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Two New Pineapple Varieties for Puerto Rico

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INTRODUCTION

The pineapple, *Ananas comosus* L. (Merr.), (6)² has been grown in Puerto Rico for centuries. Barrett (5) presumes the Arawaks and Carib Indians brought it to Puerto Rico early in the sixteenth century. Today, the pineapple is the most important fruit crop of Puerto Rico (7). It is a twofold industry consisting of: 1, Fresh fruit for both local and the United States markets, and 2, canning in various forms for both local and export trade.

The industry in Puerto Rico is based on the two varieties, Red Spanish and Smooth Cayenne. Red Spanish has satisfied the requirements for the fresh export market more fully than any other variety (7) because it has two outstanding characteristics: First, its fruit hardness which enables it to stand rough treatment in transport, and second, it is highly resistant to fruit rot. Smooth Cayenne is the most important variety among pineapple planters all over the world. It has excellent flavor, a very small amount of fiber, and is very juicy. It is preferred for canning because it has a higher yield than Red Spanish, but it does not ship well. Although both varieties possess good characters, neither fulfills all the requirements of the industry's immediate needs.

Smooth Cayenne plantations in Puerto Rico suffer great losses from epidemics of mealybug wilt (1,9,12,13,14), transmitted by *Pseudococcus brevipes* Cockerell. The Red Spanish variety is highly susceptible to gummosis (10,11), which makes the fruit undesirable for the fresh market. It is caused by larvae of *Batrachedra* sp. Both varieties are extremely susceptible to nematode injury (2,3,4) and virtually no commercial plantings are established without soil treatment for nematode control.

Although partial control of these pests is obtained by the use of chemical pesticides and other means, these add materially to the cost of production.

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² Italic numbers on parentheses refer to Literature Cited, pp. 427-8.

Both Smooth Cayenne and Red Spanish have been in great need of horticultural improvement to maintain acceptability among consumers and to increase pineapple production in Puerto Rico.

Expansion of the pineapple industry depends in part on the development or introduction of better varieties for the fresh-fruit market and the canning industry. These better varieties must be well adapted to the growing conditions presently prevailing in the production areas. They also must be highly resistant to prevalent diseases.

The importance of the pineapple to the economy of the island, and the need to improve this crop, led the Agricultural Experiment Station, University of Puerto Rico, to initiate a pineapple breeding project for the purpose of producing better varieties capable of yielding higher profits to farmers and the canning industry.

MATERIALS AND METHODS

The two leading pineapple varieties in Puerto Rico, Red Spanish and Smooth Cayenne, were used as parents in the breeding program. A brief description of each variety follows:

Red Spanish is the leading variety in Puerto Rico. The plant is large and vigorous. The leaves are slender and may have from a few to many spines along the margins, depending on the strain. The fruit is small to medium in size, usually weighing from 2 to 5 pounds (fig. 1). The shape of smaller fruits will vary from almost spherical to a slightly-tapered barrel shape; the maximum diameter is close to the base in larger fruits. Fruitlets are oriented into two spirals which cross each other at approximately right angles. The fruitlets are thereby roughly arranged in a quincuncial pattern in which each fruitlet is centrally located between four adjacent surrounding fruitlets making it roughly square in outline. The flesh is white, firm, with strong fibers, and has an excellent flavor. This variety is susceptible to gummosis, but is resistant to mealybug wilt. It bears a very good dual-purpose fruit which ships well fresh and is of good canning quality.

Smooth Cayenne is the leading variety in Hawaii. The plant is large and the leaves are smooth. The fruit has a cylindrical shape with a greater diameter near the base than near the top. Its weight varies from 4 to 8 pounds (fig. 2). The eyes are broad and flat, giving a smooth outer surface to the peel. Fruitlets are oriented into three spirals which cross each other diagonally in honeycomb fashion, thereby arranged in a hexagonal pattern. Each fruitlet is centrally located between six adjacent fruitlets making it roughly hexagonal in outline. Its flesh is slightly yellow, sweet, juicy, and with a very pleasant flavor. It is excellent for canning but does not ship well. This variety is highly susceptible to mealybug wilt but is resistant to gummosis.

Crosses were made between these two varieties. Fruits were harvested after fully ripe and the seed was taken out of the flesh with the aid of a blender. After drying, the seeds were planted in flats containing a mixture of peat moss and perlite.

When the seedlings reached a height of approximately 6 inches they were transplanted to the field for evaluation. Selection in the F_1 progeny was carried out on the basis of desirable fruit and plant characters.

Seedlings were selected in which such characters appeared to be equal



FIG. 1.—Pineapple variety Red Spanish.

or superior to those of the Red Spanish and Smooth Cayenne parents. Some of the fruit characters considered were size and shape of the fruit, acidity and sweetness of the juice, amount of fiber in the pulp, width of core, depth of ovaries and numerous others. Among some of the horticultural characters considered were the vigor of the plant, resistance to mealybug wilt and gummosis, and seed production (vegetative material).

The selected plants were propagated asexually, using the tops, slips and suckers, to increase the number of plants for further observation and evaluation. Much propagation material has been supplied for evaluation to some of the leading growers in Puerto Rico.

RESULTS

Two new varieties of pineapple have been developed as a result of this breeding program, namely, P.R. 1-56 and P.R. 1-67. These new varieties are described below. The two new varieties are quite similar, but may be identified as follows: In P.R. 1-57 the upper leaf surface is yellowish green with a reddish tint caused by an anthocyanin pigment which also is evident on the crown. The leaves in variety P.R. 1-67 are strongly cupped, dark blue-green, with a conspicuous silvery gray undersurface.



FIG. 2.—Pineapple variety Smooth Cayenne.

VARIETY P.R. 1-56

This variety, formerly seedling 1A2 (8), is the first one developed by the Agricultural Experiment Station. It is a Red Spanish \times Smooth Cayenne F_1 hybrid developed by Mariota.³ It is well adapted for the fresh fruit market. In the course of development and testing it proved to be highly resistant to gummosis and mealybug wilt, two of the worst pests of pine-

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apple. The plant is vigorous, and its fruit averages 5.5 pounds (fig. 3). It is juicy and of a very pleasant flavor. Brix ranges from 16 to 18, with an average of 16.70, and the pH ranges from 3.50 to 4.00. Yields of 30 tons per acre have been obtained.

DESCRIPTION OF A WELL DEVELOPED PLANT (fig. 4)

Stem

The height of the stem, including the peduncle, is about 55 cm., and averages 8 cm. in width near the soil level and 7 cm. near the peduncle.

Peduncle

The peduncle is about 20 cm. long and 4 cm. wide and has 12 bracts or modified leaves, the longest averaging 63 cm. in length by 4 cm. in width at the midlength section, and the shortest 19 cm. by 2.4 cm. The five basal bracts are bright red in color.

Leaves

The plant has about 60 leaves, the longest averaging 102 cm. in length by 7.5 cm. in width at the midlength section, with straight margins covered with spines. The spines are irregular (single and double), up-curved and about 1.5 mm. long. The upper leaf surface is yellowish-green in color with a reddish tint caused by an anthocyanin pigment, the lower leaf surface is silvery with a light green tint. The general appearance of a mature field is light-green and deep brick-red.

Inflorescence

The flower cluster averages about 9 cm. in length and 11.5 cm. in width. It is formed by about 127 florets, each one covered by a triangular bract. Below the inflorescence there are 18 additional bracts usually brilliantly reddish in color. These vary in size, the smaller ones being closer to the inflorescence and the longest to the peduncle.

The flower has three bluish-purple petals, six stamens, one style and a tricarpellary ovary.

Fruit

The fruit is borne at the apex of the peduncle. It varies in size and has a normal average weight of about 5.5 pounds. A single fruit weighing 5.25 pounds, measured 14.6 cm. in length by 14.8 cm. in diameter, and had a core 2.7 cm. wide at the broadest portion. This fruit had an unusually large

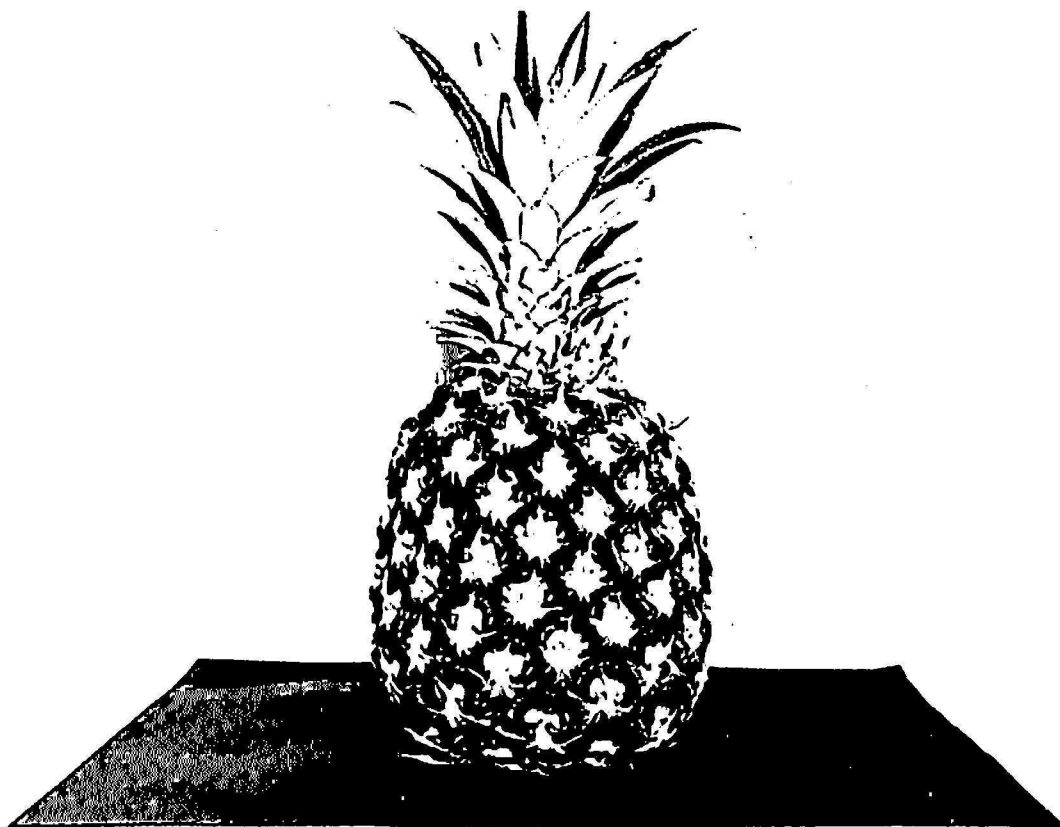


FIG. 3.—Fruit of pineapple variety P.R. 1-56.

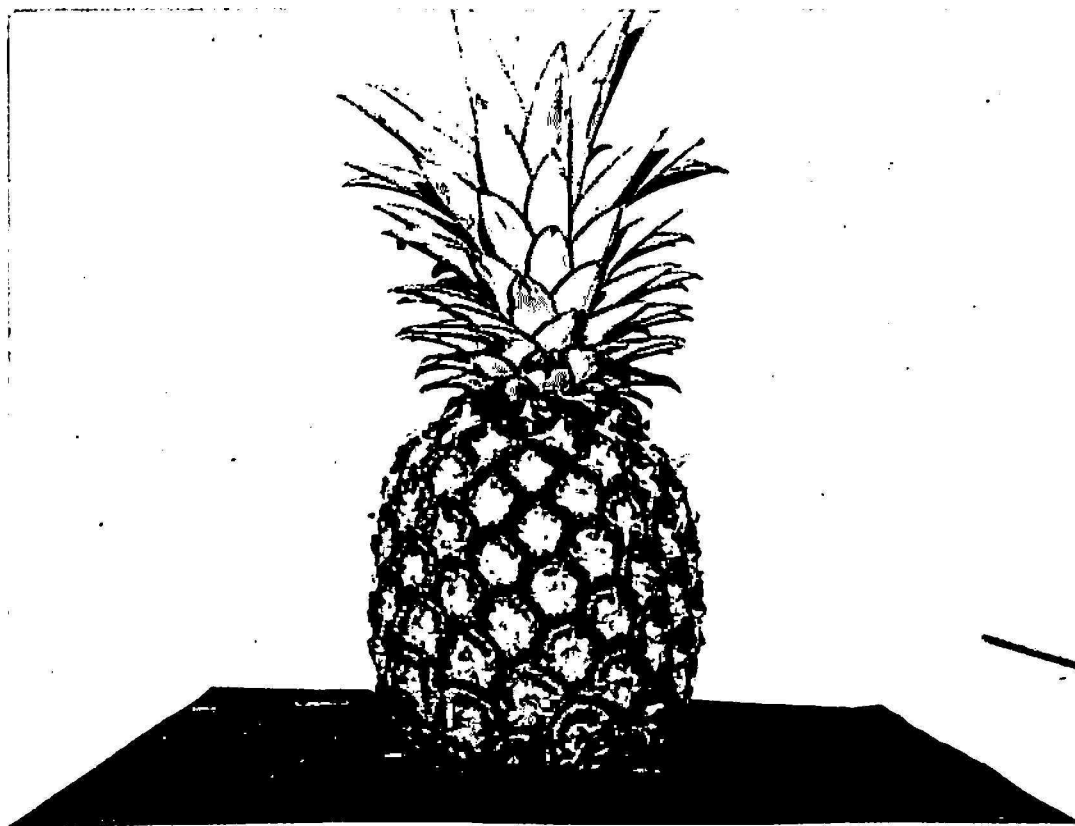


FIG. 5.—Fruit of pineapple variety P.R. 1-67.

area of attachment to the peduncle, measuring 5 cm. in diameter. The core thickness, however, is not considered excessive. Harvest is comparatively easy by use of a knife. The fruit dries out well when picked in the shipping green stage. The fruitlet has an irregular shape, more or less half way between that of the parents. These are so oriented as to permit their count in three directions, such as in Cayenne, though not as regular. When counted in the three directions, there are 13 rows from the bottom up the spiral



FIG. 4.—Pineapple variety P.R. 1-56.

towards the right, 8 rows from the bottom up following the spiral towards the left, and 21 rows from the bottom up in a near straight line.

In general this variety is very similar to Red Spanish, except in the color of the crown. Its pulp is whitish and seems when tasted to be less fibrous than that of the Red Spanish. The juice is very sweet and low in acids. This condition plus the fact that the fruit ripens uniformly from bottom to top, makes it a desirable fruit for fresh consumption. Another desirable trait is that it develops a good flavor even before it reaches full maturity. This characteristic may prove advantageous for shipping as fresh fruit to distant places. Moreover, it ships well.

Crown

The crown is normally single and is typically attached to the fruit without a narrow neck. The leaves are spiny with a reddish-brown tint on the blade.

Slips

The slips are the branches borne on the peduncle below the fruit. The plant bears from three to five slips near the base of the fruit but not attached to it.

This variety may displace Red Spanish in the fresh-fruit market. Due to its extreme vigor, it produces very good ratoons to a 4th crop. Its cost of production is less than Red Spanish because of its resistance to gummosis. It requires less weeding because of its vigorous growth. A new field can be established with fewer plants per acre. The peel may also be utilized as cattle feed because it does not require applications of chemicals for insect control purposes thus increasing the value of the crop.

VARIETY P.R. 1-67

This variety, formerly seedling 7D1S, is the second developed by the Agricultural Experiment Station. It was obtained by selection from open pollinated seed of Red Spanish grown in a field adjacent to Smooth Cayenne. The work was conducted by O. D. Ramírez and H. Gandía. The outstanding characteristics of this new variety are its excellent flavor as a fresh fruit, its resistance to gummosis and mealybug wilt, and its good size.

The plant is vigorous, producing fruit with an average weight of 5.8 pounds (fig. 5). It is sweet, juicy, and of excellent flavor. Brix ranges from 17 to 18 with an average of 17.75 and the pH ranges from 3.00 to 3.10. Yields of 32 tons per acre have been obtained.

DESCRIPTION OF A WELL DEVELOPED PLANT (fig. 6)

Stem

The stem is rather slender and long, with a length of about 69 cm. and a width of 6.5 cm. at the soil level and 6.7 cm. wide near the peduncle.

Peduncle

The peduncle is about 20 cm. long by 4 cm. wide and has 13 bracts, the longest averaging 68.5 cm. in length by 5.5 cm. in width at the midlength section, and the shortest 2.0 cm. by 1.18 cm. The five basal bracts are bright red.

Leaves

The plant has about 67 leaves, the longest averaging 83 cm. by 7.5 cm. wide at the midlength section, with straight margins covered with spines (single and double) and curved upward. They are hard, strongly cupped, and dark blue-green with a conspicuous silvery-gray undersurface.

Inflorescence

The flower cluster averages 9.5 cm. in length and 10 cm. in width. It is formed by about 112 florets, each one covered by a small triangular bract.



FIG. 6.—Pineapple variety P.R. 1-67.

Below the inflorescence, there are 13 additional, usually reddish bracts. These vary in size, the smallest ones being closer to the inflorescence and the longest to the peduncle.

The flower has three bluish-purple petals, six stamens, one style and a tricarpellary ovary.

Fruit

The fruit is borne at the apex of the peduncle. In form it tends to be cylindrical and flattened at the ends. It varies in size, having a normal

average weight of about 5.8 pounds, thus being larger than the Red Spanish. A single fruit weighing 5.3 pounds measured 15.3 cm. in length by 14 cm. in diameter, and had a core 2.7 cm. wide at the broadest portion. The area of attachment to the peduncle is smaller than that of P.R. 1-56. This fruit can be hand picked.

The eye or fruitlet has an irregular shape, half way between that of the parents. These are so oriented as to permit their count in three directions. If the fruitlets are counted from the base upward, following the spiral towards the right, there are 8 rows. When counted towards the left spiral, there are 13 rows, while along the fruit axis there are 21 rows.

Its pulp is very light yellow and seems when tasted to be less fibrous than that of Red Spanish. Its quality is good either in winter or summer. It tends to have a higher Brix and acidity than Red Spanish.

Crown

The crown is normally single though occasionally compound, and is attached to the fruit without a narrow neck.

Slips

The slips are borne on the peduncle below the fruit. The plant bears from three to five slips at the base of the fruit, but not attached to it.

The plant is vigorous, ratoons well and is resistant to gummosis and mealybug wilt. The fruit tends to be heavier than that of Red Spanish. With all these good characteristics, this new variety is expected to compete very favorably with Red Spanish in both the fresh market and cannery.

SUMMARY

A pineapple breeding project was conducted by the Agricultural Experiment Station with the purpose of developing better pineapple varieties that would be more profitable to the farmer. Two new varieties, P.R. 1-56 and P.R. 1-67, were developed under this project.

Variety P.R. 1-56, formerly seedling 1A2, is a Red Spanish \times Smooth Cayenne F_1 hybrid. The outstanding characteristic of this variety is its great vigor, particularly in the ratoon crop. It also is resistant to gummosis and mealybug wilt. The plant produces fruit with an average weight of 5.5 pounds each, and the fruit is sweet and of a very pleasant flavor. It can yield up to 30 tons per acre.

Variety P.R. 1-67, formerly seedling 7D1S, was selected from a progeny originated from Red Spanish open-pollinated seed. Its outstanding characteristics are its natural flavor, its resistance to gummosis and mealybug wilt, and its good size. The plant is vigorous and produces fruit with an

average weight of 5.8 pounds. The fruit is sweet, juicy and of excellent flavor. It can yield up to 32 tons per acre.

RESUMEN

Con el propósito de desarrollar mejores variedades de piña que sean más lucrativas para el agricultor, la Estación Experimental Agrícola inició un program de hibridación. Como resultado de este programa se desarrollaron dos nuevas variedades las cuales se conocen como la P.R. 1-56 y la P.R. 1-67.

La variedad P.R. 1-56 se conocía anteriormente como 1A2, y proviene de un cruce entre la Española Roja y la Cayena Lisa. Su característica más sobresaliente, lo es su gran vigor en la segunda cosecha. Además es resistente a la gomosis y a la marchitez. La planta produce una fruta con un peso promedio de 5.5 libras. La fruta es dulce y de sabor muy agradable. Con esta variedad se han obtenido rendimientos de hasta 30 toneladas por acre.

La variedad P.R. 1-67 se conocía anteriormente como 7D1S, y se originó de la semilla de la variedad Española Roja producida por polinización abierta. Algunas de las características más sobresalientes de esta variedad son el sabor de la fruta fresca, su resistencia a la gomosis y a la marchitez, y su buen tamaño. La planta es vigorosa y produce una fruta con un peso promedio de 5.8 libras. La fruta es dulce, jugosa y de un sabor excelente. Con esta variedad se han obtenido rendimientos de hasta 32 toneladas por acre.

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