

A New Citrus Variety—The Seedless Bibile Sweet Orange

A. V. RICHARDS, M.Sc. (Calif.), B.Sc. (Lond.), Dip. Agric. (Cantab.), A.I.C.T.A. (Trinidad),
Horticultural Officer

SUMMARY

MOST of the well known commercial citrus varieties such as the Marsh Seedless grapefruit, Washington Navel orange, Shamouti orange, Seedless Tahiti lime, Japanese Satsuma mandarin, &c., which have relatively few or no seeds, have originated as chance seedlings or bud sports of seedy types. The seedless Bibile sweet orange is a promising new citrus variety developed recently in Ceylon. It appears to have arisen as a nucellar seedling variant of the Bibile sweet orange, which is very seedy. Budgrafts of this variety produce fruits which are almost seedless and superior in flavour and quality to the seedling orange.

INTRODUCTION

Commercial varieties of citrus fruits which contain relatively few seeds generally command a premium in the world markets. But the preference is for citrus fruits of desirable varieties which are entirely seedless since it is easy to extract their juice, or prepare them for use at table as fresh or processed fruit. They can be left long on the tree to tide over periods of glut without danger of spoilage through germination of the seeds inside. The paucity of seeds also helps to reduce the drain of nutrient elements from the soil by the fruit crop.

SEEDLESS CITRUS VARIETIES

The most famous seedless citrus variety is the Washington Navel orange of California which is believed to have originated as a bud sport of the Selecta orange grown near Bahia, Brazil. One of the two budded trees of this variety obtained from the United States Department of Agriculture at Washington and planted at Riverside, California, in 1873 by Mrs. Eliza Tibbets is still alive, and it is from this early introduction that the entire Navel orange industry of California and most of the world has developed. In 1920 a grateful community dedicated a monument to her memory in the Eliza Tibbets Memorial Park at Riverside, California. The monument bears the inscription "To honor Mrs. Eliza Tibbets, and to commend her work in planting at Riverside in 1873, the first Washington Navel orange tree in California. Native to Bahia, Brazil, proved the most valuable fruit introduction yet made by the United States Department of Agriculture—1920".

Other well known seedless citrus fruits which develop parthincarpically are the Seedless Tahiti lime and the Japanese Satsuma mandarin. They are entirely seedless in solid plantings, but when grown with other citrus fruits in mixed orchards a seed or two may occasionally develop in the fruit. The Marsh grapefruit, Valencia and Shamouti oranges, and Eureka lemon contain relatively few seeds and are regarded as commercially seedless.

The Marsh grapefruit is believed to have originated from a seedling grapefruit tree, presumably of nucellar origin, on a farm near Lakeland, Florida (1). The Lue Gim Gong orange of Florida which produces nearly seedless fruits is also considered to be a nucellar variant from the seedling progeny of cross-pollinated Valencia (2).

Among the new seedless citrus varieties which are probably seedling variants of nucellar origin are the Davis grapefruit, a seedless type derived from a seedy parent which is better suited for canning than Marsh grapefruit owing to the firm texture of its pulp, and the Armstrong seedless lemon, sold by Armstrong nurseries, California, under United States Patent No. 342, which originated as an entire-tree budsport at Riverside, California (3).

LOCAL CITRUS VARIETIES

There is no record of the occurrence of budsports or nucellar seedling variants in local citrus varieties such as the Vavuniya and Bibile sweet oranges, local mandarin and acid lime which are generally grown from seed in village gardens. Being highly polyembryonic they invariably come true to type from seed although occasionally hybrid plants, mostly of undesirable type, are produced.

The Bibile sweet orange, which is a seedling variety, is grown extensively without irrigation in village gardens between Bibile, Maha Oya and Moneragala in the Province of Uva where soil and climatic conditions are very favourable for healthy growth of citrus. It makes an excellent squash orange as the fruits are juicy and somewhat more acid than the Vavuniya sweet orange which is essentially a dessert orange. But they are very seedy with an average of 10 to 12 seeds per fruit.

THE SEEDLESS BIBILE SWEET ORANGE

While judging fruit exhibits at an Agricultural Show held at Bibile in March, 1938, the writer came across a cluster of Bibile sweet oranges which contained fewer seeds in each fruit than the ordinary Bibile sweet orange. The parent tree which is still alive (Plate I), was located in a village garden at Etanawatte, near Bibile, with the assistance of the Agricultural Instructor. There are in the garden other seedling Bibile Sweet orange trees of about the same age bearing seedy fruits (Plate 2). Nothing definite is known about the history of the parent tree. It is about 25 to 30 years old and has in all probability originated as a nucellar seedling variant, for according to Frost (4) "it seems well established that occasional nucellar seedlings are genetically unlike their parents, and that valuable varieties have arisen in this way".



(Block by Survey Department.)

Plate 1.—The parent tree of the seedless Bibile sweet orange in a village garden at Etanawatte, Bibile.





(Block by Survey Department.)

Plate 2.—A view of the village garden showing the parent tree of the seedless Bibile sweet orange in the foreground with other seedling Bibile orange trees.



(Block by Survey Department.)

Plate 3.—One year old bud graft of the seedless Bibile sweet orange on rough lemon stock at the Citrus Station, Bibile.

Buds were selected from this tree by the writer on his return from study leave in California in 1940 and budded on the available rough lemon stocks in the nursery at the Citrus Station, Bibile. The budded progeny was planted out in a clonal plot on the station with other selected citrus clones for comparison (Plate 3).

The budded trees came into flower in about four years and set good crops (Plates 4 and 5). The fruits were found to contain fewer seeds than those of the seedling parent tree. Many fruits were entirely seedless (Plate 6) while a few had at the most only 2 to 3 seeds each though grown in a mixed orchard in close proximity to sweet orange, marmalade orange, grapefruit, mandarin, rough lemon and acid lime. But the flowers were found to have good pollen of bright yellow colour unlike those of the Washington Navel orange which is completely male sterile and does not produce viable pollen. The presence of own viable pollen does not apparently influence the production of seed to a marked degree in the Seedless Bibile variety. Pollination experiments are in progress to determine whether the clone is completely self sterile and whether the production of few seeds is due to the development of nucellar or gametic embryos through the stimulus of fertilization by own or foreign pollen. Solid plantings have also been made recently to see whether complete seedlessness would occur under such conditions (Plate 7).

The Seedless Bibile sweet orange matures a month or two later than the ordinary Bibile sweet orange which is in season in April-May. A second crop is often produced by the seedless budgrafts during the off season in November when oranges are generally scarce.

The fruits have a tendency to colour naturally on the trees, and when protected by paper bags against attack by the fruit piercing moths (*Othreis Sp.*) the colour becomes more intense and attractive. They are fairly thin-skinned, juicy and of excellent quality and flavour. The sugar-acid content of representative samples of fruit of budded seedless orange and seedling orange trees analysed by the Agricultural Chemist are given in table I.

TABLE I

		<i>Seedless Bibile</i> <i>Sweet Orange</i>		<i>Seedy Bibile</i> <i>Sweet Orange</i>
Av. weight of fruit	..	194.3 grms.	..	164.2 grms.
Av. volume of juice	..	86.5 cc.	..	64.4 cc.
Total Solids (Brix)	..	10.8	..	11.9
Citric acid	..	.92%	..	1.38%
Sugar/acid ratio	..	11.7	..	8.6

A fair comparison is not possible as the rough lemon stock is known to depress both the sugar and acid contents of fruits of most varieties of budded citrus in the early years (5). The fruits of the seedless budgrafts should therefore improve in flavour and quality as the trees age. The variety has been budded separately on other rootstocks such as the sweet orange, marmalade orange and sour lime in order to study its performance on different rootstocks in the various climatic zones of the Island. It has also been multiplied extensively on the rough lemon stock. Judging from its performance so far it bids fair to be one of the finest oranges grown in the tropics.

ACKNOWLEDGMENT

The writer's thanks are due to Dr. D. E. V. Koch, Agricultural Chemist, for determining the sugar-acid content of the sweet orange samples, and to Mr. Sidney Silva, Agricultural Instructor, Bibile, for assistance in conducting the pollination and budgrafting trials. He is also grateful to Mr. A. I. Wirasinghe of the Propaganda Division for taking the photographs.

REFERENCES

1. Robinson, T. R. .. The origin of the Marsh Seedless Grapefruit. *Jour. Heredity*, 1933, 24 : 437-439
2. Traub, Hamilton, P. & Robinson, Ralph, T. Improvement of Subtropical Fruit Crops : Citrus. U. S. Dept. Agric. Year book Agric., 1937 : 749-826. 19 figs (*Reprinted* as Year Book separate No. 1,589 (1938))
3. Webber, H. J. & Batchelor, L. D. The Citrus Industry, Vol. I, University of California Press, 1948
4. Frost, H. B. .. Genetics and Breeding—Chapter IX of the Citrus Industry, Vol. I., University of California Press, 1948
5. Richards, A. V. .. Influence of Rootstocks on quality of Citrus Fruits. *Tropical Agriculturist*, 1940, 94 : 354—61 Bibl. 9



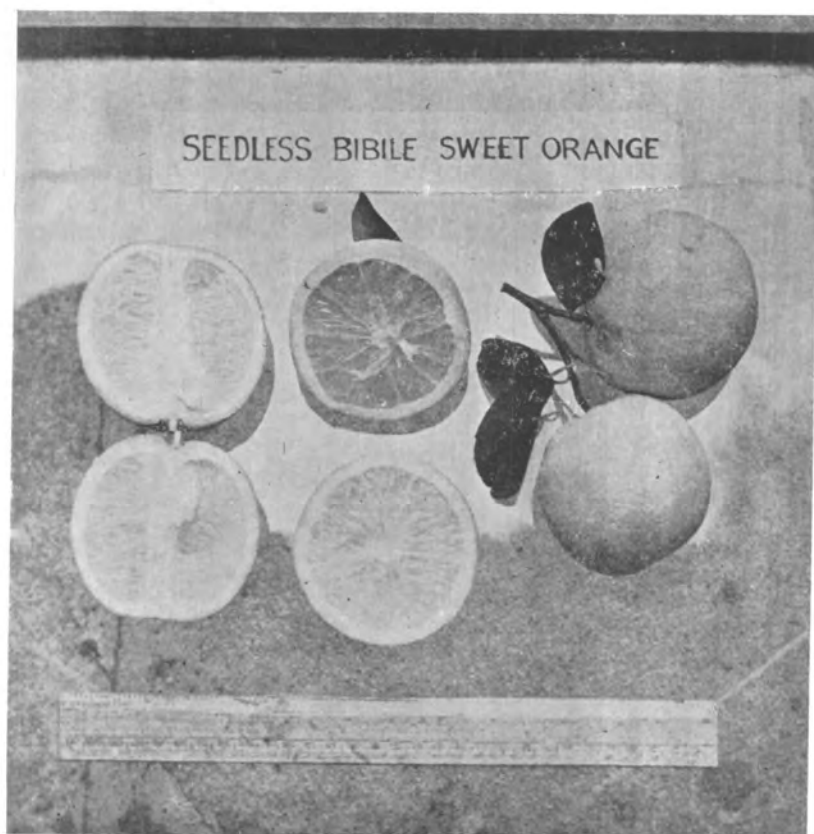
(Block by Survey Department.)

Plate 4.—Four year old seedless Bibile sweet orange tree on rough lemon stock in fruit at the Citrus Station, Bibile.



(Block by Survey Department.)

Plate 5.—A close-up of the seedless Bibile sweet orange tree in fruit at the Citrus Station, Bibile.



(Block by Survey Department.)

Plate 6.—Seedless Bibile sweet oranges from young budgrafts at the Citrus Station, Bibile.



(Block by Survey Department.)

Plate 7.—Solid planting of one year old budgrafts of seedless Bibile sweet orange on rough lemon stocks at the Citrus Station, Bibile.

