Discussion and Conclusions

The occurrence of white fruit, catface, striped corolla and hairy plant was not noted in the early generations of 'Walter' as it was being developed as a variety. These characters were evidently the result of spontaneous mutation. The frequency of mutation from normal to hairy plant was quite high (125/10,000 plants), from normal to white fruit (and normal to striped corolla) was less but also high (3.5/10,000 plants), and from normal to catface fruit was relatively low. The white fruit and striped corolla mutant characters were controlled by a recessive gene. The white fruit character was either linked or pleiotropic with the striped corolla character since they never occurred independently. The catface fruit mutant was probably due to a recessive gene also, but data were too limited to be certain. Both characters were recessive and dominance was complete (Table 1).

The occurrence of four mutant characters during such a short time may be significant with respect to the genetic stability of 'Walter.' Florida seedsmen, however, should consider the possibility that 'Walter' is more mutable than some other varieties and take special care in producing seed. Since the mutants are recessive, the character was not detected until at least one generation after the mutation occurred. For this reason seed production fields should be observed carefully every time they are grown and all off-type plants rogued as soon as they are detected.

Acknowledgments

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PRUNING TEST COMPARISON OF TOMATO VARIETIES

FLORIDA MH-1 AND WALTER

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Abstract. Pruning, restricted to the removal of 4-7 lateral branches up to, but not including the lateral shoot in the leaf axil below the first flower cluster resulted in earlier yield as well as an increased fruit size over a 5-week harvest period for both 'Florida MH-1' and 'Walter' tomato varieties.

Pruning of both 'Florida MH-1' and 'Walter' resulted in the production of larger size grade which increased the value of the crop. The variety 'Walter' produced more marketable fruit as a result of pruning but no more than either pruned or unpruned 'Florida MH-1.'

Historically the tomato is thought to have originated in Peru although it was also cultivated by the Aztecs in Mexico. Evidence is that it had been cultivated in South and Central America since around 400 B.C. It was introduced into Europe in the 16th century. The size and color of fruit appears to have been well established at the time of its introduction into Europe where it was cultivated in Spain and Italy during the 17th century. Strangely enough it was considered poisonous in England, Northern Europe and America until about 1800. The tomato was first quoted on the New Orleans market in 1812 followed by the Boston Market in 1835 (11).

The Incas and Aztecs probably practiced pruning plants since they had been growing tomatoes for some 900 years before the arrival of Pizarro and Cortez. One of the oldest illustrations of tomato, drawn in 1581 (11), shows plants with lateral branches removed. In Buist's garden guide for 1885 (2) the statement is made that "most cultivators allow their tomato vines to grow wild and support themselves; they perhaps have never given it a thought that by training and properly pruning them they will not only increase their productiveness, but the fruit will ripen better and be of much finer quality." In 1918 Sherbakoff (10)
reported that tomatoes in Florida were staked and pruned as a defense against ground rots and because pesticides were generally more effective with this type of culture.

Experimental data comparisons of yield, quality, earliness and size between staked and unstaked tomatoes have been obtained by a number of investigators since the 1900's (4, 5, 6, 8, 9). Their data were based on indeterminate type plants and comparisons were made between staked plants pruned to 1, 2 and 3 stems and unstaked, unpruned plants, growing on the ground. Magruder (8) in 1924 reported that total yield was reduced in proportion to severity of pruning but that pruning increased yield of early fruit, yield for the first 4 weeks of a 10 week season and also increased the size of individual fruit.

In 1923 the pink fruited determinate cultivar 'Cooper Special' was selected from a planting of indeterminate tomatoes growing in the Fort Lauderdale area. It was introduced as a variety in 1925 by C. D. Cooper. Although 'Cooper Special' (1) did not persist as a variety it became an important source of the gene which controls determinate vine growth and was used as a parent in the development of such varieties as 'Pritchard,' 'Victor' and 'Penred.'

Present day Florida mature-green tomato production is wholly based on the recently released, highly disease resistant, determinate type tomato varieties 'Florida MH-1,' 'Tropi-Red' and 'Walter.' Plants of this type produce a flower cluster (often 2) on alternate internodes of the stem and at a given height apical growth stops, whereas the indeterminate plant produces flower clusters (seldom 2) 3 and 4 internodes separated from each other and apical growth continues until the plant dies as a result of disease, insect attack, senescence or some other problem.

Present day stake tomato culture in Florida is characterized by driving 48-inch wooden stakes between tomato plants when they are about 6-12 inches tall and then supporting them by the "string trellis" method first advocated by Kelbert (8). Usually growers do not prune determinate type plants and those who do, with the thought of achieving earlier maturity and an overall size increase, limit the removal of branches. Only 4-7 of the lowest lateral shoots are pruned because they realize that they are dealing with a plant of limited growth and fruit production potential. No guidelines have been established to indicate the best time and method of pruning.

The nature of the tomato breeding program at AREC-Bradenton necessitates the growing of over 2500 tomato breeding lines annually, each different from the others. This mass of material is predominantly composed of determinate type plants. The evaluation of lines in replicated plots means that both determinate and indeterminate types are mixed in randomized design blocks. In such plantings errors in pruning are made from time to time and determinate types may be pruned to 2 and 3 stems. When this happens the results have always been a spectacular fruit size increase and a drastic reduction in number of fruit. However, where the error resulted in only the removal of the lower 5 or 6 laterals the result has been increased fruit size with only a small reduction in total number harvested.

A pruning test was initiated in Bradenton in the 1972 Spring season to determine the effects of pruning on determinate type tomatoes. The results of this test are summarized herein.

**Materials and Methods**

The study was conducted in the field using a full bed mulch system with a flat topped bed 10 inches high and 28 inches wide. The field was prepared by applying an initial broadcast application of 600 lb./A. of superphosphate containing 5 lbs. of fritted trace elements. After bedding 1500 lbs./A. of an 18-0-25-2 fertilizer was placed in narrow bands near each bed shoulder immediately prior to installing mulch, a 55 lb. craft paper covered with a 0.25 mil layer of polyethylene on both surfaces. Irrigation was supplied by a seep ditch system in which seven 54 inch beds were separated by a water ditch. The soil type was Leon fine sand with an approximate pH of 6.8.

On March 1, 1972, 6 week old greenhouse grown plants of 'Florida MH-1' and 'Walter' variety tomato were transplanted on 18 inch centers through 3-inch diameter holes cut in the mulch. Individual plots were 54 feet long and contained 36 plants. There were 2 varieties with 4 replications of two growing methods for the establishment of sixteen 36 plant plots.

On March 20 prunes (4 to 6-inch lateral sprouts) were removed from % of the plots by removing those shoots up to, but not including the one in the leaf axil immediately below the first flower cluster. Generally, this required removal of 4-7 prunes. On March 24 the pruned plots were checked to confirm that no prunes had been missed or had developed in the ensuing 3 day period. From pruning until time of harvest, plants were sprayed at regular intervals with approved...
pesticides. Several strands of jute twine were added to the “string trellis” as required.

Plants were harvested 5 times with the initial harvest on May 11. Fruit were graded into US No. 1’s, 2’s and culls. Fruit of size 7 x 7 and smaller were discarded as culls.

Results and Discussion

The results of total yield for 5 harvests (Table 1) expressed as the number of 30 lb. packed boxes per acre for the first three pickings was greater for ‘Florida MH-1’ than for ‘Walter’. For the fourth picking ‘Walter’ maintained volume production better than ‘Florida MH-1’ but this situation carried over to the fifth picking only with ‘Walter’ plants that were pruned. With ‘Florida MH-1’ there was no difference in total marketable production of 30 lb. boxes (Table 1) of fruit between pruned and unpruned regimes but (Table 2) with harvests 3 and 5 the fruit making up the yield from pruned plants was significantly larger than from unpruned plants and harvests 1 and 4 tended strongly in the same direction. Data in Table 3 indicate that part of the yield attributable

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**Fig. 1. The percent (by weight) of total yield from pruned and unpruned plants of the tomato varieties Florida MH-1 and Walter.**
Table 3. Average size (lbs) of U.S. No. 1 fruit from pruned and unpruned plants of ‘Florida MH-1’ and ‘Walter’ tomatoes.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Picking dates</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pruned</td>
<td>Unpruned</td>
<td>Pruned</td>
<td>Unpruned</td>
<td>Pruned</td>
</tr>
<tr>
<td>Florida MH-1</td>
<td></td>
<td>.46a</td>
<td>.45a</td>
<td>.47a</td>
<td>.32b</td>
<td>.40a</td>
</tr>
<tr>
<td>Pruned</td>
<td></td>
<td>.44a</td>
<td>.39a</td>
<td>.46a</td>
<td>.45a</td>
<td>.43a</td>
</tr>
<tr>
<td>Walter</td>
<td></td>
<td>.42a</td>
<td>.38a</td>
<td>.41a</td>
<td>.39a</td>
<td>.40a</td>
</tr>
</tbody>
</table>

Means in the same horizontal pair and cultivar followed by the same letter are not significantly different at the 1% level.

There were significantly larger numbers of U.S. No. 1 fruit from pruned plants than from unpruned plants. The total yield (Table 1) from pruned plants represented less fruit of significantly larger size (more 5 x 6 and larger), whereas the yield of unpruned plants represented more fruit of significantly smaller size (more 6 x 7 and larger).

There was a significant difference in total marketable yield between pruned and unpruned ‘Walter’ plants (Table 1). Tables 2 and 3 show this is due in part to the significantly larger fruits from harvests 3, 4 and 5 for both U.S. No. 1 and 2 grades. The U.S. No. 2 fruit showed the same significant average size differences between fruit from pruned and unpruned plants as did the No. 1 fruit but were generally smaller than No. 1 fruit regardless of pruning. The difference in number of U.S. No. 2 fruit from unpruned and pruned ‘Walter’ plants was not significant. However, there was a significantly larger number of cull fruit (7 x 7 and smaller) from unpruned

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Fig. 2. Mean weight of number 1 fruit from pruned and unpruned plants of the tomato varieties Florida MH-1 (M) and Walter (W).
than pruned ‘Walter’ plants indicating the yield of U.S. No. 2 fruit was reduced because the fruit did not make marketable size.

With both ‘Florida MH-1’ and ‘Walter’ pruning increased early yield (Fig. 1) as shown by the first 2 pickings. Yield of ‘Florida MH-1’ was equal for pruned and unpruned plants in picking No. 3 but pruned ‘Walter’ continued to outyield unpruned plants. At picking number 4, the unpruned ‘Walter,’ and ‘Florida MH-1,’ and pruned ‘Walter’ and ‘Florida MH-1’ produced 312, 286, 236 and 194 30 lb. boxes per acre, respectively (Table 1 and Fig. 1).

The mean weight for a No. 1 fruit for each harvest date is shown in Fig. 2. ‘Florida MH-1’ had a more concentrated fruit set habit (3) and produced significantly larger fruit on pruned plants for the first 2 harvests whereas ‘Walter’ produced larger fruit on pruned plants for the last 2 harvests. At harvest 3 the size of fruit from pruned or unpruned plants was not significant between varieties.

RESPONSE OF MANAPAL TOMATO SEEDLINGS TO VARIATIONS IN INORGANIC NUTRITION

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Abstract

Manapal seedlings were grown in sand culture to evaluate the early response to variations in nitrate and ammonia nitrogen sources and levels as well as variations in phosphorus, potassium, and magnesium. Growth was limited by the lack of nitrogen, potassium and magnesium but not by the lack of phosphorus, even though phosphorus deficiency symptoms had developed at two weeks. Provision of nitrogen to the extent of 80% as nitrate, 20% ammonium gave better growth than the reverse proportions. Slight ammonia toxicity resulted in the form of cotyledon necrosis when nutrient solutions containing 450 ppm nitrogen were provided (80% ammonia, 20% nitrate).

The development of a large industry in Florida for tomato seedling production presents a need for research on the nutritional requirements between seeding and the time seedlings are marketed. The quality of seedlings produced is controlled by fertilization practices which should be adjusted to obtain the desired quality. While much research has been performed on tomato nutrition in general (2, 3, 4), somewhat less has been done on the early nutritional requirements of seedlings (6, 7, 8, 9, 10). Additional work seems desirable for Florida growing conditions and Florida cultivars. This paper reports results of sand culture experiments designed to measure seedling development and growth habit with varied levels and sources of individual nutrient elements supplied under controlled conditions.

Methods and Materials

Manapal tomato seedlings were grown in a pad-cooled glass greenhouse in washed builders sand contained in plastic flats 18 x 24 x 5 cm. A single row of 100 seeds was sown down the center of each flat. At two weeks from seeding, samples of seedlings were harvested from each of 8 replicate flats. Growth response data were collected to