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INDIA abounds in many types of palms. Some types of palms their original habitant in India and some have been introduced. Among the different types, some are cultivated for their products of commercial value, some for ornamental purposes and may others grow wild.

Palms belong to the main botanical family *Palmae*. They come under the group Monocotyledons in which, as the name indicates, the embryo has only one cotyledon or seed leaf. The family *Palmae* contains about 1200 species distributed among about 140 genera.

Palms are mainly confined to the tropics and sub-tropics. They are preminent in the vegetable world for their grandeur which is especially remarkable in regions where palms grow naturally to their full luxuriance. Linnaeus appropriately styled them as "Princess of the vegetable kingdom". The palms may be divided into two main classes: (1) Feather or pinnate leaved like the coconut palm, arecanut palm, toddy palm, date palm, nipa palm, etc., and (2) Fan or flabelliform leaved as in palmyra palm, talipot palm, etc. About two-thirds of the species come under the former class.

The diversity of characters exhibited by this group is really fantastic and will amply repay an intensive study. A general idea can be obtained from the account given below.

Vegitative Habit

The vegetative habit of the palms is familiar and is seen typically in the palmyra palm-a tall straight stem with a crown of leaves either of fan or of feather shape at the top. The two most familiar departure from this are the coconut which has a stem that rises in a curve, perhaps due to reaction to light and the toddy palm which has its large much branched feather leaves scattered over quite a considerable length of the top of the stem.

Branching is a rare occurence in the tall aerial stems of palms. The exceptions to this rule are very few and are mostly limited to the Doum palm of Egypt (*Hyphaene thebaica*) and a few other spices of *Hyphaene*. Though unbranched stems form a prominent feature in palms, yet great variations are

found in size and habit of the stems. Generally, the adult palm has a tall woody stem having its circumference ring marked with the bases of leaves which have perished. In some palms like the African oil palm, wild date palm, etc., the trunks are clothed with the persistent bases of the leaves.

The stom exhibits various forms. The stem in the case of certain palms hardly come above the ground while in others they rice to a height of even 500 feet. Many palms like the sago palm, have rhizomes which creep along below the ground, bending up at the end when about to flower and others chiefly the rattans have climbing stemps which climp by aid of stout prickles that replace leaflets at the outer ends of the large leaves. The stem is often ring marked or covered with the remains old leaf sheaths or is thorny. In most of the palms it is a sturdy pillar like structure and it grows slowly in thickness. Some palms are dwarfish in stature, flowering and fruiting at a height of but a few feet. Owing to the fact that older leaves fall off as the younger ones come on, the area exposed to the wind does not increase as the palm grows older and the stem, though increases in height does not appreciably increase in thickness after it has once in its youth reached its full diameter. On the other hand, the strain at the base increases as it grows taller and this is met by the formation of numerous adventitious or buttress roots which give it a better grip for the necessary mechanical rigidity on the soil.

Leaf

The leaf of the palms is very characteristic and has very few like it outside the family. The leaves are few and large, often very large. Two types of leaves are easily distinguished, the palmate and pinnate, giving rise to popular terms fan palm and feather palm. The leaf, which may be of either

Doum palm

pinnate or palmate form, arises by a peculiar process of development. In monocots leaf fall is not a predetermined process as in dicots. It gradually falls when the leaf reaches the end of its life periods. The leaf is usually very large and at the base of the petiole is a sheath which makes a firmer attachment to the stem than a mere articulation. The sheath contains many boundles of fibres which remain after the decay of the softer tissues. As the leaf is large it must have a very good attachment to the stem to prevent it being torn away. This is provided by the fibrous sheath which in many cases form valuable sources of commercial coarsc fibre. The pinnae are folded when they join the rachis or main stalk of the leaf sometimes upwards(induplicate V in section), sometimes downwards (reduplicate V in section). The leaf emerges from the bud in an almost vertical line and thus escapes excessive radiation and transpiration. The surface of the leaf itself is glossy owing to the presence of a thick cuticle and is rarely arranged perpendicular to the incident rays of the sun, for the palms are pronounced sun plants and show derophetic characters in their leaves. The young leaf does not spread out and expose the comparatively thin blades to the sun till it is nearly mature. Often the leaf is corrugated or placed at an angle by the twisting or upward slope of the stalk; sometimes the leaflets slope upwards. Thus considerable protection against excessive transpiration is provided in the case of all palms which are considered generally as sun plants.

Inflorescence

The inflorescence is large and much branched in most palms. A few palms are monocarpic. After many years' growth and the production of a stout, woody trunk, the growing point ceases to produce leaves and develops a gigantic inflorescence. This so exhausts the plant that after fruiting it dies. The talipot palm and the sago palm are monocarpic. The great majority of plants are however polycarpic, bearing, when mature, axillary inflorescences which wither away after fruiting. These are formed in the sheathed axil of the leaves but in some palms they do not develop until after the subtending leaf has fallen when the flowering spike is therefore below the crown. The talipot palm which is monocarpic, produces a huge terminal inflorescence which may contain several million flowers. This and the vast number of fruits which follow it are produced at the expense of the enormous quantity of reserves which the palm has been storing up in the stem and when the fruits are ripe the tree gets exhausted and the palm soon dies. Even in a palm like the coconut which flowers all its life there is a great rush of sap from reserves to the inflorescence and this is taken advantage of by the drawers of toddy who tap the young inflorescence to obtain the sap which forms toddy and when fermented yields alcohol or when evaporated yields sugar.

The inflorescences arise in different ways in different palms. Sometimes the inflorsecences are in the axils of the current leaves, sometimes lower on the stem; in the toddy palm for instance they appear in descending order along the stem while in coconut, in ascending order. The inflorescence which carries the flowers may or may not be enclosed in a sheathlike structure usually known as spathe. The form and branching of the inflorescence varies much. The individual flowers are sometimes

free but very often they are sunk in the tissue of the stalk. Then the inflorescence is termed as spadix. Some palms are dioecious (male and female flowers on different plants) as the date palm, palmyra palm etc., some are monoecious (both male and female flowers are borne on the same plant) as the coconut palm, arecanut palm, African oil palm, etc. In monoecious palms the flowers may be arranged on separate inflorescences on the same palm as in African oil palm or both male and female flowers are borne on the same inflorescence as in coconut palm. In some monoecious palms like the toddy palm, the flowers are in little cymes of three, one female between two males.

The flower

The flowers of palms in general are not specially attractive either in size or in colour. They are small and inconspicuous and are produced in large numbers. It has usually a perianth in two whorls of three leaves alike in colour and texture. The stamens are also in two whorls of three and the carpels three single or united, in the latter case forming a single or three locular ovary. The flowers are sometimes pollinated by wind, sometimes by insects or by both.

The fruit

Great variety characterises palm fruits. Compared to the size of the plants, the fruits are generally small except the coconut which is one of the largest. The fruit is a berry or a drupe with the endocarp usually united to the seed. In many species there is a hard fibrous coating to the fruit as an coconut while in some others the seed is free but often it adheres to the inner coat of the fruit. In the sago palm and others of that group of the family it is covered with hard scales. The seed has a large endosperm which in the case of the date, the vegetable ivory and others is formed of cellulose deposited upon the cell walls and making the seed extremely hard. The fruits which contain only one seed is more or less rounded as in coconut or long as in date.

The seed

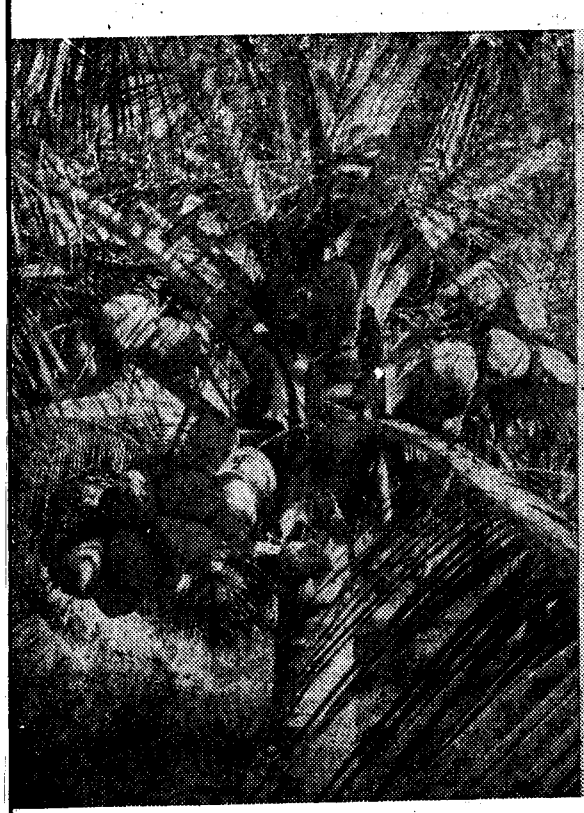
Seeds of palms are also found in many sizes and various shapes ranging from the size of a pea to the unweildy big fruit of coconut, double coconut, etc.

Some common palms

Some common palms met with in different parts of India are described with special reference to their peculiar characteristics.

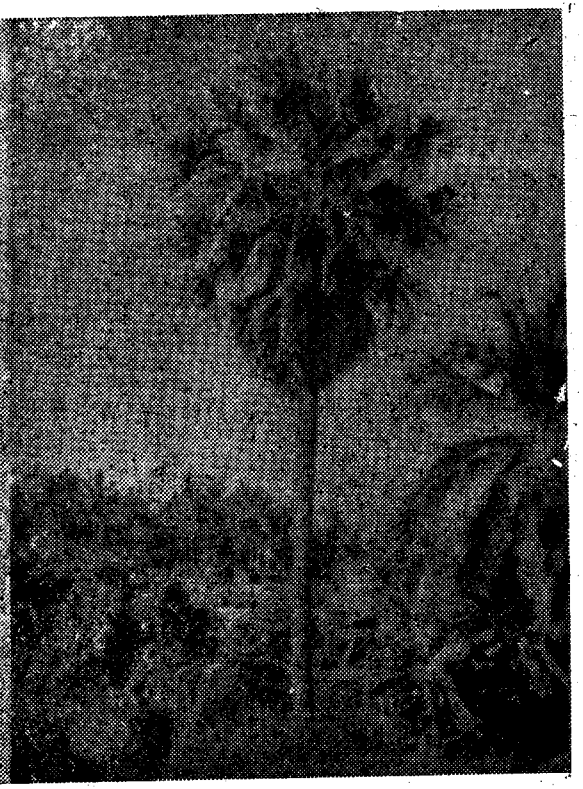
1. Coconut Palm
(*Cocos nucifera* Linn)

The coconut palm belongs to the Cocos tribe which comprises tall or dwarf palms with slender or robust ringed spineless trunks. The most important palms in India are the cultivated species of which the chief is perhaps the coconut. The coconut which is rightly called the queen of palms is one of the important agricultural crop plants of the world, and is cultivated over large and extending areas in the tropics. In coconut there are two varieties, namely, the Tall and the Dwarf. The tall variety palm grows to a height of even 100 feet or more under favourable conditions while the dwarf variety palm is short in stature, delicate and short lived. Under favourable conditions tall variety begins to bear in six to eight years after planting while the dwarf takes only three to four years for its initial flowering. The palms of the tall variety are generally cross pollinated in nature



Coconut palm

Arecanut palm



Palmyra palm

while those of the dwarf variety are mostly self pollinated. Even the nut and copra characters of these two varieties vary a lot.

The coconut flowers throughout its life unlike other palms which flower only once in their lifetime or those which flower only during certain seasons. The inflorescence which is known as spadix arises at the axils of leaves in the ascending order, that is from the older leaves to younger ones. The palm produces one inflorescence a month normally. The inflorescence is monoecious, the female flowers being at the bottom and male flowers at the top of the inflorescence.

2. Arecanut Palm
(Areca catechu)

Arecanut palm belongs to the areca tribe which characterises graceful and well known group of spincless palms, the trunks of which are either solitary or forms a ring like clump. This is a tall slender palm growing to a height of 40 to 60 feet. The inflorescence is a spadix and is monoecious as in coconut, bearing female flowers at the bottom and male flowers at the top. The peculiarity in this palm is that the inflorescence appears from the axil of the leaf which begins to drop. Usually the inflorescences appear during the peried December to June. Each tree normally yields 2 to 3 bunches a year, each bunch containing about 200 to 250 small fruits. In a season usually not more than five spadices appear and the average is about 2 to 3. Even though the fruits is like a miniaure coconut, the product obtained from it, namely the arecanut, is entirely different from the coconut of the coconut palm.

3. Palmyra Palm
(Borassus flabell fer Linn)

Palmyra palm belongs to the Borassus tribe the palms of which are characterised by tall, spineless, stout, ringed trunks. The palmyra palm is also known as the Deleb palm in Central Africa where it is a characteristic feature and whence it has spread to India where it is known as the palmyra. This gigantic palm attains a heighi 40 to 60 feet (sometimes even 100 feet) and has 30–40 large fan like leaves on the terminal crown. This palm is dioecious–that is the male and female inflorescences are borne on different palms. So in palmyra we have both the male and female palms. The palmyra palm produces inflorescences in the leaf axils only in a particular seasons of the year which is found to vary to some extent from traci to tract. While flowering of the palmyra takes place as early as August in the West Coast of India, it is considerably delayed in the East Coast particularly in the Circars and takes place in December–January. There appears to be no regularity in the production of inflorescences. It has also been noticed that the inflorescences do not arise from all the leaf axils.

4. Toddy Or Fish Tail Palm
(Caryota urens L.)

Toddy or fish tail palm also belongs to Areca tribe. They belong to spineless, monocarpic palms with tall, stout ringed trunks at length bearing suckers. Toddy palm is also known as Kittul tree or Indian Sago palm. This palm grows to a height of 40–60 feet and bears large much branched (bipinnate) feather leaves scattered over quite a considerable length of the steam. It flowers mostly throughout the year. This palm attains its full

Toddy or fish tail palm

Talipot palm (after flowering)

Wild date palm

size in about 15 years and yield for about 7 years. The peculiarity of his palm is that its big inflorescences appear in descending order along the stem. The first inflorescence is of big size and arises from the axil of the upper leaf. The second is from a lower axil and slightly smaller and so on downwards until the tree gets exhausted and dies. The inflorescence is very long, pendulous and resembles a huge docked horse-tail. The flowers are in little cymes of three, one female between two males.

5. TALIPOT PALM

(*Corypha umbraculifera* L.)

The talipot palm belongs to the Corypha tribe. They are tall fan-leaved palms with spineless stout trunks. The talipot palm is considered to be a native of North Malabar of Kerala where it is found abundantly in low, moist coastal regions. It is monocarpic. The talipot grows vegetatively for 40–70 years and then at last produces a huge terminal inflorescence which may reach a height of even 20 to 30 feet and may contain several million flowers. This palm, when it attains full maturity say when 30 or 40 years old, flowers during the beginning of the hot season and dies soon after the seeds ripen, 9–10 months later. As mentioned in the beginning, the huge inflorescence and the development of the vast number of fruits are produced at the expense of the enormous quantity of reserves which the palm has been storing up in the stem before flowering and when the fruits are ripe, the palm is exhausted it soon dies.

6. WILD DATE PALM

(*Phoenix sylvestris* Roxb.)

and

DATE PALM (*Phoenix dactylifera* L.)

These palms belong to the Phoenix tribe which forms a distinct and exceedingly useful genus of palms planted for fruit, ornament and shade. Phoenixes differ from all other pinnate-leaved palms in having the leaves folded upwards and lengthwise and in the peculiar form of the seed as seen in the date. The plants are either male or female.

The wild date palm is common throughout India. It is cultivated for its sap which yields sugar and toddy. The trunk when it attains a height of about 4 feet is tapped. The palm continues to yield about 8 maunds of sugar a year. The dense almost spherical crown with the gracefully bending leaves is quite different from the real date palm which has been introduced into India during early times. The wild date palm grows to a height of 30–50 feet. The trunk of the palm is rough due to the persistent bases of the leaf stalks. It flowers during the beginning of the hot season and the fruit ripens in September and October months.

The date palm yields the edible date. It is one of the most useful trees in the world. This was probably introduced into India at the time of first Mahomadan conquest of Sind at the beginning of the 8th century. The total area under this palm is confined to Uttar Pradesh, Gujarat and Madhya Pradesh. The palm attains a height of 100 to 120 feet. The base of the palm is often surrounded by a dense mass of root suckera which is never the case in the wild date palm. Leaves of date palm are longer than those of the wild date palm. Date palm flowers in March, April months; the fruit ripens during August to October. The date palm can be vegetatively propagated by the root suckers. The palm raised from seed takes about 8 years and the one propagated by root sucker takes about 4 or 5 years to reach the full bearing stage. The average

Cane palm

Sugar palm

African oil palm

life of the date palm is about 50 years.

Both the palms are dioecious. There are male and female palms, the former bearing the male inflorescences and the later female inflorescences.

7. CANE PALM

(Calamus rotang L)

Cane palm belongs to the Calamus species which are usually climbing pinnate palms. Their stems are slender, more or less prickly, usually climbing and never bearing a terminal inflorescence. There are more than 200 species most of which inhabit India. Some of the species have stems several hundred feet long which creep over the tops of the tallest trees. The leaves are peculiarly well adapted to assist the plant in climbing. There are hook like processes arranged on the mid ribs of the leaf, with the help of which they climb. In the cane palm the stem is very slender and its flagelliferous sheaths are sparingly armed with short flat spines. The leaves are 1½ to 2 feet long, petiole very short and stout and margined with small straight or recurved spines. In most of the Calamus species the stems are long, cylindrical and of uniform thickness, solid, straw yellow in colour and more or less covered by spiny leaf sheaths. The time required for various Indians canes to reach maturity is roughly 5 to 6 years. In these species only the stems are useful because of its remarkable pliability, strength and lengths in which they can be obtained. The growth of each stem in Calamus is indefinite and all inflorescences are lateral. It flowers usually in summer months.

8. SUGAR OR SAGO PALM

(*Arenga Pinnata* Wurumb)

This is the principal sugar yielding palm of Malaya and hence its old name *Arenga saccharifera* Labill. Arengas are tall, usually spineless palms with a thickish ringed trunk, the upper part of which and the leaf stales are often ocovered with long black fibres. They are natives of Asia and Australia. Among the eight species known, *Arenga pinnata* is an important economic plant in India. It is found wild in parts of Assam. The palm has a trunk 20–40 feet high with long pinnatisect leaves. It reaches maturity in about 6-10 years and produces a floral axis 6 to 10 feet long covered by a big spathe. It takes about 70 days for the floral axis to emerge from the spathe. The fruit takes about a year to ripen. It flowers throughout the year. In this palm inflorescences arise first from an upper leaf axil and successively from lower ones. So the spadices of the upper axils flower first and often have mature fruit when the lowest come to flower. After producing the first spath, the palm goes on producing for 2-3 years till the lowermost axil of the leaf is utilised and the tree gets exhausted. The fruit ripens durind the year following the appearance of the flowers. After all spadices have matured their seed, the tree dies. It is reported that male and female spadices are produced by the palm though some are of the opinion that the spadices often are unisexual because of the abortion of one type of flowers. Usually the male spadix is chosen for tapping since female spadices do not yield any sugar. The apex of the *Arenga* palm stem forms a rather small inflorescence and then other (sometimes larger) inflorences arise from the axils of successive leaves downwards. According to some scientists this genus thus combines the terminal inflorescence of some palms (monocarpic) like Metroxylon etc. with the axillary inflore-

scences of the majority of palms and forms an intermediate case. The black fibre at the leaf bases known as the gomuta fibre is widly used for filters and in the caulking of ships. The sap, obtained when the plant is 10-12 years old, yield sugar commonly referred to as arenga sugar.

9. NIPA PALM

(*Nipa tructicans* Wurumb)

The nipa palm belongs to one species which are found widespread along tidal rivers and estuaries. It is abundant in the Sunderbans area of West Bengal. It is a rhizomatus palm which bears peculiar inflorescences on short stems. The morpology of the palm has not been investigated thoroughly due to the large size of the plant and the deep muddy conditions in which it grows.

10. AFRICAN OIL PALM

(*Elaeis guineensis* Jacq.)

The African oil palm was introduced into India nearly twenty years ago and attempts have been made to cultivate it on a commercial scale in some parts of Kerala but it has not attained economic importance anywhere in India.

It is a stately erect monoecious palm growing to a height of 20 to 80 feet with a dense crown of pinnate leaves, 10-17 feet long. The stem of the palm is covered with the bases of dead leaves. It is monoecious (bearing male and female inflorescences on the same palm). The fruits are borne in large bunches. The fruit is a drupe, egg shaped about 1½ inches long and 1 inchin diameter, reddish brown or orange in colour when ripe. The fruits are small and numerous when the tree begins to bear but decrease in number and increase in size in the next few years. The outside portion of the fruit (pericarp) varies in thickness and is composed of a soft fibrous pulp from which the palm oil is extracted. Inside the pericarp is the nut consisting of a hard shell, varying in thickness, enclosing usually a single kernel which is dark reddish brown or almost black externally and internally and consists of a hard white flesh.

The African oil palm is foremost among the useful palms of West Africa. Oil is obtained from the mesocarp as well as the kernel of the fruit.

Thus it is interesting to note that palms exhibit different characteristics with regard to their vegetative habit and other morphological characters. In this note only a few of the common palms met with in India and their peculiar characteristics are described. Still there are a number of palms which grow wild and those which are grown for ornamentel purpose which are yet to be studied. Such a study will reveal the still unsolved mysteries of the palms and will lead to a better understanding of them.
