

Effect of Pruning and Harvesting Methods On Guava Yields¹

Justo López García and Rafael Pérez Pérez²

ABSTRACT

Work on the effect of pruning guava (*Psidium guajava*, L.) on yield, mechanical harvesting, and reduction of labor cost was conducted at the Fortuna Substation in an experiment with 7-year old, apparently genetically different guava trees. Two types of headback (10.2 and 30.5 cm) and three harvesting methods (hand picking, plastic nets, and a combination of plastic nets and a mechanical shaker) were tested. The last two harvesting methods appear more promising than conventional hand picking.

INTRODUCTION

The common guava, *Psidium guajava*, L., belongs to the family Myrtaceae, which includes many aromatic plants of economic value. The guava is indigenous to the American Tropics, but it has been distributed throughout all tropical and subtropical areas of the world. In many of these areas it has become acclimatized, occurring as a wild or semiwild plant.

The market value of Puerto Rican guava products (shell, nectar, paste and jam) exceeded \$2 million several years ago. It is probably now near \$4 million.

In India it was found that the size and weight of fruits from pruned shoots were considerably greater than those from unpruned shoots (8).

The purpose of this study was to evaluate the usefulness of pruning and of mechanical harvesting techniques in guava production in an effort to find information that may lead to increased yields and reduced operation costs.

MATERIALS AND METHODS

A pruning experiment on guava trees was initiated in March 1971 at the Fortuna Substation farm near Juana Díaz, Puerto Rico. The trees were about 7 years old and were spaced 6.1 meters square. The soil type was a San Antón silty loam, shallow phase, on level land. The experiment was laid in a complete randomized block design with three treatments replicated four times and with two trees per replication of each of

¹ Manuscript submitted to Editorial Board September 5, 1975.

² Associate Horticulturist and Acting Administrator, and Assistant Entomologist, Corozal and Fortuna Substations, respectively, Agricultural Experiment Station, Mayagüez Campus, University of Puerto Rico, Río Piedras, P.R.

the three cultivars: Corozal Mixta (CM), Seedling 57-6-79 (S), and Corriente (C).

The three treatments were: a) Headback at 10.2 cm; b) headback at 30.5 cm; and c) the control, no pruning. The headback treatments consisted of the removal of all the branch tips either at 10.2 or at 30.5 cm from the apex. It is a very expensive and time consuming operation.

Pruning debris was immediately removed from the orchard. A ground surface area corresponding to the tree canopy was cleaned for fertilization with a 12-6-16 mixture, amounting to 0.9 kg/tree. The fertilizer was left uncovered. Furrow irrigation was applied afterward. During the first 4 weeks after pruning, irrigation was applied weekly, and at 2-week intervals thereafter. No irrigation was applied when rainfall was 1.27 cm or more during the preceding two-week period. The basins around the trees were kept free of weeds by hand hoeing for the first month after pruning; thereafter, Gramoxone³ was used at the rate of 473 ml/188 liters of aqueous solution.

Harvesting was done mainly by hand. During the first crop, 12 trees were harvested by a mechanical shaker in conjunction with plastic nets spread beneath the entire canopy. This machine was developed by the Station Department of Agricultural Engineering.

Plastic nets in conjunction with natural fruit fall were tested on 24 trees, randomly selected. The fruits were collected from the nets every 7 days without any apparent damage. Bacteria counts showed no appreciable differences between the fruit harvested by hand and that collected from the plastic nets.

The guava trees appeared to be genetically different, as indicated by dissimilar phenotypes and fruit characters. This was true within and among the cultivars tested. Notwithstanding this difference, the experiment was initiated in an effort to get preliminary information on the effect of pruning on yield.

The trees in the southern part of Puerto Rico usually yield two crops yearly. One crop is due in late summer and early autumn and the second in late winter and early spring. As a rule, the summer-autumn crop is heavier, although individual fruits are usually smaller. During 1973, however, there were no seasonal crops. Fruit, rather, was produced continuously but in small amounts, although orchard management was identical to that of previous years.

³ Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico or an endorsement over other equipment or materials not mentioned.

RESULTS AND DISCUSSION

Table 1 shows the average yield per tree. For two of the three cultivars, the headback treatments increased yield significantly over that of the control. The headback treatment at 10.2 cm from the tips was better than that at 30.5 cm for the Corriente cultivar, but not for the Seedling 57-6-70 and Corozal Mixta cultivars. The tendency to increase yield with the headback treatments in the Corozal Mixta and Corriente cultivars might be explained by the fact that a greater number of branches developed as a result of tipping, since guava trees tend to produce fruit on the new shoots.

The combination of a mechanical shaker and plastic nets seemed to be an efficient and economical harvesting method. This combination could be improved if the trees were trained to a single trunk, but yield would probably decline. Also, the number of vibrations per second should be studied further because a number of immature fruits dropped together with the mature ones. Coppack (2) studied the selective harvest of Valencia oranges by mechanical means and found that shaking should be used at the appropriate stage of fruit development in order to obtain the best results.

When plastic nets were used alone, fruits were gathered from the nets every 7 days. Statistical analysis of fruit quality index showed no significant differences in quality between these fruits and those harvested by hand picking. The results indicate that, under the conditions prevailing in the southern part of Puerto Rico, guava fruit could be harvested efficiently and economically by using plastic nets. Vicente-Chandler et al. (9) obtained similar results when using plastic nets in harvesting coffee. This method, as well as the one previously described, may drastically reduce harvesting costs, which are usually very high. Harvesting by hand, the commonly used method in Puerto Rico, is expensive because it is time consuming.

TABLE 1.—Average yield per tree (kg) with various headback pruning treatments

| Treatment | Cultivars | | |
|-----------|--------------------|------------------|-----------|
| | Corozal Mixta | Seedling 57-6-79 | Corriente |
| 10.2 cm | 159 a ¹ | 100 b | 150 a |
| 30.5 cm | 125 ab | 108 b | 117 c |
| None | 122 b | 212 a | 139 b |

¹ Values in the same column followed by one or more letters in common do not differ significantly at the 1% level.

RESUMEN

En marzo de 1971 se comenzó un experimento de poda de guayabos de aproximadamente 7 años de edad en la Subestación Experimental Agrícola de Fortuna, cerca de Juana Díaz, Puerto Rico.

El experimento consistió de tres tratamientos con cuatro repeticiones, como sigue: A) despunte de las ramas a 10.2 cm. del ápice; B) poda de las ramas a 30.5 cm. del ápice; y C) el testigo sin poda.

Se cosecharon 12 árboles combinando el uso de mallas plásticas con un vibrador de mano. También se cosecharon otros 24 usando mallas plásticas solamente. Las frutas se recogieron de las mallas cada 7 días sin que sufrieran daño aparente. La mayor parte de la cosecha se hizo a mano.

Se encontró que la poda de las ramas tiende a aumentar la producción.

Los árboles aparentemente no eran genéticamente puros a juzgar por la diferencia fenotípica y las características de la fruta. De ser genéticamente puros, los resultados pudieron haber sido más claros y precisos.

LITERATURE CITED

1. Batjer, L. A. and Westwood, M. N., Effects of pruning, nitrogen and scoring on growth and bearing characteristics of young Delicious apple trees, Proc. Am. Soc. Hort. Sci. 82: 5-10, 1963.
2. Coppack, G. E., Properties of young and mature Valencia oranges related to selective harvest by mechanical means, Am. Soc. Agr. Eng. Trans. 15 (2): 235-8, 1972.
3. Garman, C. F., Diener, R. G., and Stafford, J. L., Effect of shaker type and direction of shake on apple detachment, J. Agr. Eng. Res. 17: 195-205, 1972.
4. Jolicœur, J. A., The rooting of Guava (*Psidium guajava* L.) cuttings treated with hormones under mist in Haiti, Am. Soc. Hort. Sci., Proc. Carib. Reg. 10: 57-9, 1962.
5. Lewis, L. N., McCarty, C. D., and Moore, P. W., Effects of skelotonization on the rejuvenation and production of declining orange trees, Proc. Am. Soc. Hort. Sci. 83: 295-9, 1963.
6. Liang, T., Lewis, D. K., Wang, J., and Monroe, G. E., Random function modeling of Macadamia nut removal by multiple frequency vibration, Am. Soc. Agr. Eng. Trans. 14: 1, 175-9, 1971.
7. Pennock, W., and Maldonado, G., The propagation of guava from stem cuttings, J. Agr. Univ. P.R. 47(4): 280-9, 1963.
8. Sundarayan, S., and Muthuswamy, S., Effect of pruning on fruit size and weight in certain varieties of guava (*Psidium guajava*), S. Indian Hort. 14(1-2): 63-4, 1966.
9. Vicente-Chandler, J., Silva, S., and Abruña, F., A new low-cost method of harvesting coffee in high-yielding plantations, J. Agr. Univ. P.R. 53(4): 259-67, 1969.