

DISCUSSION

Defoliation of unstaked fresh-market tomato plants revealed a changing sensitivity to this type of damage in the course of their development as was demonstrated for processing tomato (36), potato (30) and sugarbeet (3).

Damage early in the development, before or at anthesis, when most of the metabolic activity of the plant is directed at vegetative development, seriously slowed plant growth. Defoliation at that time may also affect the initial stages in ovary and embryo development, resulting in reduced sizes of the fruit. Although Houghtaling (10) postulated that the ultimate fruit size is determined early in fruit development, defoliation around mid-season, both in Experiments 1 and 2, resulted in a reduction of the fruit size. This observation suggests that mid-season is a critical time for photosynthate mobilization to growing fruit. Defoliation of the tomato plants starting from ground level (20% to 60% of the older foliage) had little, if any, effect on fruit set, development or quality, especially when the defoliation occurred in the first two months of the season. Apparently, foliage remaining on the plant is capable of synthesizing sufficient amounts of nutrients necessary for the normal development of the fruit. Since the canopy of unstaked tomato plants is normally very dense, the lower leaves which are approaching senescence toward the middle of the season will not contribute significantly to the plant's net photosynthesis. They are probably beyond the compensation point, using more photosynthate than they produce. The upper 20% to 40% of the foliage has in fact been shown to account for more than half of the net photosynthetic activity of entire tomato plants, since the upper leaf layers obviously intercept and utilize the largest amount of light. In addition, defoliation has been found to have a stimulatory effect on the remaining leaves, possibly even

Table 9. Influence of defoliation of 'Walter' tomato plants on the mean fresh weight of all above-ground plant parts, excluding fruit, at the time of completion of the third harvest of the spring crop of 1978.

| Defoliation level ^c | Mean fresh weight per plant (in grams) ^{a,b} | | |
|--------------------------------|---|------|------|
| | Time of defoliation (in days after planting) | | |
| | 30 | 60 | 100 |
| 80% lower | 11062* | 8080 | 6928 |
| 80% upper | 10960* | 7100 | 8175 |
| 100% | 14177** | 7595 | 7785 |

^a Mean fresh weight per control plant: 8545 g.

^b Weight is significantly higher from the control if indicated by * for $P < 0.05$ or by ** for $P < 0.01$.