

Evaluation of the use of Bare-rooted Dormant Plants in an Annual Plasticulture System of Growing Strawberries

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Background

Limited varieties available as plug plants and the expense associated with the cost of growing and shipping plugs has increased the interest in using other available varieties in the annual plasticulture system of growing strawberries. There are many eastern-bred varieties available as dormant bare-rooted plants that are primarily used in the perennial matted-row system. However not all eastern-bred varieties are suitable for the annual system because these varieties are bred to produce runners as the means of increasing the number of flower producing crowns per acre. Varieties bred for the annual system are selected for their capacity to produce branch or side crowns as the method of increasing the number of crowns per acre.

Methods

Nine varieties were selected from Nourse Farms inventory for trial. These nine (Allstar, Bish, Chandler, Daraselect, Eros, Jewel, KRS-10, Ovation and Seascape) were selected based on past performance in other plasticulture trials. Planting beds were prepared as recommended for the annual system and either white or black plastic mulch was used. As a post-planting treatment to reduce mortality, plots would either be intermittently overhead irrigated for several days or receive no overhead irrigation. As a control group, these nine selections were received in early July 2007 and were planted into a 48 cell tray-packs. These would be well rooted plants and receive no post-planted overhead irrigation. The second group of plants was received on July 23 and directly field planted as bare-rooted dormant plants and one of these two groups received the overhead and one group did not.

Standard plasticulture practices were followed and pesticide controls were used to keep the plots insect and disease free. A 1.0 oz/sqft floating row cover (FRC) was deployed in December of 2007 and removed in early March of 2008. Several frost events necessitated redeployment of the FRC and I feel confident that no cold damage affected flowering. 2008 harvest began on May 9th.

Collected data includes:

- Post-plant mortality
- Fall fruiting
- Fall crown development
- Fall runner production
- Spring yields.

Results

Post-planting mortality: (Table 1)

Air temperatures during the 10 days following planting was typical for our location with daytime highs in the upper 80's to 90's and bright sunshine. Reduced soil temperatures at the 3 inch depth were realized in both the white plastic and the black plastic that received post-planting overhead irrigation. However with the exception of the variety Seascape, plant mortality was less than 10%.

Runner Production: (Table 1)

As expected, the number of runners produced was larger than we see when we plant plugs in early September. When to remove these runners, is a management issue and removal of all runners at some point before Spring growth is desirable to reduce potential insect and disease problems.

Fall crown development: (Table 1)

The development of branch crowns in the Fall is crucial for greater Spring yields in this type of growing system. Generally 1 -2 branch crowns developed on most of the varieties during the Fall growing period. Although the development of this number of branch crowns is what we hope for when growing the variety Chandler, during this season it did not translate into high yields. Interestingly, we had our usual Chandler plug plants planted and they also had a lower Spring yield (0.8 lbs/plant). What we have observed over the years is that if Chandler has a poor harvest, then most all varieties we are growing have a poor harvest usually because of a severe late Winter weather event that damages flower buds ever before they emerged from the crown.

Year of planting Fall fruit production: (Table 1)

Seascape was the only variety that showed any Fall fruiting and this was an extremely low Fall harvest yield. Most likely this was due to not enough plant development.

Spring yields: (Table 2)

Despite generally lower yields than we saw with our plugged Chandler, several varieties did stand out. KRS-10, a selection from the Nova Scotia breeding program was the latest season variety and had over 1 pound of fruit per plant and average fruit size of 0.7 oz. Galletta, a 2007 release from NC State also yielded more than 1 pound per plant with 1 oz average fruit size. Seascape, a day neutral variety from California yielded 1.4 lbs per plant. Seascape has always yielded well for us at Wye in the Spring, but fruit quality such as flavor and fruit softness has been less than ideal. Interestingly the bare-rooted Chandler yielded better than the plugged Chandler in this trial.

Effects of plastic mulch color on Spring yields: (Table 3)

Using colored mulches to influence strawberry growth is a challenge. We want cooler temperatures in the Summer, but we need warmer temperatures later into the Fall and Spring to accelerate growth. The intent of the use of white plastic in this trial was to minimize temperatures during the establishment period. Soil temperatures (Table 1) were decreased using the white plastic. There was a varietal preference for mulch color based on Spring yields. Bish, Allstar, Eros and Daraselect had higher Spring yields on white plastic. Chandler, Galletta and Seascape had higher yields on black plastic. Jewel, Ovation and KRS-10 had equal yields on black and white plastic. However the differences between mulch color was not significant.

Effects of plastic mulch color on harvest date: (Table 4)

Table 4 indicates the date in which 50% of fruit had been harvested. Intuitively, I would have thought that the black plastic treatment would have advanced harvest, but this did not occur with all varieties. Galletta and Allstar on black plastic were 3 days later than those planted on white plastic. Seascape harvest was advanced 4 days on black plastic with the remaining varieties harvested within 1 day of each other on black or white plastic. These differences were not significant.

General observations, conclusions and recommendations

Limited varieties are available as plug transplants for the annual system. Many more eastern-bred varieties are available as dormant bare-rooted plants. In many cases these eastern varieties have more unique varietal characteristics than the varieties commonly grown on plastic (Chandler, Camarosa). However these eastern varieties also are not as firm and fruiting characteristics (short fruit trusses) are not as desirable. However, for direct sales, these varieties and this system could benefit some growers.

Pros to using this system:

- Plant material less expensive than plugs
- More varieties available
- May be more applicable for 2nd season harvest

Cons to using this system:

- Needs to be hand transplanted
- Planting in mid Summer
- Fruit not as firm
- Yields may be lower
- Needs further fine-tuning for optimum planting density, this would influence disease control strategies by decrease in canopy over-crowding.
- Not all varieties produce fruit on long trusses. This is important for ease of harvest and more air circulation around the developing fruit.

Having grown strawberries as an annual crop over the past 15 years, I feel that we have learned a lot on how to manage the variety Chandler. With the exception of planting date (late July) and transplant type (bare-root dormant), this trial used the “Chandler model“. Under a different management system, ie, wider spacing, different fertility program, we could get different yield results. I believe that most all of the varieties tested should be planted at a wider in-row spacing.

With variety trials and the temporal difference in bloom, it is difficult to apply fungicides over the whole plot without missing some flowers. In addition the extended use of row covers for frost protection during the bloom period changed the moisture dynamics (increased humidity) under the row cover. Because of these 2 factors, I encountered more gray mold than I have even seen here at WYE. I would have no problem adjusting the yields upward 15-20% to account for the fruit rot (not included in yield data) in all varieties except the 2 latest ripening varieties Ovation and KRS-10. These 2 varieties had 0% gray mold. This had more to do with the later flowering time. These 2 varieties were by far the largest plants and could benefit from a wider spacing. Despite these large plants and close spacing, KRS-10 still produced high yields and large fruit.

I am carrying over most of this plot for a 2009 Spring harvest. We did some crown thinning to reduce plant size, counted and removed runners and managed the fertility as recommended for a 2nd year Chandler planting.

Table 1. Fall collected data

| Mulch color | White | White | White | Black | Black | Black |
|---------------------------|-----------|--------|-----------|-----------|--------|-----------|
| Irrigation, post plant | Yes | No | No | Yes | No | No |
| Plant Type | Bare-root | Potted | Bare-root | Bare-root | Potted | Bare-root |
| % mortality | 3.6 | <1 | 7.6 | 8.9 | <1 | 26 |
| Crown # Per plant | 2.5 | 2.3 | 2.5 | 2.3 | 2.4 | 2.3 |
| Runner # Per plant | 10 | 8.8 | 10 | 7.6 | 8.9 | 7.2 |
| Fall yield Per plant (g) | 1.0 | 10.4 | 0 | 0 | 9.5 | 0 |
| 7/31-8/6 soil temp f (3") | 71.4 | ----- | 77.1 | 73.9 | ----- | 79.8 |

Statistically, there was no difference between the treatments for the Fall collected data. Soil temperatures were insufficiently replicated for statistical analysis

Table 2. Spring Yields influenced by plastic mulch color

| Variety | Mulch | Yield/plant | Fruit size | Mulch | Yield/plant | Fruit size |
|---------------|-------|-------------|------------|-------|-------------|------------|
| Bish | Blk | 391c | 17.0b | White | 468d | 15.7ab |
| Allstar | Blk | 151a | 13.5a | White | 168a | 13.4a |
| Jewell | Blk | 306bc | 12.7a | White | 308bc | 14.8a |
| Ovation | Blk | 299b | 15.6ab | White | 288b | 15.5ab |
| Chandler | Blk | 474d | 16.8b | White | 422cd | 16.3b |
| Daraselect | Blk | 313bc | 19.3c | White | 376c | 19.8c |
| Eros | Blk | 380c | 15.7ab | White | 445d | 16.1b |
| KRS-10 | Blk | 520d | 19.8c | White | 522d | 21.9c |
| Galletta | Blk | 483d | 28.8d | White | 299b | 20.8c |
| Seascape | Blk | 649e | 16.4b | White | 441cd | 15.8ab |
| Chandler plug | Blk | 404c | 16.5b | White | 364c | 16.8b |

Statistically, there was no difference between the two mulch colors
Differences were detected between varieties within each mulch color, similar letters within columns are not statistically different at 0.5%

Table 3. % Yield difference black versus white plastic mulch

| | |
|------------|------|
| Variety | |
| Bish | -17% |
| Allstar | -10% |
| Jewell | 0 |
| Ovation | 0 |
| Chandler | 11% |
| Daraselect | -17% |
| Eros | -15% |
| KRS-10 | 0 |
| Galletta | 39% |
| Seascape | 32% |

Not statistically different

Negative number = white plastic had greater yields

Table 4. Date of 50% fruit harvested. white versus black plastic mulch

| Variety | Mulch | Date | Mulch | Date |
|------------|-------|--------|-------|--------|
| Seascape | Blk | May 15 | White | May 19 |
| Bish | Blk | May 17 | White | May 18 |
| Chandler | Blk | May 17 | White | May 18 |
| Galetta | Blk | May 20 | White | May 17 |
| Daraselect | Blk | May 21 | White | May 20 |
| Allstar | Blk | May 23 | White | May 20 |
| Jewell | Blk | May 25 | White | May 25 |
| Eros | Blk | May 27 | White | May 27 |
| Ovation | Blk | May 30 | White | May 31 |
| KRS-10 | Blk | June 2 | White | June 3 |

No statistical differences between mulch colors