EVALUATION OF STRAWBERRY CULTIVARS GROWN UNDER A HIGH PLASTIC TUNNEL IN WEST CENTRAL FLORIDA

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Abstract. Commercial strawberry (Fragaria × ananassa Duch.) production in Florida is almost all open field production; however, production under high clear-plastic tunnels has the advantage over open field culture of keeping leaves and fruit dry, thus eliminating rain damage to the fruit and reducing the potential for certain diseases. On 20 Oct. 2004, four cultivars currently important in west central Florida, ‘Festival’, ‘Treasure’, ‘Camino Real’, and ‘Carmine’, were planted in a 20 ft wide × 100 ft long × 12 ft high tunnel at Dover, Florida. Ripe fruit were harvested twice weekly during December, January, and February. Data were collected on yield, fruit number, and incidence of fruit rots and arthropod pests. Cultivars differed significantly in yield, average fruit weight, and average number of aphids per leaflet.

Open field culture is the standard method used to produce strawberries in the U.S. But in many of the winter and early spring production areas outside the U.S., strawberries are grown under clear plastic tunnels (Childers, 2003; Hancock, 1999). In Spain, which is the second largest producer of strawberries in the world, almost all strawberries are grown in tunnels. The Spanish industry uses tunnel culture to 1) advance the season by creating a warmer environment, and 2) protect ripening fruit from damage by winter rains (Lopez-Aranda et al., 2003). In a previous trial at Dover, Fla., ‘Sweet Charlie’ strawberry grown in a tunnel produced significantly higher early season yields than ‘Sweet Charlie’ grown in the open field. However, the early yield of ‘Camarosa’ grown in a tunnel was significantly less than ‘Camarosa’ grown in the open field (Xiao et al., 2001). The primary objective of the research described in this paper was to evaluate the performance of the major west central Florida strawberry cultivars under a high plastic tunnel.

Materials and Methods

On 20 Oct. 2004, four cultivars (Festival, Treasure, Camino Real, and Carmine) were planted on standard, two-row beds in a 20 ft wide × 100 ft long × 12 ft high (at the apex) tunnel at Dover, Fla., with the long axis of the tunnel, and the beds, oriented north-south. The clear plastic that covered the tunnel’s frame had been used for the two previous seasons, and was nearing the end of its effective life span. (The tunnel was used for powdery mildew efficacy trials during the 2002-03 and 2003-04 seasons.) The side curtains were kept in a raised position and the ends were left open during the duration of the trial. This provided maximum ventilation and allowed plants under the tunnel to be easily sprayed with a tractor. Cultivars were randomly assigned to one bed in each of four blocks, and each plot contained 30 plants. Block one was at the south end of the tunnel, and block four was at the north end of the tunnel. Blocks were arranged in this manner to allow for light levels within blocks to be as uniform as possible. It was assumed that light levels would be highest at the south end of the tunnel because of the open end. Plants in the tunnel were treated regularly with fungicides, but a miticide spray was applied only to the plants on 21 Dec. and 29 Dec. This was done to prevent spider mite numbers from reaching excessive levels. Each week, the total number of spider mites and aphids were counted on 10 randomly selected leaflets from the middle plants of each plot. Ripe fruit were harvested twice weekly, starting Dec. 16 and ending Feb. 28. Data were collected on yield, fruit number, and incidence of fruit diseases.

Results and Discussion

Yields for all cultivars from December through February were quite low (Table 1). Yields in the open field for this period are typically double what we obtained in the tunnel. ‘Festival’ and ‘Carmine’ had the highest total yield, followed by ‘Treasure’ and ‘Camino Real’. ‘Treasure’ plants, when healthy, normally produce high early season yields, but in this trial some of the plants of ‘Treasure’ were stunted and appeared to be suffering from Colletotrichum root rot (caused by Colletotrichum acutatum). ‘Camino Real’ is a University of California cultivar that is known to be a late producer in west central Florida.

Average fruit weights were similar to what is expected in the open field. ‘Treasure’ and ‘Camino Real’ produced larger fruit than ‘Festival’ and ‘Carmine’ (Table 2). The incidence

| Table 1. Marketable fruit yield of strawberry cultivars grown under a plastic tunnel during the 2004-05 season at Dover, Fla. |
|-----------------|----------------|----------------|----------------|
| Festival        | 100 (401)a     | 254 (601)      | 647 (898)      | 981 ab         |
| Treasure        | 17 (33)        | 200 (326)      | 522 (451)      | 739 b          |
| Camino Real     | 13 (50)        | 338 (551)      | 29 (630)       | 384 c          |
| Carmine         | 92 (338)       | 298 (764)      | 706 (1,311)    | 1,086 a        |

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*Numbers in parentheses are yields for plants in open field plots at Dover, Fla. These plots were not included in the experimental design of the tunnel study, so a mean separation procedure cannot be used to compare tunnel vs. open field treatments.

*Mean separation by Fisher’s protected LSD test, P ≤ 0.05.
of Botrytis and anthracnose fruit rots in the tunnel was negligible, and the incidence of powdery mildew was generally low, but it did appear that ‘Camino Real’ and ‘Treasure’ had a higher incidence of powdery mildew on their fruit than did ‘Festival’ and ‘Carmine’ (Table 2).

Spider mites did not have a clear preference for one cultivar over another. On 22 Dec., ‘Camino Real’ did have the highest infestation of spider mites, but overall there was not a significant difference among cultivars (Fig. 1). Aphids, however, did appear to prefer ‘Treasure’ (Fig. 2).

The weather during the 2004-05 season was generally favorable for excellent open field production. Most days were mild and sunny, while most nights were cool and dry (http://fawn.ifas.ufl.edu). So it is not surprising that plants in the tunnel were not more productive than plants in the open field. But ‘Festival’ and ‘Carmine’ yields of only about half those obtained in the open field are somewhat surprising. All plants (in the tunnel and open field) received essentially the same amounts of water, fertilizer, and pesticides—which leaves light quantity and quality as the factor most likely to be the cause of low yield in the tunnel. Unfortunately we didn’t measure light levels, but, considering the age of the plastic, reduced light quantity and quality under the plastic would be expected.

Before recommending certain cultivars for tunnel culture in west central Florida, additional trials need to be conducted. Ideally these trials should be conducted in a multi-bay tunnel covered with high quality plastic. This will provide the most uniform temperature and light environment.

### Literature Cited


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Table 2. Average fruit weight and percent of fruit that were small (i.e., ≤10 g) or showed symptoms of powdery mildew on strawberry cultivars grown under a plastic tunnel during the 2004-05 season at Dover, Fla.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Avg wt (g/fruit)</th>
<th>Smalls (%)</th>
<th>Powdery Mildew (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Festival</td>
<td>21 b</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Treasure</td>
<td>25 a</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Camino Real</td>
<td>24 a</td>
<td>&lt;1</td>
<td>10</td>
</tr>
<tr>
<td>Carmine</td>
<td>21 b</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

*Mean separation by Fisher’s protected LSD test, *P* ≤ 0.05.*

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Fig. 1. Population dynamics of spider mites on strawberries grown under a plastic tunnel during the 2004-05 season at Dover, Fla.

Fig. 2. Population dynamics of aphids on strawberries grown under a plastic tunnel during the 2004-05 season at Dover, Fla.