TROPICAL FRUIT WORKSHOP

Presented September 10, 1975, by the American Pomological Society and the Pomology Section of the American Society for Horticultural Science at the annual meeting in Honolulu, Hawaii.

Production of Guava (*Psidium Guajava L.*) in Hawaii

GORDON T. SHIGEURA AND RICHARD M. BULLOCK[1]

The guava (*Psidium guajava* L.) is native to the American tropics, but now distributed to all tropical and subtropical areas of the world. Undoubtedly, the guava fruit's distinctive aroma, flavor, nutritive value and its versatility in usage helped in its complete dissemination. The guava was brought to Hawaii in the early 1800's by Don Francisco de paula Marin, a seafaring botanist from Spain, who jumped ship and settled in Hawaii. During the early days of the monarchy, Marin became the most influential European resident in the Hawaiian Islands.

The guava belongs to the Myrtle family (Myrtaceae) and thus is related to the common spices (clove, cinnamon, allspice, etc.), eucalyptus, and many other smaller fruits in common usage including strawberry guava, roseapple, surinam cherry and jaboticava.

The guava (Fig. 1) is an excellent source of vitamin C, containing 2 to 5 times more than oranges and 10 times more than tomatoes bred for high vitamin C content. Some selected strains contain as high as 600 mg of vitamin C per 100 cc of pulp. It is also a good source of niacin and vitamin A. Compared with other fruits, the whole guava is a moderately good source of calcium, a fair source of phosphorus and a good source of iron. The iron content of guavas with seeds removed is only about one-fifth that of the whole fruit, indicating that most of the iron is in the seeds. This fact seems to indicate a utilization study of seeds since they are waste products in the cannery. The sugar content of the fruit expressed as brix is about 10%. The nutritive value of guava has been recognized for some time now, and its usage in infant diets is increasing. The usage of guava in the making of mixed juices, jams, jellies, marmalades, butter, chutney, and bakery products is becoming increasingly popular in Hawaii, on the West Coast and in the New York City areas where the Puerto Ricans and Cubans reside. The demand for the products continues to increase. In

Fig. 1 The guava fruit is round or lemon-shaped, 1½-2½ inches in diameter and with a thick, coarse, edible rind with seeds imbedded in a firm, soft pulp. When fruit set is heavy the weight of the fruits drags down the branches in pendants as shown in figure.

[1]Hawaii Agricultural Experiment Station College of Tropical Agriculture, University of Hawaii.

Fig. 2. Note flower buds in axils of leaves on newly emerging vegetative fruit twigs. Axillary fruit twigs in figure were induced by ethaphon-urea defoliation.

Fig. 3. Fruits with calyx yet attached on fruit twigs induced by ethaphon-urea defoliation.

Puerto Rico and Florida, a thick guava paste with the consistency of American cheese and canned guava shells are prepared and sold in the markets.

The guavas thrive, with adequate care, in soil types ranging from the best sandy loams to the geologically new pahoehoe (smooth) lava flows. Land does not appear to be a problem when the other growth conditions are not limiting. The guava responds very readily to complete fertilization using N, P, and K with added minor elements.

In the state of Hawaii, at median latitude 21°N, guavas are found growing wild from sea level on the exposed coastline up to 3000 feet in the range country on the island of Hawaii. Total growth and fruit production are reduced at both of these extremes. Salt water and wind exposure bring about the reduction at sea level and cold temperature affects growth and production at the upper elevation.

One of the most critical botanical characteristics of guavas is that the *flower buds are always borne on newly emerging vegetative terminals* irrespective of time of year (Figs. 2 and 3). In the tropics, when vegetative growth is so easily obtained throughout the year by simple changes or manipulations in pruning, fertilization and irrigation, blossom bud formation and subsequent fruit set is very erratic during the year. However, this basic characteristic presented a situation where the trees can possibly be exploited by a systematic manipulation of these factors to induce flowering and fruit setting when desired. The most common way is by pruning the branches in a manner so that the apical dominancy of the total pruned branch will not be disrupted. This can be done by taking out the other branches, by cutting these off at the junction to the main branch that remains, rather than clipping off the terminals of each of these branches and thereby breaking apical dominancy. When the former is done vegetative buds throughout the remaining branches emerge to form fruiting branches. On the other hand, when branch terminals are clipped off, the tendency is for the buds immediately below the cut to develop into vigorous cane growths which produce very little flower buds. Vegetative growth can also be induced by a combination

system of pruning, rapid irrigation and fertilization, and a third system of defoliation of trees using some caustic spray materials as defoliants (1). Horticulturists from the temperate regions will appreciate this fact since, under temperate conditions, flower buds develop normally only in the spring months after a normal winter defoliation, and fruits ripen from early summer to late fall. Under temperate conditions there is only one fruit season a year and there is little choice in this matter. Experimental evidences now being gathered seem to indicate the latter two methods, or combinations thereof, are better than simply pruning to induce new vegetative growths and subsequent blossom bud formation. With the perfection and adoption of these methods in commercial guava production, it is anticipated that, 1) guava fruit set and harvest can be precisely regulated and controlled into a system of "fruit cycling" so that fruits will be harvested throughout the year from different fields to greatly increase the operational efficiency of the cannery, 2) cannery will then be operating throughout the year rather than on the "catch as catch can" or "feast or famine" bases from erratic fruit production in the field, 3) with the confinement of blossom set and fruit ripening over a very short period, mechanical harvesting is a definite possibility, 4) further shortening of the ripening period is being attempted with the usage of ethapon, 5) the current indication is that one fruit crop can be expected every 8 months, or 3 harvests every 2 years, and 6) total yield per year seems to be considerably increased over the now practiced operational procedures. A complete report on this work should be publishable in two years.

Literature Cited

1. Shigeura, G. T., R. M. Bullock, and J. A. Silva. 1975. Defoliation and Fruit Set in Guava. *HortScience* 10:590.

Pineapple Production

HENRY Y. NAKASONE[1]

INTRODUCTION

The pipeapple (*Ananas comosus* (L.) Merr.) is indigenous to the area covering central and southern Brazil, Northern Argentina and Paraguay (4, 6). Seedless clones were selected by the Indians and were widely distributed through tropical America, even before the discovery of the New World (6). Today, the pineapple has become a commercial fruit of great importance in many tropical countries. Before 1950, Hawaii contributed approximately 70% of the world production of processed pineapples (1). Contribution to the world market from Hawaii has steadily declined to less than 36% as other countries increased their production. The Ivory Coast of Africa, Kenya, South Africa, Malaysia, Taiwan, Philippines, Australia and Mexico began to increase their contributions to the world market. In 1974 Hawaii's pineapple acreage was approximately 22,800 ha which produced 9.4 million cases of canned fruits (2).

In recent years 3 of the 6 pineapple companies in Hawaii have discontinued their operations. Two of the remaining companies have been reducing their production acreages in Hawaii due to various factors, but have also extended their operations to foreign areas where competitive levels in production costs may be obtained.

[1]University of Hawaii.