

Coconut Varieties in Thailand

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Abstract

Coconut is an ancient crop. Numerous varieties exist in Thailand as well as in other coconut-growing countries throughout the tropics. These can be grouped into two main forms, tall and dwarf. The tall form has a bole at the base of its tall, majestic trunk; it is cross-pollinating and late bearing. The dwarf form lacks a bole, is short in stature; it is self-pollinating and early bearing. A key to the identification of Thai coconut varieties is devised by the author based on overall tree height, presence or absence of bole, earliness of flowering, mode of pollination and various other morphological characters.

The tall form includes the following varieties: Hua Ling, Thalai Roi, Pak Chok, Pluak Wan, Klang, Maphraeo, So, Yai, and Yai Phiset. The dwarf form includes: Mu Si, Nok Khum, Nam Hom, Mu Si Khieo, Thung Khlet, Mu Si Luang, Nalike, Mu Si Som, Fai, and Pathiu. In addition, there is a miscellaneous group consisting of rather rare coconut varieties whose affinities are not clearly understood; this includes Phuang, Tuen Dok, Thale Ba, Nim, Lao Tan, and Kon Chuk.

A short description of all varieties is given together with a discussion on the possible origin of the coconut in Southeast Asia; the presence of varieties for specific purposes; and the economically important varieties in Thailand which include young tender coconut having aromatic or sweet water, hybrids for copra production, and those which are used for sugar production.

Keywords: Tall, dwarf, bole, pollination, precocious bearing, Mu Si, spicata,

Introduction

Coconut, *Cocos nucifera* L., is an ancient crop, and one of the most common in Thailand and in the tropics in general. There is, however, no suitable botanical classification of forms within the species. It is well known that coconut consists of two forms, tall and dwarf. The tall form is majestic with a stout trunk arising from a swollen base, or bole; it can attain a height of 20 m or more. This form is late maturing, less precocious, and predominantly cross-pollinating as male and female flowers do not bloom simultaneously. Populations are highly heterogeneous. The tall form is the ordinary plantation coconut and is known for its larger-sized nuts and superior quality of copra. The dwarf coconut, on the other hand, is characterized by its short stature,

narrow trunk, lacking a bole, and earliness in bearing. It is self-pollinating and thus genetically more stable, producing fairly uniform populations. The dwarf form is generally grown as a novelty and is cultivated sporadically. It is generally more productive, producing small-sized nuts and copra of inferior quality.

The following classification of varieties comprising these two contrasting forms is based on overall tree height, presence or absence of bole, earliness of flowering, mode of pollination, composition of principal fruit components, yield, and various other morphological characters. A key was devised for the identification of Thai coconut varieties, but could easily be modified for use in other countries.

Key to the Identification of Thai Coconut Varieties

- A. Palm tall, late-bearing, with bole
 - B. Fruit very small (750 g)
 - C. Few in a bunch *Hua Ling* (1)
 - CC. Numerous in a bunch *Thalai Roi* (2)
 - BB. Fruit medium to very large
 - D. Fruit medium
 - E. Fruit long *Pak Chok*+ (3)
 - EE. Fruit broad
 - F. Husk sweet, edible ... *Pluak Wan* (4)
 - FF. Husk not sweet, inedible
 - G. Inflorescence branched *Klang**+ (5)
 - GG. Inflorescence unbranched *Maphraeo*+ (6)
 - DD. Fruit large to very large
 - H. Fruit large
 - I. Nut angular *So** (7)
 - II. Nut not angular *Yai**+ (8)
 - HH. Fruit very large *Yai Phiset**+ (9)
- AA. Palm dwarf, early-bearing, without bole *Mu Si*** (10)
 - J. Fruit very small (750 g) *Nok Khum* (11)
 - JJ. Fruit small to medium
 - K. Fruit small (800-900 g)
 - L. Fruit green
 - M. Liquid endosperm aromatic *Nam Hom* (12)
 - MM. Liquid endosperm not aromatic
 - N. Normal bearing... *Mu Si Khieo* (13)
 - NN. Prolific bearing *Thung Khlet* (14)
 - LL. Fruit not green
 - O. Fruit yellowish
 - P. Fruit yellow *Mu Si Luang* (15)
 - PP. Fruit ivory color *Nalike* (16)
 - OO. Fruit reddish
 - Q. Fruit orange-red *Mu Si Som* / *Mu Si Daeng* (17)
 - QQ. Fruit apricot-red *Fai** (18)
 - KK. Fruit medium (1075 g) *Pathiu* (19)

Description of Thai Coconut Varieties

In accordance with the Key, coconut varieties in Thailand can be grouped into two main categories, namely: (i) tall palms which are late-bearing and produce a bole at the base of the stem, and (ii) dwarf palms which are early-bearing and without a bole. A third category, 'miscellaneous', may be added to include several other peculiar, uncommon variants, or those whose status is not clearly understood.

Group I: Tall palms, late-bearing, with bole

1. *Hua Ling*: The varietal name of this variety is derived from two Thai words, *hua* (head), and *ling* (monkey). This varietal name was probably originated from the appearance of the nut which resembles a monkey's head. The palm is tall and its fruits are very small, about 10 cm in diameter, and weighing more than 750 g. The two blind 'eyes' are conspicuously swollen (resembling the eyes of the monkey!). Its shell is popularly used in making several household utensils, e.g. *Krabuai* (a deep large spoon or dipper), *Chauk* (a small drinking cup). It is a rare coconut variety which is in danger of extinction due to increasing under-utilization, i.e. utensils made from its shell are being replaced by metal and plastic products (Figs. 1 and 2).

2. *Thalai Roi*: This name is derived from two Thai words, *thalai* (bunch) and *roi* (hundred), referring to its large bunches of fruits, an outstanding characteristic of this rare variety, and probably caused by a hereditary abnormality (Figs. 3 - 5). Each inflorescence

* The Thai word for coconut is 'Maphrao'. It is customary to put this word in front of some varietal names, e.g. *Maphrao Klang*, *Maphrao Yai*, *Maphrao Fai*, *Maphrao So*, since without it, the names are ambiguous.

** *Mu Si* is the collective name of a group of dwarf varieties of Thai coconut which are early bearing. In addition to specific varietal names listed, namely *Nok Khum*, *Nam Hom*, *Thung Khlet*, *Fai*, *Nalike*, *Pathiu*, they can also be named according to the color of the fruits, viz. *Mu Si Khieo* (green), *Mu Si Luang* (yellow), *Mu Si Som* (orange).

+ These varieties exhibit color variation from green to several shades of brown.

produces numerous female flowers, sometimes as many as 180 (Fig. 9). Not all flowers set normal fruit, however, as some fruits abort early (called in Thai *thui*, referring to different fruit shapes and sizes, depending on the degree of abortion). The number of full-sized fruits is about 80 per inflorescence; a record high of 145 was observed on the mother palm located at Ao Luk subdistrict, Thai Muang district, Phangnga province in southern Thailand. The owner stated that he obtained the seednut from a fruit floating in the Andaman Sea which landed on the beach near his house. It may prove to be the same variety as the Laccadive Micro of India since they both have similar characteristics (DOA 1964). From this mother tree, seed nuts have been planted in several places, e.g. Sawi Coconut Experiment Station (now called Chumphon Horticultural Research Center).

This palm is tall and smaller than the typical Thai *typica* variety, 'Maphrao Yai'. It has a little but distinct bole, and a slightly curved trunk with a diameter of 97 cm one meter above ground. It begins bearing fruit eight years after planting. The midrib of the 14th leaf is 526 cm long (Thirakul and Harris 1982). The fruit is rather small (763 g) as a result of prolific production, long, and green or brown in color. Young fruits produce rather sweet water.

3. Pak Chok: The name of this variety originates from the name of a village on Khao Phra Thong island, Kho Khao branch-district, Ranong province, southern Thailand, where the variety was first discovered. Legend has it that a long time ago, a Chinese junk loaded with coconuts encountered a storm and capsized upon reaching the island. The coconuts floated towards the shore, then germinated and grew to become a distinct variety.

This palm is tall with a small bole and slightly curved trunk with a diameter of 101 cm one meter above the ground. The length of the midrib of the 14th leaf is 522 cm (Thirakul & Harris 1982). Its fruits are medium-sized, and variable in shape and color; common shapes are rather long, and 'rugby ball'-shaped (Figs. 6-8, 10). The presence of a depressed central line around the mature fruit (as if it had been

tied with a rope) is a distinct characteristic of this variety. The color of fruits varies from green to brown to red-brown. The nut is broad and egg-shaped and encased inside a thick husk. The copra layer is thick. A whole fruit weighs 1542 g while fresh copra weighs 450 g. It has one of the highest percentages of fresh copra to nut weight (57% *versus* 38-49% in other varieties); it also has a high oil content (65-70%). The fruit drops when ripe making it easy to collect without having to employ monkeys or other means of harvesting. Due to its small size as compared with 'Maphrao Yai', its cultivation is limited to the west coast of the Peninsula where it was first found.

Based on the *Niu kafa* - *Niu vai* hypothesis (Harris 1978), Pak Chok is of the *Niu kafa* type in having a thick husk and low water content (Harris *et al.* 1982). It is considered to be more primitive than the *Niu vai* type which possesses thin husk and high water content.

4. Pluak Wan: From two Thai words, *pluak* (husk), and *wan* (sweet). This variety has a characteristic sweet husk (when young only) which is fiberless and tastes like yam bean; it is edible. The husk loses its sweetness, becoming fibrous and inedible as the fruit matures. This palm is tall with a bole. Fruits are medium-sized and rather broad (17.8 cm wide x 20.5 cm high); the nut is 12.0 cm wide x 12.4 long, and fresh copra weighs 450-500 g. This variety is rare and unknown in most coconut-producing areas.

5. Maphrao Klang: In Thai, *klang* means 'intermediate' and refers to the size of its fruits which are intermediate between those of 'Mu Si' and 'Maphrao Yai' (see later). It is classified as a tall palm but its trunk is somewhat smaller than 'Maphrao Yai'. It has a distinct bole with a 94 cm diameter one meter above ground. It bears fruits six years after planting; fruits are round to oblong (Figs. 11-12), and three main colors are found - green, yellow, and reddish brown. This variety produces about 220 g of copra, and bears about 60-120 fruits per year.

6. Maphraeo: This varietal name is a corruption of the word *maphrao* which means 'coconut'. This particular variant has no rachilla (spikelet) branching from the rachis;

botanically, the inflorescence is a spike. It is mutant, possibly controlled by a recessive gene causing it to be rachilla-less. This type of coconut palm is classified as *spicata*; it is found planted sporadically in groves in most countries. The first reported 'Maphraeo' was grown more than one hundred years ago at the present day site of the Municipality Office of Songkhla province. No one knows about its grower. It was felled several decades ago but its progeny have been grown in ten places (Chomchalow 1979).

Its characters are exactly the same as 'Maphrao Klang' except for its inflorescence (spike vs panicle), and is believed to be a mutant of that variety. It has as many color variations as 'Maphrao Klang', i.e. green, brown and red-brown (Chomchalow 1979).

The inflorescence of 'Maphraeo' has an unusually large number of female flowers, about 200, borne on a portion of the rachis which is 50 cm long. About 250 male flowers are borne at the upper end of the rachis at a distance of 12.5 cm (Fig. 13). Some male flowers are borne interspersed with female flowers. Only about four to five female flowers set fruit, although as many as 10-13 can be formed; those which do not set fruit fall off, leaving the axis clean.

7. Maphrao So: *So* (pronounced 'saw') is a Thai fiddle. Its sound-box is made from the polished shell of this variety. It resembles 'Maphrao Yai' except for its nut which is angular, often tetragonal, in shape. The fruit is broad, 2.1 cm wide x 19.5 cm high, while the nut is 14.8 x 12.5 cm. The apical end of the fruits is flattened while the basal end is slightly pointed. It contains 550-700 g of fresh copra. Some trees are prolific bearers (Fig. 14).

8. Maphrao Yai: In Thai, *yai* means 'large', referring to its large fruits. Its life span is around 70-100 years. It has a large, distinct bole with a diameter of 102 cm one meter above ground. The length of the midrib of the 14th leaf is 533 cm (Thirakul and Harries 1982). It bears fruit after 8 years. Its fruit is 19.5 cm wide x 27.3 cm high; the nut is 14 cm wide x 14 cm high. It has a thick husk and rather thin meat. The fresh copra weighs 540 g (304 g

when dried). It is the typical 'Nui vai' type of Harries (1978). Many colors are found in young fruits: green (most common) (Fig. 15), pale yellow, cream, light, dark brown. When ripe, they are all brown. It is the most common variety grown commercially in Thailand.

9. Maphrao Yai Phiset or Kalok: The word *phiset* means 'special', and *kalok* means 'skull'. It occurs as a deviant form in 'Maphrao Yai' populations with a frequency of about 1%. This palm resembles 'Maphrao Yai', with a diameter of 105 cm one meter above ground. The midrib of the 14th leaf is 540 cm long (Thirakul and Harries 1982). The fruit is very large, broad to somewhat ellipsoid, 30.6 cm wide x 31.8 cm high, with a volume of 15,120 cm³ and weighing 2361 g. The nut is 17.0 cm wide x 15.7 cm high with a volume of 1920 cm³; fresh copra weighs 720-900 g (or 354 g when dried). Young fruits are green, light brown, or dark brown. Trees normally produce 20-30 fruits per year (Fig. 16).

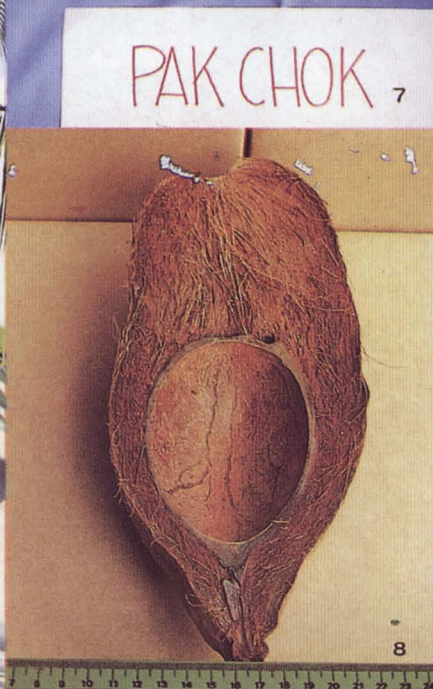
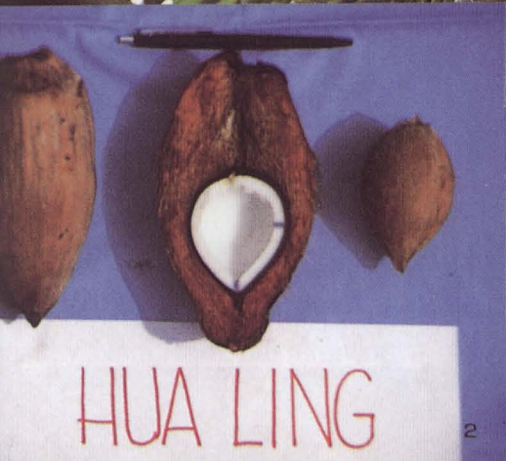
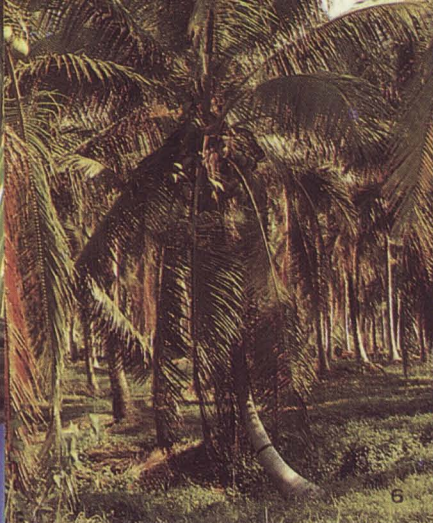
The shell of its extra-large fruit is used to make a bowl or basin to hold water, or to make a king-sized soundbox for a Thai fiddle. It may be comparable to other extra-large fruits varieties such as 'San Ramon' and 'Tagnanan' of the Philippines, 'Bali' and 'Manado' of Indonesia, 'Rennell' of the Solomon Islands, and 'Panama Tall' of the Pacific coast of South and Central America (Harries *et al.* 1982).

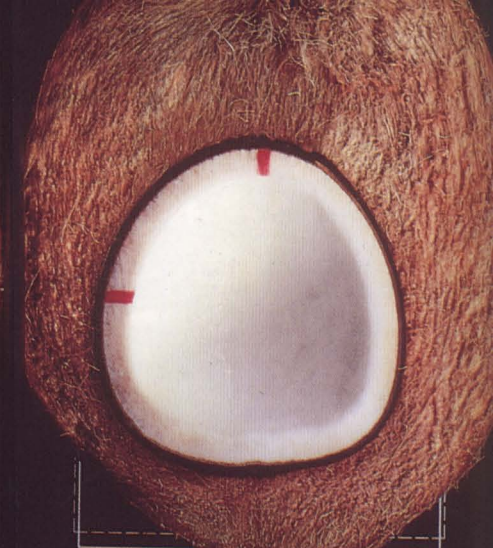
Group II. Dwarf palms, early-bearing, without bole

10. Mu Si: 'Mu Si' is a collective name used for dwarf coconuts. To specify a given variety, a color is added to the name. e.g. 'Mu Si Khieo' (green), 'Mu Si Luang' (yellow), 'Mu Si Som' (orange). It also includes other

Coconut Varieties in Thailand (photos at right)

1. 'Hua Ling', showing a bunch of fruits. 2. 'Hua Ling' fruit and nut. 3. 'Thalai Roi' tree with mostly normal fruits. 4. 'Thalai Roi' tree with mostly aborted ('Thui') fruits. 5. 'Thalai Roi' fruit. 6. 'Pak Chok' tree (note the slightly curved trunk). 7. 'Pak Chok' fruit. 8. Another form of 'pak Chok' fruit. 9. Inflorescence of 'Thalai Roi' - Note numerous female flowers. 10. 'Pak Chok' tree showing fruit bunches. 11. 'Maphrao Klang' tree. 12. 'Maphrao Klang' fruit. 13. 'Maphraeo' tree - Note absence of spikelet. 14. 'Maphrao So' fruits.





'Maphrao Klang'

'Maphrao Yai'

'Chumphon Hybrid 60'



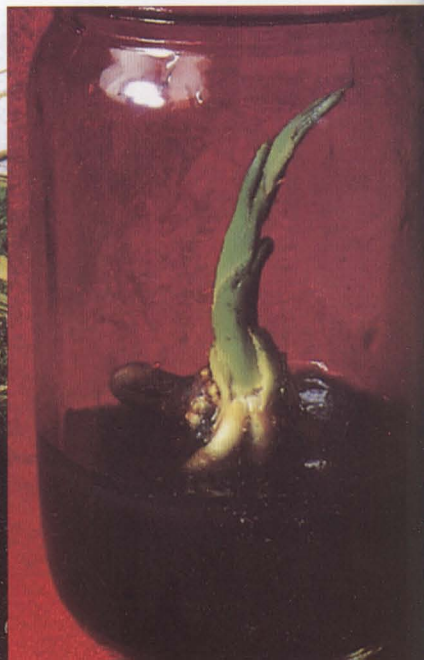
A fruit bunch of 'Chumphon Hybrid 60'



A healthy 'Nam Hom' palm producing high number of fruits per bunch

'Maphrao Tuen Dok' fruit bunches with over 200 fruits per bunch

Award winning variegated coconut at 5-month old cultured embryo of an ornamental plant show in Bangkok 'Maphrao Kathi' on solid medium

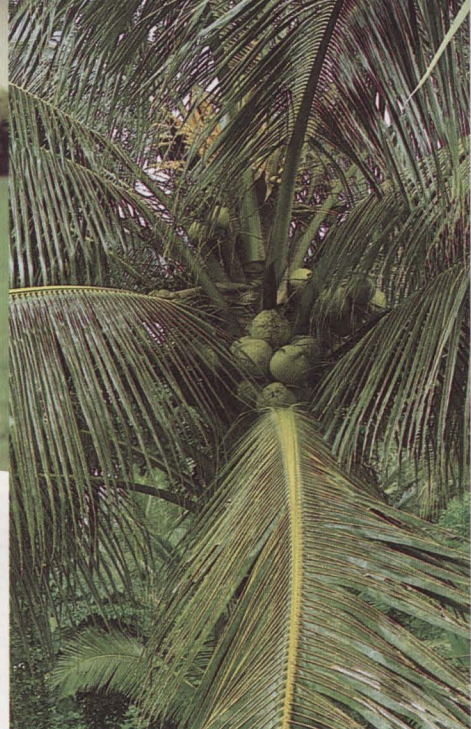




A healthy 'Nam Hom' palm having circular crown and fruit bunches resting on the midribs



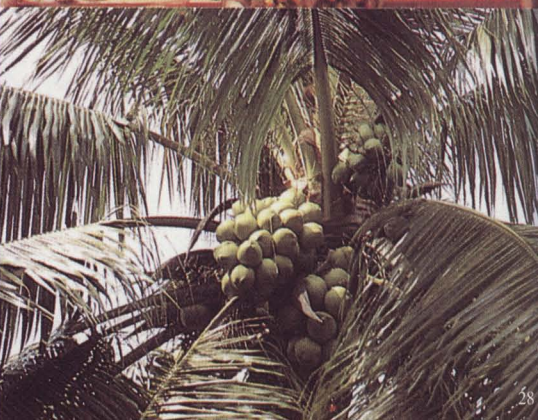
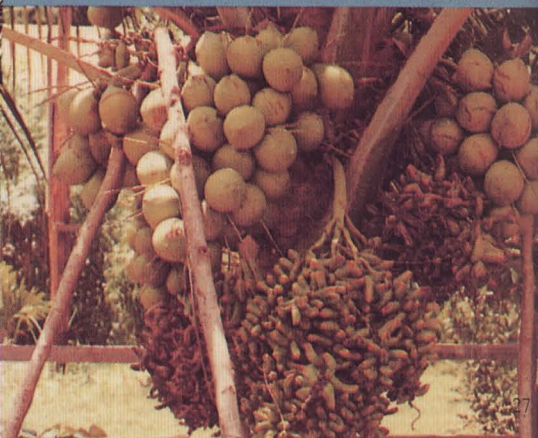
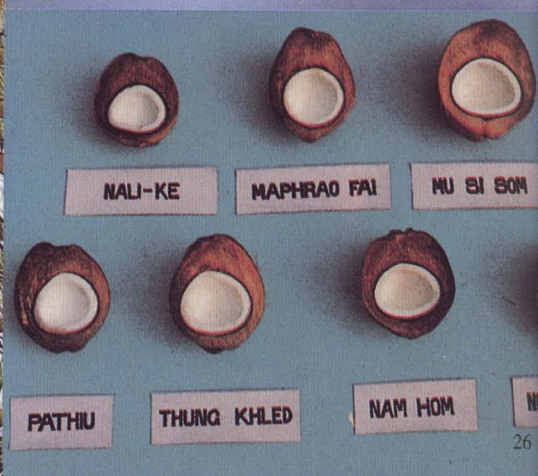
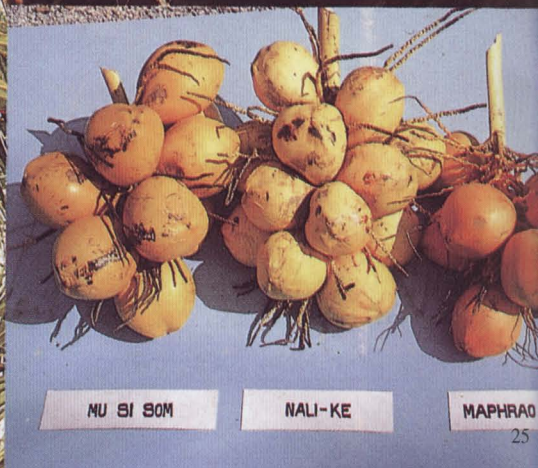
Fruit bunch and peeled fruits of the famous 'Nam Hom' variety



A healthy 'Maphrao Kathi' palm having circular crown with drooping leaves and prolific bearing

An exhibit of the coconut and its diverse products at a display in a coconut meeting in Chiang Rai (below)





varieties which are called by other specific names, e.g. 'Nok Khum', 'Nam Hom', 'Thung Khlet', 'Fai', 'Nalike', 'Pathiu'. The varietal name 'Mu Si' is believed by the author to have originated from a subdistrict of the same name in Pak Chong district, Nakhon Ratchasima province, north-eastern Thailand, where a number of dwarf coconuts are grown. It may also come from the name of a river in Palembang, Sumatra, Indonesia.

These palms are characteristically small trees with narrow stems and short leaves (to 4 m). They have a shorter bearing life than the first group. All are self-fertilized since the female flowers become receptive when the male flowers of the same inflorescence are shedding pollen. Trees bear fruit three to four years after planting. Numerous, small fruits (22-25) are produced in bunches, and their meat is rather thin; it takes 7,000-8,000 fruits to make one ton of copra. Some varieties have aromatic liquid endosperm. They are popularly grown as ornamental plants and their fruits are consumed fresh while still young. Several varieties are known and are described below.

11. Nok Khum: *Nok Khum* means 'quail' which is believed to refer to the appearance and small size of the fruit (about 750 g). Its copra content is about 100 g, one-half of the normal 'Mu Si' varieties. The young fruit is green (Fig. 28).

12. Nam Hom: This varietal name comes from two Thai words, *nam* (water), and *hom* (aromatic). It arose as a mutant of 'Mu Si Khieo' in Nakhon Chaisi district of Nakhon Pathom province, central Thailand. The trunk has a diameter of 71 cm one meter above ground, and the length of the 14th leaf is 425 cm (Thirakul and Harries 1982). Its fruits are

small (800 g) and broadly ellipsoid in shape; fresh copra weighs 100 g (Fig. 17). It is now widely cultivated for its young fruits. At least three strains with minor morphological difference are observed, namely, (i) 'Kon Chip' (with necked end) originated at Ang Thong Farm in Krathum Ban district, Samut Sakhon province, (ii) 'Luk Klom' having round fruits, and (iii) 'Luk Ri' having elliptic fruits. The last two are not as popular as the first one, which is extensively grown on raised bed in the loamy lowlands near Bangkok.

13. Mu Si Khieo: It is a typical dwarf coconut with a thin boleless trunk and rather small, short leaves. It bears fruit only three years after planting when the trunk is not more than 1.5 m long. The small-to-medium-sized fruits have rather thin meat (11 mm thick) and produce 200 g of copra. One strain has very sweet water, popularly known as 'Nam Wan'. This variety, including 'Nam Wan', is grown mainly for its young fruits which are valued as dessert while its water is sweet and refreshing. It is not possible to distinguish between fruits of 'Nam Wan' and other 'Mu Si Khieo' strains, or 'Nam Hom', except after tasting their water.

14. Thung Khlet: Thung Khlet is the name of a subdistrict of Muang district in Prachuap Khiri Khan province, lower Central Thailand. Originally, dwarf coconuts of the variety 'Mu Si Khieo' were brought from Nacha-ang district, Chumphon province, and planted in a farm at Thung Khlet where the owner had selected a mother palm which produced a large number of fruits per bunch while still very young (about 2.5 years). Through a lot of publicity, this variety is now grown in many parts of the country. This palm has a diameter of 66 cm one meter above ground and the 14th leaf is 464 cm long (Thirakul and Harries 19982). It is further characterized by its prolific fruiting habit initiated about 2.5-3 years after planting, and the first bunch of fruits almost touches the ground (Fig. 18). Its fruit is small (900 g), green, broadly ellipsoid, and contains about 160 g of copra.

15. Mu Si Luang: This variety is similar to 'Mu Si Khieo' except for the yellow color of its fruit, petiole and midrib (instead of

Coconut Varieties in Thailand (photos at left)

15. 'Maphrao Yai' fruit. 16. 'Maphrao Yai Phiset' fruit - Note very thin husk and very large cavity. 17. 'Nam Hom' tree. 18. 'Thung Khlet' tree. 19. 'Maphrao Fai' tree. 20. 'Mu Si Luang' tree. 21. 'Nalike' tree. 22. 'Mu Si Som' tree. 23. 'Maphrao Fai' fruit bunch. 24. 'Mu Si Som' fruit bunch. 25. Comparison of bunches of 'Mu Si Som', 'Nalike', and 'Maphrao Fai'. 26. Comparison of half nuts of different varieties of Thai coconuts. 27. 'Maphrao Tuen Dok' fruit bunches. 28. 'Nok Khum' tree.

green). The fruit is smaller, and broad in shape. It is often mistakenly considered synonymous with 'Nalike' as their colors (yellow vs ivory) are not clearly differentiated by many people (Figs. 20, and 25). Certain trees possess aromatic water, and can be grouped under the 'Nam Hom' variety. It is grown and consumed in the same manner as 'Mu Si Khieo'. It is used as a mother tree in crossing with 'Thai Tall', a selection of 'Maphrao Yai', yielding a once popular hybrid, 'Sawi 1'.

16. Nalike: In Pali/Sanskrit languages (from which many Thai words are derived), the word *nalike* (pronounced 'nali-ke') means 'coconut'; in Thai, it is used for the name of a rare variety of coconut having ivory-colored fruit skin. Its water is sweet but not aromatic.

Its fruit is small and broad with a distinctive ivory color; the petiole is of the same color. It is normally grown as an ornamental plant since the leaf and the fruit are colorful (Figs. 21 and 25). Under suitable growing condition it may develop a small but distinct bole, and attain a height of tall palm.

17. Mu Si Som: Sometimes called 'Mu Si Daeng' by some people, this variety is similar to 'Mu Si Khieo' except for the color of its fruit, petiole and midrib which is orange-red or reddish orange instead of green (Figs. 22, 24, and 25). It has never produced aromatic water. Because the fruit is colored a shade of red, it is often mistaken for 'Maphrao Fai' which has apricot-red fruit. It is grown and consumed the same way as 'Mu Si Khieo' and 'Mu Si Luang'. It may be identical with 'Malayan Red Dwarf'.

18. Maphrao Fai: *Fai* is a Thai word for 'fire', referring to its apricot-red colored fruits (Figs. 19, 23 and 25). It matches all other 'Mu Si' varieties except for the color of its fruits.

It is felt by some (DOA 1964) that this variety actually has orange or red fruits, and thus should be regarded as 'Mu Si Som' or 'Mu Si Daeng' (the layman may find it difficult to differentiate between apricot-red and orange-red). Still others believe that the real 'Maphrao Fai' produces a green fruit except for a pinkish rim formed by its persistent calyx. It can be

distinguished from other varieties by its liquid endosperm which is said to have a lethal effect on other plants watered with it. The author has yet to encounter such a coconut having a red (or even pink) calyx rim!

19. Pathiu: Pathiu is the name of a district of Chumphon province from which this variety was originated. It has similar characteristics as 'Mu Si Khieo' but the tree is a little larger. Contrary to the typical dwarf type, it has small but distinct bole which suggests that it may have inherited this character from the tall parent. Its fruits are the largest of all dwarf coconuts (1975 g), with the oil content of 61%; fresh copra weighs 203 g (170 g when dried). The length of the midrib of the 14th leaf is 477 cm with broader leaflets than those of other dwarf varieties.

Group III. Miscellaneous

Thailand also has a number of varieties of coconut whose affinities are not clearly understood, and which occur sporadically as uncommon variants among other coconuts in certain localities. Among these are the following:

20. Maphrao Phuang: Some literature (e.g DOA 1964), mentions the existence of an abnormal coconut having a very high number of female flowers per inflorescence, as in 'Thalai Roi' (this may be the reason for its varietal name, as the floral cluster consists of hundreds of female flowers). Only three to eight fruits are produced, however, the rest develop into *maphrao thui* with various degrees of abortion. The fruit is about the same size as 'Mu Si'. Two colors are observed: yellowish brown, first found in Songkhla province, and green, first found in Chon Buri province.

It is not clear whether 'Maphrao Phuang' is the same as 'Thalai Roi'. No mention has been made about its habit whether dwarf or tall, or with or without bole.

21. Maphrao Tuen Dok: This is not the true name of an established coconut variety but was coined by the author from a descriptive phase [derived from a Thai saying: "*Maphrao tuen dok, yachok tuen mi*", which means "a

coconut palm is showing off its prolificacy, (while) a beggar is showing off his wealth"] which illustrates the characteristics of this unusual palm. It was found at Wat Si Bunyaram, Mu Si subdistrict, Pak Chong district, Nakhon Ratchasima (Chomchalow 1987). A specimen of this palm produced its first bunch of fruits four years after planting; there were 208 fruits which were very small but perfectly formed. The second bunch had 270 similar-sized fruits; in the third bunch, all 700 female flowers developed into abortive fruits (*thui*). Similarly, the fourth bunch produced 800 *thui* fruits. From the fifth bunch onwards, this palm produced four, fully-developed fruit bunches alternating with four abortive fruit bunches (Fig.27). The liquid endosperm has a mild aroma (like that of the 'Nam Hom' variety) if consumed during the morning hours.

The author believes that this is another example of an inherited abnormality; it is possibly a mutant of 'Nam Hom' developing in the same direction as 'Maphrao Phuang' or 'Thalai Roi', but differing in the higher number of fruit set and larger fruit size.

22. Maphrao Kathi: This is a peculiar form of normal coconut. Genetically speaking, it is a mutant caused by a single (recessive) gene mutation, causing the endosperm to appear fluffy and totally fill the entire cavity of the fruit. The embryo of the homozygous recessive nut cannot develop since the endosperm has been altered

23. Maphrao Tan: This is a group of coconut whose inflorescence sap is used to make coconut sugar. Many varieties have been selected by the farmers for this purpose. The main features include high sap yield, regular and frequent production of spathes, large, long and strong spathe which is easily bent downwards, short stature with short internodes. All are of tall type, but may attain short stature. The following varieties have been developed in Samut Songkhram and Samut Sakhon, the two adjacent provinces well known for their toddy and coconut sugar.

23.1 Thale Ba: This variety, whose name literally means 'mad sea' was found in Nakhon Chaisi district, Nakhon Pathom province. It is probably a selection from 'Maphrao Klang' and

displays a prolific-bearing habit. It is the most common variety cultivated.

23.2 Suricha: A tall plant with 5-6 years bearing age. Compared to 'Thale Ba' variety, it has longer leaf, lighter leaf color, softer leaf, shorter internodes, softer spathe, more spathes, less sap but longer sap-yielding period, smaller and rounder spathe, more prolific fruit bearing.

23.3 Sai Bua: Originated at Lat Yai and Bang Takhina subdistricts of Ban Phraeo district, Samut Sakhon province where it becomes most popular variety grown for sugar making. It has tall, big trunk, takes 5 years to bear, fast growing in height, higher number of leaves, short leaves and erect. Leaves are tough and not easily falling, powdery green color, large spathe, giving more sap; prolific bearing of round, powdery green fruits.

23.4 Theong Bong: Largest trunk of all 'Maphrao Tan', it has large spathe producing more sap; it also has more leaves with large green fruits. Not a prolific type, with less spathes produced.

23.5 Kathi: Not to be confused with a variety having fluffy meat, but the one which usually produce such kind of meat, thus the name. Light green rather long leaves, small spathe which is easily borne; more number of spathes and more sap produced from the first spathe onwards, and from the tip to the base of spathe. Flower and young fruit pinkish. Fruits rather round. Its drawbacks are fragile, brittle leaves that falls off easily.

23.6 Khi Kai: Small, dwarf palm, slow growth (thus most suitable to be used as sugar production). Long leaves; more sap produced from tip to base of spathe. One disadvantage is since it over produces sap, its growth is halted fast. As such, it is cut down after 10 years.

24. Maphrao Nim: *Nim* means 'soft' or 'tender', in reference to the tender husk and shell of its young fruits. These parts are edible (Suwannamek 1959).

25. Lao Tan or Maphrao Tanot: Both names refer to this *spicata* coconut since its inflorescence resembles that of the 'palmyra palm' (*Tan* or *Tan Tanot*). It could have been called 'Maphraeo', had it not been such a prolific bearer, producing 200-400 fruits per year (Chaichuen 1959).

26. Kon Chuk: This name refers to the characteristic fruit of this variety, which is swollen at the end. It is a tall palm with a life span of up to 80 years. Its fruit is small, 12.5 cm wide x 23 cm high, ellipsoid, and a thick husk. The copra layer is thin but contains a high oil content (64-72%) (Juthanond 1968). It is grown mainly for its oil. It is considered to be very rare, and is in danger of extinction.

Discussion

Place of Origin of the Coconut: Coconut is one of the world's most important crops. It is grown in all countries in the tropics as well as many subtropical areas. Being an ancient crop with widespread geographical distribution, its place of origin is not definitely known. Having a large genetic diversity in Southeast Asian countries, namely Indonesia, Malaysia, Philippines and Thailand, these countries are believed to be the center of origin of coconut. One significant evidence is the fact that the farther away from this center to the east across the Pacific, and to the west, through India, Africa and across the Atlantic, genetic diversity of coconut reduces. In Central America where coconut finally found the end of its long journey, varieties grown in the Pacific coast (e.g. 'Panama Tall' in Panama) are quite different from those grown in the Atlantic coast (e.g. 'Jamaica Tall' in Jamaica) in spite of the fact that the two coasts are only 200 km apart, but possess high mountain range as land barrier. These two varieties must have different origin. This evidence only strengthens the theory that coconut originated in Southeast Asia (Harries 1971; Whitehead 1966; 1976).

Varieties for Specific Purposes: Although as many as 30 varieties of the coconut are recorded in Thailand, not all are common, and many are quite rare. Yet there are quite a few which are very common. One interesting fact is that each of these varieties has specific purpose; these include varieties for aromatic and sweet water, for young tender meat, for making coconut sugar, for cooking, for making soundbox of the fiddle, as well as for ornamental purpose.

Economically Important Varieties: For copra production, only new hybrids are grown. These include 'Sawi 2', a tall hybrid derived from Thai Tall x West African Tall, and 'Chumphon 60', another tall hybrid derived from Thai Tall x Thai Tall. For young coconut, 'Nam Hom' is by far the most popular variety grown. Large amount of 'Nam Hom' fruits are being exported, mainly to the US, Hong Kong and China. For coconut sugar, 'Thale Ba' is most popular.

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(All in Thai, except for those marked with *)

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