Dioscorea nummularia Lam.: The Primary Edible Yam of Western Samoa

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ABSTRACT

The authors feel that, in W. Samoa, the importance of Dioscorea esculenta and D. alata has been overestimated and that of D. nummularia underestimated. Thus the literature on the latter is reviewed and observations from village production and a variety collection are reported.

D. esculenta is eaten only on the western tip of Savaii island and other Samoans deride people of that district since sweet root crops such as sweet potato are generally disliked. Only D. alata "ufi tau" and D. nummularia "palai" are marketed. However, even in the June through August D. alata season, "palai" is more common in the market. The solid texture and high dry matter of the latter is preferred by Samoans. Four "palai" cultivars are recognized: 'maoi (Samoa)' has a dark spiny stem, 'Niu Kini (New Guinea)' has a thicker less spiny stem and curving tubers, 'ulu' has a large protocorm, and 'lau palai' has lighter stem and leaves.

D. nummularia is also the primary marketed yam in Suva, Fiji.

While reading the literature on yams in the Pacific, it appeared to the authors that the importance of Dioscorea alata and D. esculenta has been overestimated and that of D. nummularia greatly underestimated, particularly in Western Samoa. Martin has suggested that systematic studies of the neglected minor species D. nummularia, D. transversa and D. pentaphylla be given priority in yam research. Thus the authors have reviewed the literature on D. nummularia and have initiated trials on this species (Chandra, 1979; Yen, 1979; Jackson, 1980; Sivan, 1980; Martin, 1981; personal observations).

D. nummularia Lam. originated in South-East Asia. Today it is cultivated in Indonesia and is the most important Dioscorea species in parts of New Guinea and some Pacific Islands. Nonetheless, it has been neglected in germplasm collections. In Indonesia only two cultivars from east Java have been collected, in the Solomon Islands the collection has been small until very recently, and the yam collections in Papua New Guinea, Philippines and Fiji presently contain no accessions of D. nummularia (Burkill, 1951; Spencer, 1966; Coursey, 1967; Damania and Williams, 1980; Jackson, 1980 and personal communication; Sivan, personal communication).

D. nummularia belongs to the section Enantiophyllym of the family Dioscoreaceae characterized by vines which twine counter-clockwise (twining to the right). Stems are round in cross-section with dense spines and occasionally indistinct ridges at the base. The upper portion of the vine is glabrous. Tubers, which can be as deep as one metre, are large, deeply lobed, almost independent, with each lobe deltoid. Roots are wirey and flesh is white to red. Leaves are large, cordate or elliptic, with the lower ones opposite and upper alternate. Flowers are in racemes, the males in groups of one to four racemes each up to 4 cm long. The females are in groups of one or two racemes each up to 15 cm long (Barrau, 1956; Massal and Barrau, 1956; Coursey, 1967; Martin and Degras, 1978).

D. glabra Koorders non-Roxb., D. palauensis Knuth, D. hebridensis Knuth, D. seemanii Pr. and Burk., and D. pirita Nadeaud are either synonymous with or subspecies of D. nummularia Lam. In addition several other species recognized by Knuth are also synonymous, including D. angulata, D. glaucoidea, D. lufensis and D. raymundii. Likewise D. divaricata Blanco is very similar, differing from D. nummularia only in the straightness of the lamina margin (Burkill, 1951; Barrau, 1956; Coursey, 1967).

Distribution

D. nummularia on Hai-nan island, China, is locally called "toa tu tang". In Malaysia its name "tali cupang" is derived from the fact that the stem is sometimes used as cordage and in eastern Malaysia, northern Kalimantan and Sulawesi, Indonesia, it has been described as deep growing, low yielding and high in saponin. In Indonesia D. nummularia is called "sounda" in east Java, "marau" in the Hermit islands, and "waro" on Amboina. In contrast to other Dioscorea species which are differentiated by cultivar name, the wild D. nummularia in Sunda, Indonesia, and among the Sambali of Luzon, Philippines, has the same vernacular name as Smilax sp. However, on eastern Luzon wild D. nummularia had more than one series of vernacular names. In the Philippines the typical variety has been called vera, while var. glauca is distinguished by glaucous capsules. Knuth also recognized var. lata with broad leaves. Tagalog name on Luzon is "ubing basol", it has the name "banan" on Mindanao, while in the Republic of Belau in Micronesia to the east it is called "detachel" (Prain and Burkill, 1959; Burkill, 1951).

In Papua New Guinea the names "kiloma", "boku" and "sinngo" have been used in the literature for D. nummularia. It has been reported from the north and south-east of the mainland, and on the islands of Louisade, New Ireland and Bougainville. In Goroka highlands it is a minor cultivated crop in addition to being gathered from the wild and in west New Britain where it is biennial and weedy, the Sengseng often harvest it from wild populations (Prain and Burkill, 1939; Barrau, 1956; Brookfield and Hart, 1971; Yen, 1979; Bourke, 1980).

Although D. nummularia was not recognized in the early literature of New Caledonia, thirty cultivars have now been identified from the country as a whole and fourteen cultivars including two wild ones have been identified in Poya alone. Cultivar 'bwet' was described as being less susceptible to excess soil magnesium and it absorbed relatively less iron, nickel and chromium than the D. alata tested. In addition, 'bwet' had better taste and larger starch grains than D. alata but stored poorly (Barrau, 1958; Bourret, 1973 in Martin and Degras, 1978; Bourret, 1975).

In the Solomon Islands D. nummularia is locally called "karausu" and "puutiko." Eight cultivars from Guadalcanal have been recorded as 'uvi matua', 'uvi vatu', 'uvi chamba' 'chavuli', 'kaipuchi', 'ngoti hila', 'ngoti tambu ni bela' and 'sambina'. These were largely found in the interior but with some in the west and at Longgu. Vines of these cultivars were generally many (10-20), with spines ranging from large and many to very few. Tubers varied in number and shape, some being round in cross-section, others square, generally deeply placed, although one cultivar was reported to produce shallow tubers. One cultivar produced small tubers within the first year but most required three or four years to produce a reasonable yield and most produced tubers with hard flesh although one cultivar typically had soft flesh and tubers rotted easily (Barrau, 1956; Tedder and Tedder, 1974).

On Anuta, a Polynesian outlier island in the Solomon Islands, D. nummularia was mapped in central and eastern parts of agricultural zone III. It was called either "uporoi" or "Taumako", the former after Upolu, W. Samoa and the latter after a neigh-boring outlier. The tubers produced were illustrated as large, round and irregularly shaped. In contrast, D. alata and D. esculenta were mapped in only one area in zone VI with small plants and tubers (Yen and Gordon, 1973.)

In Vanuatu, D. nummularia is called "pango" and "loopitiko", the latter being similar to the "puutiko" name used in the Solomon Islands. On Ponape, Federated states of Micronesia, D. flabellifolia Pr. and Burk. reported in the literature to grow in the mountains and to be used during famine is most probably D. nummularia cultivar "kap nair" or "kapin-air". D. nummularia variety "sep" reported from yap appears to have a corrugated leaf like D. bulbifera (Glassman, 1952; Sasuke, 1953; Barrau, 1956; personal observation.)

In Fiji D. nummularia is called "rauva (-dua)", "tivoli", "tikau" or "san shue" in Cantonese, while in the Lau islands of eastern Fiji it is locally called "tchivoli", a name similar to one from the Solomon Islands. Generally it grows below 500 m elevation. It has been reported to be rare (less than 2%) in Suva home gardens as compared to 2-9% for D. alata, but in the Suva market it is definitely more important than D. alata. In 1975 and 1976 D. nummularia was recorded during 33 of the 35 market surveys with a mean abundance score of nearly 3 out of a maximum of 4 (very abundant). Although it was available year-round, tubers were most abundant in the months April through November. One Saturday in November 1981 the senior author observed that yams in the Suva market were almost exclusively D. nummularia with cultivar "tivoli" dominating. Only one Chinese merchant was selling D. alata "uvi" which was sprouting and spoiling. On Vanuabalavu island in the Lau group, wild "tivoli" and "tikau" yams were reported as common in the 1920s and 1030s, but have almost disappeared today due to extensive clearing of the forests (Barrau, 1956, 1961a; Thaman, 1976/1977, 1978a; Thaman and Ba, 1979; Smith, 1979; personal observations).

In tonga cultivars "ufi fisi", "ngu" and "tuaata" commonly found in cooperative yam gardens on Tongatapu may be D. nummularia but this species has not been reported from Vavau in northern Tonga (Prain and Burkill, 1959; Thaman, 1978b).

"Ufi parai" is the name given to D. nummularia on Rarotonga and on Niue it is called by a similar name "uhi palai". On the latter it has been reported to be scarce and to produce several long, slender, white tubers (Barrau, 1956).

At Fatuhiva, Marquesas Islands, the yam originally identified as the African yam D. cayensis Lam. has now been reidentified as D. nummularia. The two species are similar in appearance and easily confused, but D. nummularia usually forms deeper tubers and required much longer (2-3 years) to produce a reasonable yield. In the Society Islands, including Tahiti, and on some of the Cook Islands, "pilita" or "pirita were names for D. nummularia (Nadeaud, 1873; Brown, 1931; Barrau, 1956, 1961 a,b; Coursey, 1967).

In recent times two cultivars of D. nummularia have been introduced into Puerto Rico and the cultivar "wael" from New Caledonia with a chromosome number of 2n=80 was recently introduced into French West Indies where it has been reclassified as D. transversa R. Brown based on the fact that it had alternate leaves except near the vine apex, sparsely scattered spines near the base, profuse vine growth, triangular glossy leaves, and numerous club-shaped tubers (Bourret, 1973, 1975; Degras et al., 1971; Martin, 1974; Essad et al., 1978 in Degras, 1978).

"Ufi Palai" Cultivars in Samoa

In western Samoa four cultivars of D. nummularia are recognized. "palai maoi" or "palai samoa" has very spiny, dark stems and leaves with primary leaf veins at an acute angle. Flowering may occur after two to three years of growth at the time when it is ready for harvesting. Male flowering is common but three female plants were found in different locations in July.

"Palai niu kini", as indicated by its name, is an introduction from New Guinea. Like "palai maoi" it has a dark stem but it can be distinguished by the fact that the stem is less spiny and the tubers curve upwards towards the soil surface. In addition, its leaf is longer from the petiole junction to the apex with the sinus at an obtuse rather than an acute angle as compared to "palai maoi." The quality of "palai niu kini" is reportedly best when it just begins to resprout but after that time it becomes unpalatable. When harvested in August and immediately replanted sprouting occured at the end of October (Lamauta T., personal communications; personal observations).

"Lau palai" has a light green stem bearing leaves with veins at approximately right angles. The tuber shape is similar to that of "palai "maoi" which grow somewhat horizontally and therefore develop closer to the soil surface. Also it and "tue. has been reported to have broader leaves and shorter tubers than "palai maoi" (Christophersen, 1935; personal observations).

The fourth cultivar, "palai ulu", has a distinctive corm from which the tubers develop and has a bluish-green stem with wide upturned scale-like spines. A possible fifth cultivar "palai vao" has been reported but is probably "palai maoi" which has escaped from cultivation in abandoned plantations. Parham has included Christophersen's record of "ufi vao" with D. nummularia, but "ufi vao" inland of Sapoe, Upolu Island, was observed by the senior author to be D. alata (Christophersen, 1935; Parham, 1972; Onwueme, 1978; personal observations).

Two steamed and one boiled samples of D. nummularia harvested from a home garden in western Samoa averaged 38.6% dry matter and it is this high dry matter which gives the species the hard texture so much preferred by Samoans. In contrast, D. alata "ufi vao" and "ufi tau" ranged from 21% to less than 27% dry matter and D. bulbifera L. "soi" bulbils which are considered poisonous ranged from 23.8 to 27.4% dry matter (Pratt, 1911; Cable, unpublished data).

Data from market surveys conducted in Apia for the first week in each month of 1979 except January indicated that yams are only a minor cash crop in western Samoa. Each week total weight sold of the staple carbohydrates including taro, green bananas, Alocasia sp., breadfruit, yams and husked coconuts ranged from about 110 to 210 tonnes, whereas the maximum sale of yams reached only 0.3 tonnes in the two months August and December. Data for yams included both D. alata and D. nummularia but sale of the former is significant only in August during the cool, dry season when this species becomes dormant and sheds its leaves. At other times of the year D. alata is unpalatable and D. nummularia is the only species in the market. D. esculenta (Lour.) Burk. "ufilei" is not marketed. It is now found only in the driest Falealupo district on the western-most tip of Savaii. Most Samoans deride those from that district for eating the sweet tubers of "ufilei" since sweet tasting root crops such as sweet potato are generally disliked. Likewise D. pentaphylla L. "pilita", also called "lena" on Tutuila, is rare (Pratt, 1911; Setchell, 1924; Christophersen, 1935; Parham, 1972; Economic Analysis and Planning Division, 1979a-d; Leuluai J. W., personal communication; personal observations).

In American as well as western Samoa villages "palai" are normally planted in mounds and trellised on poles to trees 5-6 m away. Each family generally has no more than twenty or so plants of the different "palai" cultivars. Stones often are used to surround the mounds and coconut husks and mulch may cap the top as well. Whole corms with several tuber initials or sections of individual upper tubers may be planted with or without pre-sprouting. Because of the effort in digging the relatively long tubers, harvest is usually delayed until after two years. In lithic soils the corm tops may by that time begin to protrude from the ground. Yield data are not available but one "palai niu kini" plant harvested from a home garden produced a 4-branched tuber weighing 21.2 kg. It descended 63 cm into the soil and the dried remnants of the previous years's 4-branched tuber was attached to the same corm. This indicates that D. nummelaria is not perennial as sometimes reported (Merrick, 1977; Martin and Degras, 1978; personal observations).

There is a Samoan legend concerning the "palai" (tivoli") yam in Fiji. One of the numerous Sina married the king of Fiji. Her brother Pili went to visit her but hid in the bush being evidently doubtful of his brother-in-law's reception. He asked the birds and trees how he could arrange a meeting with his sister and the "palai" yam offered to send out one of his "tolo" vines to Sina's door. As Sina came out, her foot caught in the vine and since at that time there was a shortage of food in Fiji, Sina followed along the vine to find the tuber. There she found her brother. Since "palai" yam is very long, Sina broke off only a piece of it an returned home. Every day she returned to meet her brother and broke off another piece of yam. As she had followed up (tuli) the broken-off tuber (matanau), the tuber was called "tuli matanau". Hence repeated attempts at meetings or consultations to effect unity is referred to as "tuli matanau, le ufi o sina" (Tuli matanau, the yam of Sina) (Hiroa, 1930).

Acknowledgement is made of Dr. M. Asghar and Mr. J. Breen who reviewed the manuscript, and of Mr. I. Sagaga who performed dry matter analyses.

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