New, Superior Varieties of *Dioscorea alata*, the Asian Greater Yam[1]

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ABSTRACT

Ten varieties of the winged-stemmed yam, *Discorea alata*, which represent the best of a large collection from India to the islands of the Pacific, are described. These yams combine favorable field growth characteristics with good yields and suitable kitchen qualities. They are now being distributed by the Mayagüez Institute of Tropical Agriculture and should enrich the varietal base and replace lesser varieties in Puerto Rico and other areas of the tropics.

INTRODUCTION

Improved varieties of *Dioscorea alata* L., the water yam or winged-stemmed yam, are now available to the farmer. The first series of such yams was released and distributed in 1974.[3] The second series of selections, varieties entirely new to Puerto Rico and the Caribbean, is now being distributed. These new varieties, with their desirable tuber shapes, high yields, and superior cooking qualities, should displace less desirable varieties wherever they are tested and should provide a high-quality product for home and commercial use. This second series of yams represents the best of a large group of good varieties collected from India to the islands of the Pacific. The purpose of this publication is to describe the varieties and stimulate interest among those who might wish to obtain them.

MATERIALS AND METHODS

The yam cultivars in this collection were obtained as single tubers and multiplied one year in Mayagüez. They were then grown and judged yearly for three seasons in Mayagüez and one season in Isabela. They were evaluated for 100 characteristics observed in the field, at harvest, or in the laboratory both before and after cooking. From this evaluation and previous studies,[3] clear standards of cultivar quality were established. Inferior cultivars were eliminated early, and final selections were made on the basis of replicated yield trials and observations. Varieties were described with respect to morphological, physiological, and culinary characteristics.

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[3] Martin, F. W., Cabanillas, E., and Guadalupe, R., 1975, Selected varieties of *Dioscorea alata* L., the Asian Greater Yam, J. Agric. Univ. P.R. 59(3): 165–81.

TABLE 1.—*Information on source, outstanding characteristics, principal defects, and recommended use for new* Dioscorea alata *selections*

PI number	Common name	Recent source	Outstanding characteristics	Principal defect	Remarks
390096	Toki	Solomon Islands	Excellent in storage	Small size	Mechanical harvesting
390094	Taniela Vula Leka	Fiji	Excellent cooking qualities	Small size, poor yields	Mechanical harvesting
390080	Kinampay	Philippines	Purple color	Variable shape	Coloring for ice cream
390079	Kinabayo	Philippines	Excellent yields and shape	Poor storage	Commercial use
390078	Kabusah	Philippines	High yields	Poor cooking qualities	Animal feed
390072	Binugas	Philippines	Excellent cooking qualities	Tubers too large	Commercial use
390102	Gunung	Indonesia	Very high yields, excellent cooking qualities	Variable tuber shape	Multipurpose
390104	Purmay	Malaysia	Purple color, good in storage	Aerial tuber production	Coloring for ice cream
390101	Moresby	Papua, New Guinea	Excellent appearance and cooking qualities	Cortex often rough and corky	Commercial use
390093	Tanala	Papua, New Guinea	Excellent cooking qualities	Susceptible to leaf spot	Commercial use

RESULTS

Ten varieties were selected for their desirable characteristics. These varieties are listed in table 1 with information on their recent geographical origins. Their particular strengths and weaknesses are given, as well as judgment of their possible uses. The selections included several types with somewhat spherical tubers, judged suitable for mechanical

TABLE 2.—*Yields and other characteristics of selected yam varieties in a replicated trial (spaced at .6 × 1.6 m)*[1]

Variety	Tubers/plant	Kg/plant	Tons/hectare
Toki	1.53	2.59	23.3
Taniela Vula Leka	1.48	2.68	24.1
Kinampay	1.15	2.76	24.8
Kinabayo	1.46	3.90	35.1
Kabusah	1.18	3.11	28.0
Binugas	1.40	2.81	25.3
Gunung	1.71	4.40	39.6
Purmay	1.19	2.18	19.6

[1] Moresby and Tanala were not included in this trial.

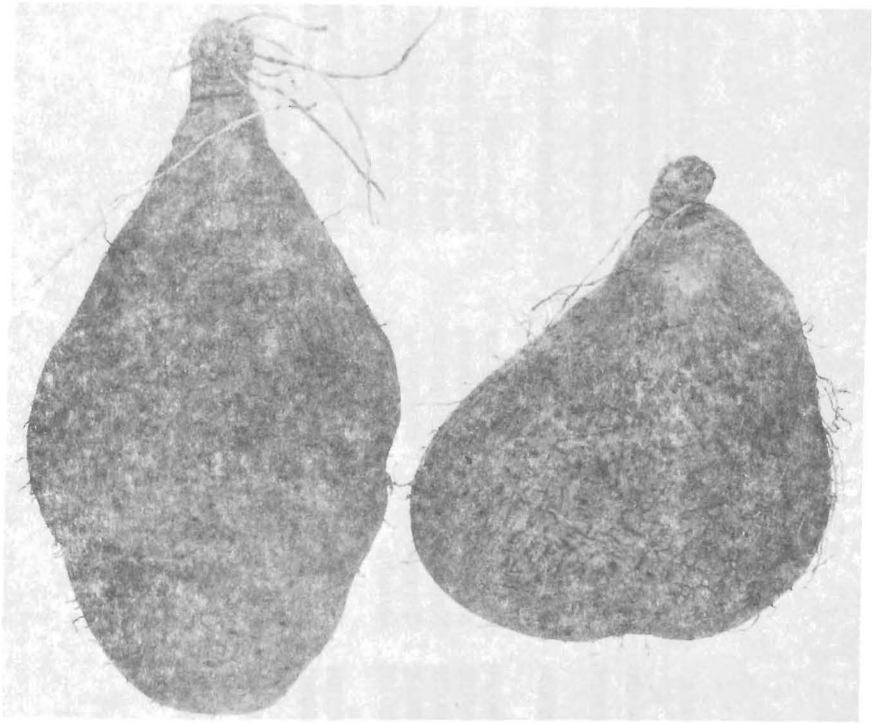

FIG. 1.—Tuber of the yam variety Toki (× 0.20)

harvesting. The flesh of two of the varieties (Kinampay, Purmay) is purple and is used chiefly in other countries for making ice cream. One variety with high yields, Kabusah, appears to be primarily suitable for animal feeds, because the flesh is coarse with a tendency to oxidize. One variety, Gunung, may be useful for various purposes. Yields were very high (39.6 tons/ha in one test), and cooking characteristics were excellent, but the tubers were irregular in shape. Several other varieties have potential for commercial use, because they are consistent and productive, and their tubers are well shaped.

Yields of the selected varieties in one replicated test are given in table 2. All of these yields are very good for Puerto Rico.

Descriptions of the varieties follow:

TOKI. Early, excellent sprouting, medium vigor, small ovate leaf with acute tip, very slight anthocyanin content, somewhat resistant to leaf spots, virus symptoms not seen, aerial tubers not seen. Yields medium, average of two tubers per plant, in form of a short cylinder with a slight neck, surface smooth with a few soft roots (fig. 1). Cortex slightly pink, flesh white, with highly uniform color, grainy in appearance, low

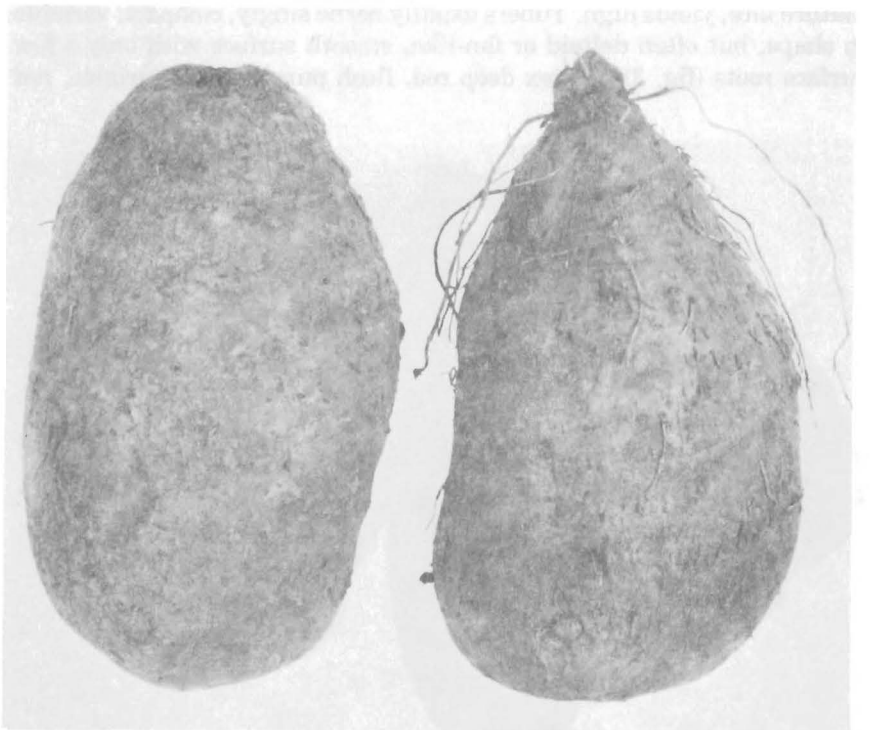

FIG. 2. – Tuber of Taniela Vula Leka (× 0.23)

oxidation tendency. Excellent for cooking, good color, moist, exceptional flavor, free of bitterness. Keeps especially well in storage and thus retains its excellent characteristics. Should be useful at medium spacing for mechanical harvest. Should make a superior commercial yam.

TANIELA VULA LEKA. Early, excellent sprouting, vigorous, medium-sized, ovate to narrowly sagittate leaves, anthocyanin content low, resistant to leaf spot diseases, virus symptoms not seen, aerial tubers not seen. Tubers mature late, yields medium to low. Tubers borne usually in threes, ellipsoidal in shape, smooth surface, free of surface roots (fig. 2). Cortex and flesh white and uniform, flesh grainy in appearance, rather gummy, low oxidation tendency. Among the best yams in cooking qualities, easy to peel, excellent appearance, moist with good flavor. Keeps well in storage and retains its flavor. Its chief defects are its relatively small size and poor yields. It is believed that closer spacing can compensate for these traits, thus making it a good commercial variety suitable for mechanical harvesting.

KINAMPAY. Excellent midseason sprouting, very vigorous variety with large ovate leaves, foliage colored by anthocyanin, resistant to leaf spot, virus symptoms not seen, aerial tubers not produced. Tubers mature late, yields high. Tubers usually borne singly, compact, variable in shape, but often deltoid or fan-like, smooth surface with only a few surface roots (fig. 3). Cortex deep red, flesh purplish but variable, not

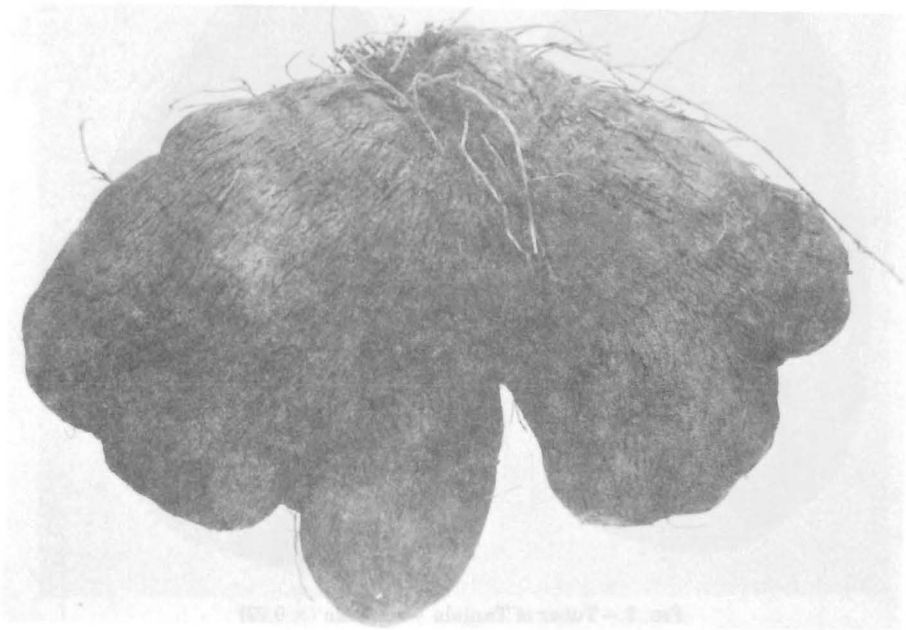

FIG. 3.—Tuber of Kinampay (× 0.17)

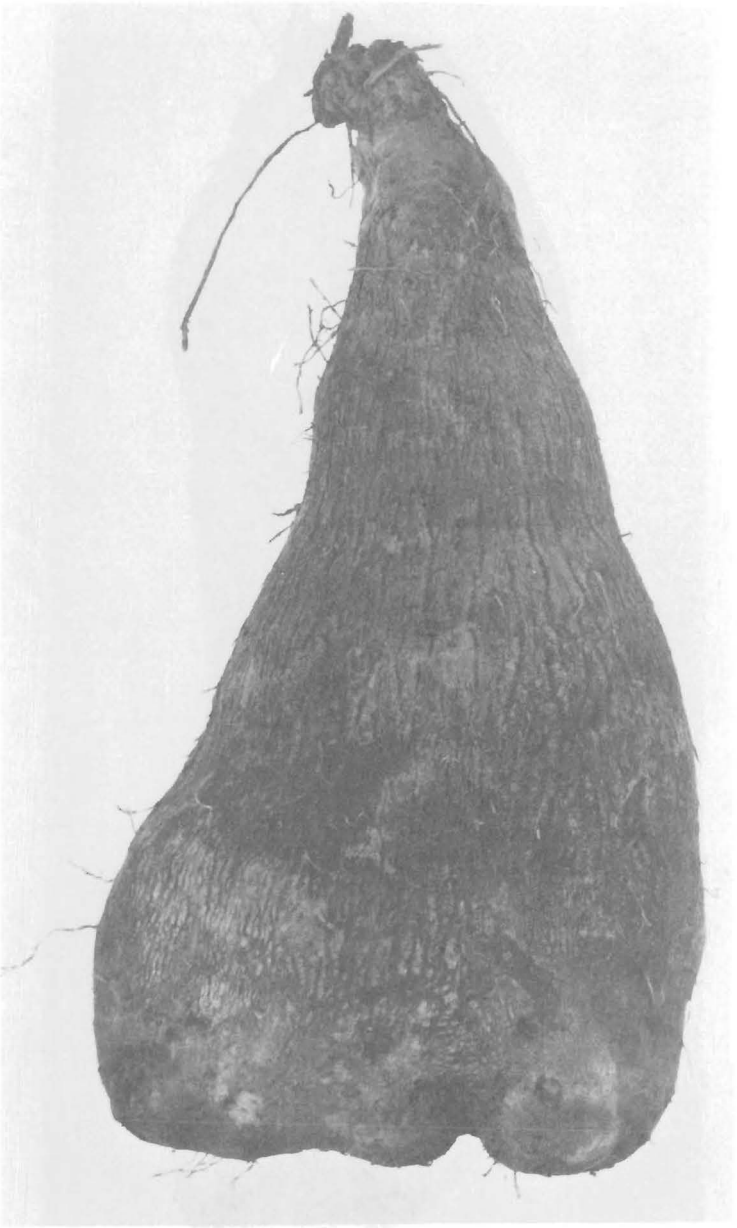

FIG. 4. – Tuber of Kinabayo (× 0.25)

uniform in appearance, some tendency to oxidize, heavy producer of gums, very grainy in appearance. This is a purple-fleshed variety and the cooked color is not attractive to everyone. The flavor is good. The yam feels grainy when tasted. Keeps well in storage, shows a slight

FIG. 5. – Tuber of Kabusah (× 0.25)

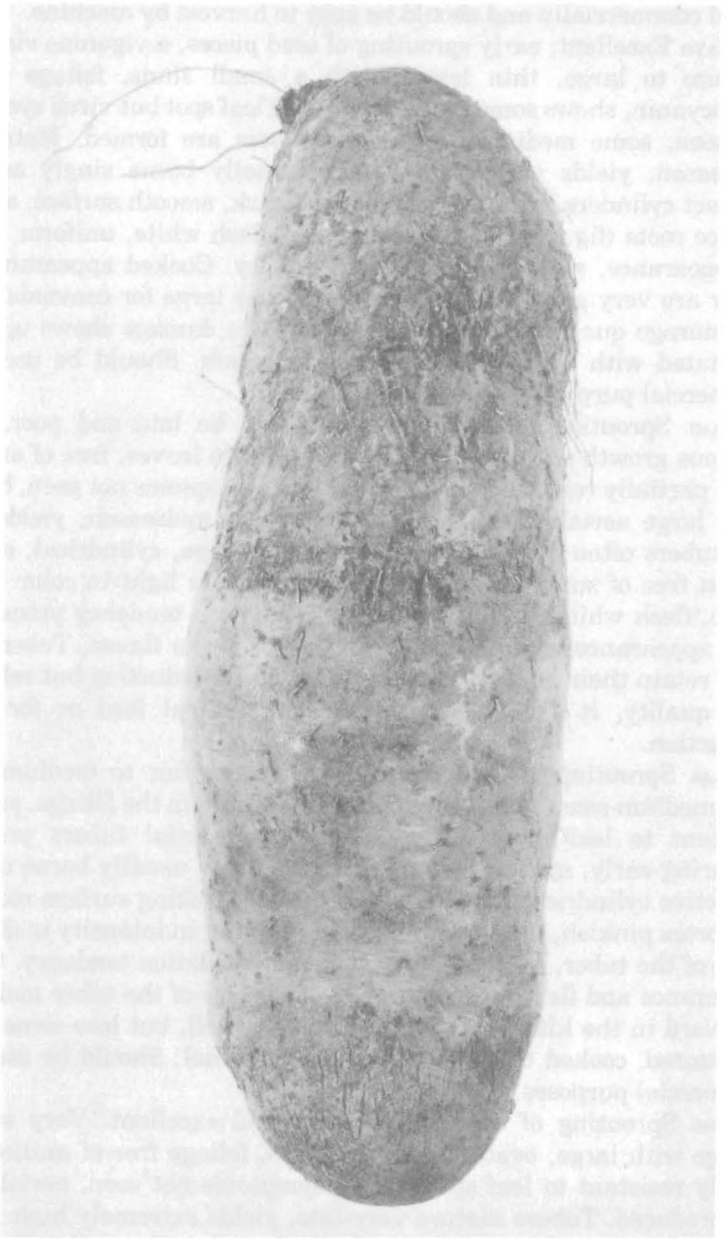

FIG. 6. – Tuber of Binugas (× 0.19)

tendency to crack. The best of the purple types examined, it should be useful commercially and should be easy to harvest by machine.

KINABAYO. Excellent, early sprouting of seed pieces, a vigorous vine with medium to large, thin leaves with a small sinus, foliage free of anthocyanin, shows some tendency toward leaf spot but virus symptoms not seen, some medium-sized aerial tubers are formed. Matures at midseason, yields very high. Tubers usually borne singly as thick compact cylinders, with thick protective bark, smooth surface, and few surface roots (fig. 4). Cortex red in color, flesh white, uniform, grainy in appearance, with low oxidation tendency. Cooked appearance and flavor are very good, but the tuber is rather large for convenient use. The storage qualities are poor, hidden insect damage shows up, often associated with rot; color changes to a cream. Should be useful for commercial purposes.

KABUSAH. Sprouting of seed pieces tends to be late and poor, fairly vigorous growth with medium-sized thin ovate leaves, free of anthocyanin, partially resistant to leaf spots, virus symptoms not seen, bearing some large aerial tubers. Tubers mature at midseason, yields good. The tubers often borne in twos, excellent shape, cylindrical, smooth, almost free of surface roots (fig. 5). The bark is light in color. Cortex white, flesh white, uniform granular, oxidation tendency pronounced. Poor appearance when cooked, and only average flavor. Tubers store well, retain their quality. Because of its high production but relatively poor quality, it should be useful as an animal feed or for starch production.

BINUGAS. Sprouting of seed pieces late but has fair to medium vigor, with medium-sized ovate leaves, no anthocyanin in the foliage, partially resistant to leaf spot, virus not seen, no aerial tubers produced. Maturing early, medium to high yields. Tubers usually borne in twos, attractive cylindrical shape, smooth surface, lacking surface roots (fig. 6). Cortex pinkish, flesh cream-colored, varying in intensity in different parts of the tuber, grainy appearance, low oxidation tendency. Cooked appearance and flavor excellent. The large size of the tuber makes use awkward in the kitchen. Tubers store very well, but lose some flavor. The stored, cooked tuber is harder than normal. Should be useful for commercial purposes.

GUNUNG. Sprouting of seed pieces early and excellent. Very vigorous foliage with large, ovate, leathery leaves, foliage free of anthocyanin, highly resistant to leaf spots, virus symptoms not seen, aerial tubers not produced. Tubers mature very late, yields extremely high. Tubers of complex fan shapes, very much thickened with swollen branches, relatively smooth surface otherwise, few surface roots (fig. 7). Cortex white, flesh white but not uniform. Oxidation tendency low, appearance

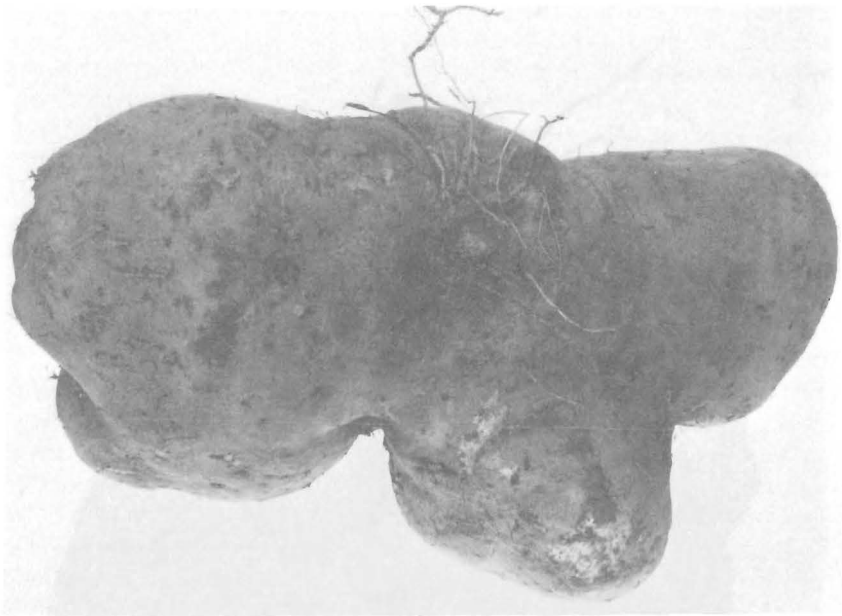

FIG. 7.—Tuber of Gunung (× 0.25)

is rather granular. Cooking appearance excellent, tubers moist, somewhat sweet, and very good. Difficult to peel. Stores very well and develops a pleasant, crisp texture and even more sweetness. Less inclined than most to shrivel. Because of its excellent yields it merits some attention for home, commercial, and industrial uses.

PURMAY. Sprouting of seed pieces late but excellent, extremely vigorous foliage with very large ovate leaves, red with anthocyanin, very resistant to leaf spot disease, virus symptoms not seen, produces many large purple-fleshed aerial tubers. Tubers mature medium to late, yields medium to low. Tubers almost spherical in shape, very uniform, smooth but thick-barked, some heavy roots on surface (fig. 8). Cortex deep red, flesh purple but not uniform, very grainy appearance, low oxidation tendency. Cooked, the purple appearance is upsetting to some people, but the taste is excellent. An easy tuber to peel, but somewhat large. In storage this variety is particularly slow to sprout, keeping quality is excellent. Collected in Malaysia, it is an excellent purple-fleshed type that should be of high commercial value wherever this color is appreciated.

MORESBY. Early, good sprouting. Vigorous foliage, sagittate leaves with overlapping lobes, susceptible to leaf spot disease, free of virus. Aerial tubers not produced. Tuber matures early, yields high. Tubers produced in twos and threes, compact with a slight tendency to fork, surface

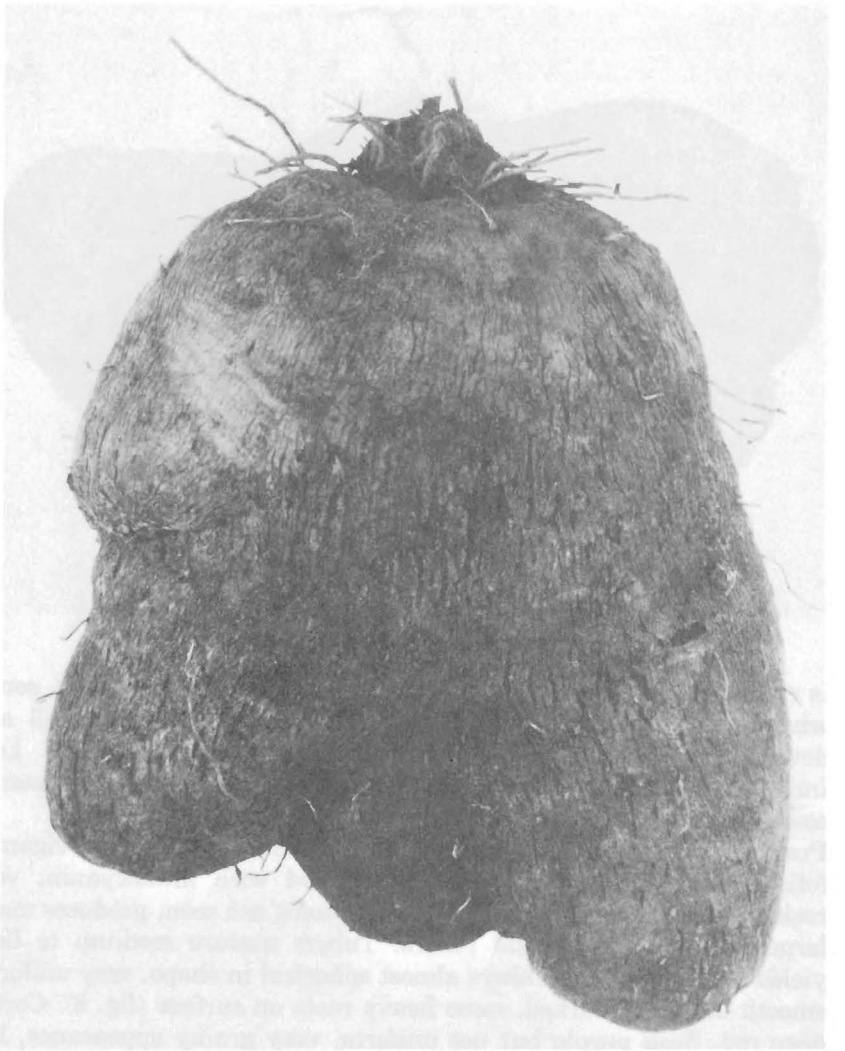

FIG. 8. – The purple fleshed tuber of Purmay (× 0.25)

fairly smooth, with thick, corky bark and some fibrous roots. Low incidence of insect damage. Flesh white, grainy in appearance, low oxidation tendency. Excellent cooked appearance and taste, stores well. Suitable for commercial use.

TANALA. Early and very good sprouting, vigorous foliage, sagittate, cupped leaves, almost free of anthocyanin, susceptible to leaf spot and virus. Tuber matures early, yields good. Tubers produced in pairs with one often much larger than the other, compact shape but not uniform,

cortex thick, surface smooth with a few fibrous roots. Flesh white, grainy in appearance, low oxidation tendency, excellent cooked appearance and taste, stores well. From Papua, New Guinea. Recommended for commercial use.

DISCUSSION

Because the winged-stemmed yam does not reproduce itself sexually, the varieties found in any particular area are often those that arrived by chance. Thus, an excellent opportunity exists to improve the status of this yam by introduction and testing. Now a series of varieties have been introduced and selected for superior quality in Puerto Rico, and their widespread use should improve not only the production of yam but also the image of yam in Puerto Rico.

RESUMEN

Se describen diez variedades sobresalientes del ñame de agua, *Dioscorea alata*, que forman parte de una vasta colección que abarca de la India a Oceanía. Estas variedades combinan un buen crecimiento, buenos rendimientos y características culinarias deseables, por lo cual enriquecerían el caudal de variedades superiores que podrían reemplazar las de menos valor en Puerto Rico y otros lugares del trópico.