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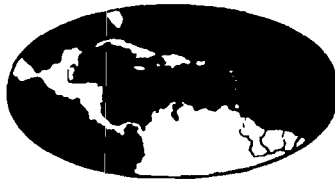
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PROCEEDINGS
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VOLUME III

COMMERCIAL GROWING OF PAPAYAS IN PUERTO RICO

Arturo Riollano ^{1/}

INTRODUCTION

The Agricultural Experiment Station of the University of Puerto Rico has completed successfully some research project whose accomplishments will undoubtedly help fostering and improving the growing of papayas (Carica papaya L) in Puerto Rico as well as in the Caribbean Area. These experimental results have played an important role in expanding the commercial growing of papayas in the island, for fresh fruit consumption and for processing. It is estimated that at present time the total area planted to papayas is around 300 acres. The largest acreage is located in the northwestern section where climate and soil conditions are most favorable for this fruit crop. The largest single planting is located at Isabela with 53 acres planted in a single block.

VARIETIES

As expected, types and varieties of papayas cultivated in the island lack in uniformity because they are the outcome of a genetic mixture of many introductions from different countries. The complexity of sexes with the various complicated floral combinations which make easy cross pollination through the wind and insects, makes difficult maintaining the purity of varieties. However, several farmers have made their own selections of some commercial types and they seem to be obtaining high yields with relative uniformity in the quality and size of the fruit. The Agricultural Experiment Station has introduced and evaluated more than 400 types and varieties from which some selected seed will be distributed to growers.

PRODUCTION OF CONTROLLED SEED

According to flower types, papaya plants may be classified into three main groups, namely: male, female and bisexual or hermaphrodite. The market preference is for the fruit of cylindrical shape with small seed cavity of bisexual tree rather than the nearly round fruit produced by the female plant. It should be the objective of the papaya grower to have the largest proportion of bisexual trees in his grove. This may be accomplished by producing self pollinated seed from bisexual trees.

Genetic studies have shown that:

^{1/}Agronomist, Agricultural Experiment Station, Río Piedras, Puerto Rico.

1. A female pollinated by a male papaya tree will give equal numbers of female and male progeny.
2. A female pollinated by bisexual gives equal numbers of female and bisexual trees.
3. Bisexual pollinated by male gives equal numbers of females, bisexual and males trees.
4. Bisexual self pollinated gives 2/3 bisexual and 1/3 female. Self pollination is easily done by covering bisexual blossoms with glazine or paper bags before they open. Seed from self-pollinated flowers will produce 67 percent hermaphrodite trees and the balance female.

PROPAGATION

The commercial method for propagating papayas is by planting 6 to 8 open pollinated seeds in plastic bags of the same kind as those used in propagating coffee seeds. Then available, 2 to 3 controlled seeds from self pollinations should be planted in each bag. To fill these bags it is recommended to use a mixture in equal proportions of well rotted filter press cake and good sandy or loamy soil. Well decomposed manure can be substituted for the filter press cake. A soil shredder can be used for making the best mixture. Fumigate the soil mixture with DD or methyl bromide and wait 10 or 12 days after fumigation to plant the seed. Trees should be transplanted when they reach 10 to 15 inches in height.

SOIL SELECTION AND TRANSPLANTING

Soils selected for papayas should be fertile, loose and well drained. Papayas plants do not tolerate excessive moisture or stagnant water. This condition will cause loss of trees in short time. After plowing and discing make furrows 10 feet apart, and then distribute the trees at 10 feet interval in the furrow. Planting in straight rows 10' x 10' will facilitate the use of cultivation equipment in both directions. When transplanting be careful always to remove completely the plastic bags or otherwise, this will affect root development and cause stunting of trees. If open pollinated seed was used, eliminate trees of undesirable sex at flowering time, leaving always the largest proportion of hermaphrodite trees.

FERTILIZATION

The use of filter press cake or well rotted cow manure is highly recommended for fertilizing papaya trees. Liming should be practiced if soil has marked acidity as shown by a low pH. Two weeks after transplanting apply to each stool of trees one pound of fertilizer 9-10-5. After thinning out trees at flowering time, apply 2 pounds of this chemical fertilizer, repeating this operation every five or six months.

CULTIVATION AND IRRIGATION

While trees are small, disc cultivation with a tractor should be practiced to control weeds. After each cultivation, a piece of iron rail or a heavy plank should be passed between rows in both directions to level and smooth the ground. After blooming, when roots develop fast in all directions, disc cultivation should be discontinued. Weeding closely around trees should be done by hand or by spraying with aromatic oil as a herbicide. Do not use other chemical weed control because papaya plants are very susceptible to damage from chemical herbicides.

Irrigation should be practiced if the area is subject to long periods of dry weather. Use the furrow system of irrigation if the land is level or slightly rolling. Low angle sprinklers should be used if overhead irrigation is preferred or if the land is very steep.

DISEASES AND INSECTS

Bunchy top, a virus disease transmitted by the leaf hopper Empoasca papaya Oman, is the most serious disease prevalent in the northern and western sections of the island. Spraying with DDT at three-week intervals has been rather successful in controlling this sector and reducing the damage caused by this virus disease. Several types of mosaic have been described as affecting seriously papayas grown in the southern coast. No effective control has been found for these mosaics. For controlling or preventing such diseases as leaf spot and fruit spot (anthracnose caused by Colletotrichum gloeosporioides) can be controlled by spraying with Dithane-45. During periods of excessive rains a fungus (Phytophthora parasitica) causes root, trunk and fruit rot. The use of the above named fungicide might help to a certain extent in controlling this disease. Stem end rot can be controlled by standard hot water treatment, 116°F. for 20 minutes, which also controls fruit spot caused by anthracnose organism. Thin fleshed varieties are subject to fruit damage of insects whose larvae get inside the fruit. DDT sprays at two-week intervals may help in controlling these insects.

FRUIT PRODUCTION

As indicated in the beginning, there is a considerable mixture of varieties and the tendency has been to select and grow certain types that produce medium size, cylindrical fruit ranging in weight from 4 to 6 pounds. Production of this type of fruits is generally high, from 25 to 30 tons of fruit per acre per year. The fresh fruit for direct consumption in the local markets should be handled with extreme care because of its market perishability. It should be picked when light yellow streaks appear and then wrapped in shredded paper for added protection in shipment. Most of the fresh fruit is sold in the metropolitan area of San Juan and in other major cities of the island. Fresh fruit in small amounts are also exported to

the Virgin Islands during the tourist season. Experimental shipments of fruits have been made by air cargo to Miami and New York. The expansion of these shipments depend upon a selection of the best fruit, care in picking at the proper stage of maturity and a well organized promotion.

The largest proportion of the fruit is sold in the green stage for processing in local plants. Green fruit has been also shipped by air cargo to Miami for processing. The fruit is generally processed in heavy syrup incubes or in slices. There are now two large processing plants studying the possibilities of canning papaya nectar blend with other tropical fruits like pineapple, guavas, passion fruit and bananas. It seems that papaya plantings will expand in Puerto Rico as fast as canning plants increase the demand for fruit processing. Presently the school lunch program is the largest single consumer of processed papayas. The Department of Education purchases processed papayas from the local canneries under contracts awarded on a competitive basis.

PAPAIN PRODUCTION

A pharmaceutical firm is producing papain under a new method of cultivation where trees are planted very close, from 20,000 to 30,000 per acre, to be harvested at the stage of producing the largest amount of green matter. Generally at the age of 8 months the whole trees are cut and processed in a roller mill for juice extraction. Through a chemical process papain and other enzymes are recovered from the extracted juice. This process is described in detail under patent 3,141,832 issued to Dr. E. M. Burdick of Coral Gables, Florida. The process is also described in the Chemurgic Digest, Vol. 16, No. 7 (July 1957).

SUMMARY

At present time there are about 250 acres planted to papayas in Puerto Rico. The largest acreage is located in the northwestern section of the island, in the municipalities of Isabela and Aguadilla. Most of the groves of papayas are small, usually from one to five acres in extent. The largest single planting is located at Isabela, with 52 acres planted in a solid block.

There is a considerable mixture of varieties, but the tendency has been to grow those that produce medium size fruit ranging in weight from 4 to 6 pounds each. Open pollinated seed has been used in all of these plantings with the exception of a large commercial grove where a portion has been planted with controlled seed from self pollinated hermaphrodite trees.

Production of fruit is generally high, from 25 to 30 tons per acre. The fresh fruit is mostly sold in the Supermarkets of the metropolitan area of San Juan and in the cities of Aguadilla, Mayaguez and Ponce. Fresh fruit in small amounts are also exported to the Virgin Islands specially during the tourist season. Trial

shipments of fresh fruit by air cargo have been also made to Miami and New York.

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CONSERVATION AND HIGH CROP YIELDS ATTAINED WITHOUT TILLAGE ON THREE TYPICAL MOUNTAIN SOILS OF PUERTO RICO

José Vicente-Chandler, Rubén Caro-Costas and
Elvin G. Boneta ^{1/}

INTRODUCTION

Erosion is a serious problem in the Humid Mountain Region of Puerto Rico comprising more than half of the Island. Plowing or cultivation this steep land, or even walking on it after it has been loosened, causes large downhill movement of soil simply in response to gravity. For example, Vicente-Chandler and Smith^{2/} showed that on loose Utuado soil, up to 50 per cent of the erosion losses from cultivated land were accounted for by gravity erosion. Soil loosened by cultivation is also readily washed away by run-off. Thus, one way of reducing erosion losses is to disturb the soil as little as possible.

The present study determined the effect on yields of the major crops of Puerto Rico of thoroughly tilling the soil compared to no tillage, on three typical soils of the Humid Mountain Region.

^{1/}Project Supervisor, Soil and Water Conservation Research Division, Agricultural Research Service, USDA, Agronomist cooperative between the Agricultural Experiment Station of the University of P.R. and the above Division, both stationed at Río Piedras, P. R., and Research Assistant of the Agricultural Experiment Station of the University of Puerto Rico, stationed at Adjuntas, P. R. This paper covers work carried out cooperatively between the Soil and Water Conservation Research Division, Agricultural Research Service, USDA, and the Agricultural Experiment Station of the University of P. R.

^{2/}Vicente-Chandler, J., and Smith, Richard M., Principles and practices of bench terracing in Puerto Rico, Journal of Soil and Water Conservation 6 (3) 134-45, 1951.