0.0439 |

• Site by blossom removal treatment interaction not significant, so sites can be combined (interaction sig. at p(F) = 0.32 for wt per plant, and 0.089 for mean berry wt, respectively).

Table 2 – First Fruit Production Following Blossom Removal

|  |  |
| --- | --- |
| Treatment | First Fruit Produced |
| #1 – No Blossom Removal | July 2 |
| #2 – Blossom Removal for 2 weeks | July 10 |
| #3 – Blossom Removal for 4 weeks | July 17 |

The results of this research indicate that producers do not need to remove flowers after the plug plants are planted in Spring. This will represent a savings in the labor required to establish spring planted day neutral strawberry plants. The only advantage to flower removal would be to delay fruit production to target a certain market. This research demonstrates that, for these type of plug plants, removing the flowers neither hurts or helps overall production; however, it should be noted that flowers were removed when plants were in the plugs at the nursery. We continue to recommend flower removal at the nursery. Although we did not use dormant plants for this trial, the smaller size of dormant plants containing lower numbers of flower trusses, probably makes flower removal beneficial when dormant plants are used. As dormant plants can be field planted earlier than plugs, flower removal would not delay fruiting significantly when compared to later planted plug plants.

Another recommended production practice for summer strawberry production is that of using aluminized plastic. Black plastic mulches have been shown to increase soil temperatures around 4-5°F (Sanders 2001). Black plastic mulches would be favorable for plant establishment during cool spring weather but may reduce production during hot summer weather. Strawberries stop producing when summer temperatures are above 86°F (Demchak et al. 2006). Aluminized reflective mulch has been shown to decrease soil temperatures by 5-8oF (Lamont 1999). During hot summer days, the cooler soil temperatures would be desirable for strawberry production. Research conducted in Alabama on June bearing varieties showed that “In certain cases a whiteon- black mulch, which keeps the soil cooler in hot weather, may be useful to extend the harvest season later into the spring” (Himelrick and Akridge 1999). In Garrett County where the springs are often very cool and the summer temperatures are mild (<1900 Growing Degree Days @ base 50°F), aluminized plastic may reduce temperatures to the point where yield is reduced. Aluminized plastic has a higher cost to the producer of about $400.00 per acre.

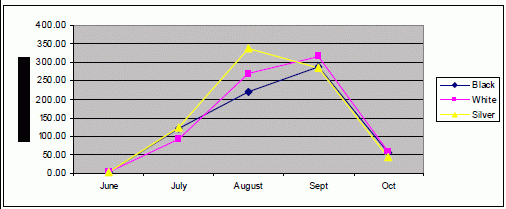
A research plot was established to compare fruit production of annual plug planted day neutral strawberries on three different colors of plastic mulch: black, aluminized, and white. Rows of black, aluminized and white plastic were randomized across the field. Three twenty plant blocks were randomly assigned in each of the different mulches. Soil temperatures were taken with a probe at 3” deep during each harvest time. The ‘Evie 2’ plants were spring (May 14th) planted in a typical 12 inch double row raised bed plasticulture system.

Fruit was harvested a minimum of three times weekly. Number of fruit per plant and grams of fruit per plant were recorded and data were analyzed with ANOVA. The production per plant on aluminized plastic was 792 grams with an average fruit weight of 13.7 grams, while production on white plastic was 743 grams per plant with an average fruit weight of 13.3 grams. The production on black plastic was 689 grams of fruit per plant with an average weight of 13.2 grams. While the production on aluminized and white plastic was higher than that of black plastic there was not a statistical difference in yield between plastic types as shown in Table 3.

Table 3

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment | Grams/plant | Average Fruit Size | Soil Temp. oF |
| Black | 689g | 13.2g | 71.5 |
| White | 743g | 13.3g | 73.3 |
| Aluminized | 792g | 13.7g | 69.7 |

While total fruit production was not statistically different between the three colors of plastic, differences were noted in monthly fruit production on each color of plastic. August production on aluminized plastic was 336 grams per plant compared to 269 grams on white and 220 grams on black plastic (Figure 1).

  
  
The production in August is statically significant at the 1% level (F= 12.4). High production during hot summer months is important to profitability with day neutral strawberries as there is no competition from lower elevation production and consistency in the market is important. The additional quarter pound of fruit per plant, at larger weights, translates in the market to $1.00 additional income per plant assuming $4.00 per pound prices ($15,000 per acre). Growers in cooler climate area such as Garrett County can get greater production during the summer months by using aluminized plastic.

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