

Varieties with reduced height and branching nature for the future

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There are two natural sub-groups in coconut referred to as "Tall" and "Dwarf" cultivars. Each producing region has its own selection, for example Indian Tall' seen in west coast region is called "west coast tall (WCT)" as in Jamaica called 'Jamaican Tall'. The tall cultivars are grown commercially because they live longer and are higher yielding in terms of copra than the dwarf cultivars. Tall palms are typical single trunked palms which can reach up to 25 meter in height. Farmers are now less interested in growing Tall-type coconut palms and Tall x Tall hybrids because of their height. People may fall when climbing the palms. Fruits and leaves may fall on people. Coconut palms can fall on houses and people during storms and cyclones. Even though palm climbing devices based only on human power, long ladders are available to climb the palms and harvesting from palms, still climbing tall trees is a serious problem in coconut sector. For the purpose of conserving coconut genetic resources, the palm-climbing technique has a significant human and economic impact. For instance, for climbing the palms in Côte d'Ivoire, workers of the coconut gene bank use large triple aluminum ladders which can reach a maximum height of 14 meters. Workers need to climb the palm to make controlled pollinations by bagging the inflorescences. Coconut varieties with reduced height in gene banks need to be regenerated using this controlled pollination technique for



Thailand Dwarf green

the future. This is the only way to ensure that these varieties are conserved true-to-type during successive regenerations

In many villages in the Pacific region, it is now forbidden to plant Tall-type coconut varieties. It seems quite simple to climb the coconut palms in order to stay beneath the leaf crown to harvest fruits and to cut old leaves. But it is much more challenging to climb the coconut leaf crown in order to reach the young inflorescences. This is needed for application of pesticides in the crown to prevent pest and disease attack, making controlled pollinations with bagging for research purposes and production of hybrid seedlings and for harvesting the 'the sweet sap (neera) from coconut inflorescences which serves to produce sugar. One of the ways to solve this problem to some extent in future could be to plant varieties

with reduced height and branching. It is reported that farmers of the Mekong Delta in Vietnam have developed a technique to reduce the growth of tall coconut palms by removing them from the ground at two years of age and then replanting them again. These tall type coconut palms are then grown as dwarf types. Generally from the farmer's point of view, it would be good to use varieties with reduced height that facilitates the safe and effective management of coconut plantations

Dwarf types for future

Coconut varieties with reduced height are well known. It is also typical single trunked palms which can reach up to a maximum 10 meter in height with a life span of 40 years. Dwarf coconut varieties are considered as less rigid than Tall type, but farmers obtain very high yields by using advanced

management techniques. Two distinct different dwarfism syndromes exist within the species are dwarfs with thin stems and reduced boles (like Chowghat Orange Dwarf, Malayan dwarf orange or Brazil Green Dwarf), and compact dwarfs with thick stems and large boles that are more resistant to cyclones. Commercial dwarf types suggested for future are mainly of the orange, green and yellow and takes three years only to begin production. The Green Dwarf types are the Malayan green dwarf, the Brazilian Green Dwarf and Chowghat green dwarf. The Malaysian Yellow Dwarf is having a larger nut size and a less intense yellow colour in petioles and epicarp of the nuts. A third Dwarf type variant is the Red Dwarf (Orange Dwarf). The Red Dwarf is similar to the orange dwarf of India and Sri Lanka and the Malaysia. It was suggested that this variant might have been a recent introduction from a Caribbean Country. The Cameroon Red Dwarf (CRD) is another dwarf seen in Cameroon. Its origin is probably the Pacific Ocean region, as shown by recent molecular biology studies. The Bronze Dwarf was reportedly introduced from Surinam Island. Currently, there are only a few homesteads with this variety, but the current demand suggest that it has the potential to spread rapidly to commercial holdings in future. Preliminary surveys recently conducted in French Polynesia and Fiji indicates that many amazing compact dwarf varieties have not yet been collected by scientists. The major dwarf palms noticed in various coconut growing countries are:

Aromatic

The aromatic dwarf coconut is originally from Thailand. Distinguishing features include



Malayan yellow

short, wide leaves, many small male flowers and sweet meat and water. Immature nuts are green and mature nuts have a navel at the eye when split.

Malayan Yellow

The Malayan yellow dwarf coconut is originally from Malaysia. Distinguishing features include high-yielding fruit with yellow petioles of leaves and young nuts, low meat content, thin-husk nuts, self-fertilizing and sensitivity to certain types of fruit rot.

Niuleka Green

The niuleka green dwarf coconut is originally from Fiji. Distinguishing features include short and rigid



D X T hybrid

leaves with wide and closely spaced leaflets, cross-pollinating with large fruits and a dense crown with short internodes.

Gangabondam

The gangabondam dwarf coconut is originally from India. Distinguishing features include a mixture of both tall and dwarf characteristics and high oil content.

Pilipog

The pilipog dwarf coconut is originally from the Philippines. Distinguishing features include female flowers, pink parts including at the base of shoots, tips of roots and just germinated seedlings and round, green nuts.

Chowgat Orange

The chowgat orange dwarf coconut is originally from central Kerala in India. Distinguishing features include medium orange nuts, retention of its unfertilized females at the spike and early bearing.

King Coconut

The king dwarf coconut is originally from Sri Lanka and known as the most famous Sri Lankan coconut. Distinguishing features include high self-pollinating, high-quality water and a larger trunk than most dwarf coconuts

Catigan

The catigan dwarf coconut is originally from the Philippines. Distinguishing features include medium-sized nuts, thick husk, long bunch rachis, round shape with a prominent stigmatic tip and green young nuts and petioles.

Brazilian Green

The Brazilian green dwarf coconut is originally from Brazil.



Brazilian dwarf

Distinguishing features include round and smaller nuts than other dwarf coconuts, good fruit composition and clearly marked dwarfism.

Mangipod Green

The mangipod green dwarf coconut is originally from the Philippines. Distinguishing features include strict dwarfism, high self-pollinating and retention of many ripe nuts at the crown due to the nuts drying while on the tree.

Cameroon Red Dwarf

It is paler than any of the Red Dwarf varieties described in this catalogue. The youngest leaves at the top of the palm are erect and straight, very different than the Malayan Dwarf varieties. The peduncles of the bunch are quite long for a Dwarf type; for this reason, very heavy bunches may abort before reaching full maturity. The Cameroon Red Dwarf produces medium sized, pear-shaped fruits of excellent composition. May be it is one of the coconut varieties that have the thinner husk. The Cameroon Red Dwarf starts to flower two to three years after field planting. It produces 50 to 90 fruits per palm

per year without irrigation.

The Cameroon Red Dwarf is mainly an ornamental palm, planted among gardens and in the cities. Water from young nuts is sweet and tasty. The hybrid between CRD and the West African Tall is very productive but quite sensitive to bug attacks. Nowadays, the cross between CRD and the improved Rennell Island Tall (RIT) is released to farmers by the "Marc Delorme" Research Centre in Côte d'Ivoire.

Surinam Brown Dwarf (SUBD)

Another variant, the Bronze Dwarf, so-called because of its bronze epicarp, is a relatively new find of about six years ago. The Bronze Dwarf was reportedly introduced from Surinam in South America. Currently, there are only a few homesteads with this variety, but the current demand suggest that it has the potential to spread rapidly to commercial holdings. Similar type of variety also identified from Thailand called Thailand Brown Dwarf (THBD) and also in Sri Lanka called Sri Lanka Brown Dwarf variety (SLBD).

Dwarf x Tall Hybrids for future

Dwarf plants can also be

produced by cross pollination of selected dwarf plants as female parent and elite tall palm as male parent, from Dwarf x Tall progenies. Apart from this, off type progenies of which are called, Natural Cross Hybrids (NCD's) are also available. About 20-25% NCD's will be obtained from a dwarf coconut nursery, if the nuts sown are collected from mother palms surrounded by tall palms. Hence inter-planting of tall gardens with dwarf mother palms and promising hybrids need to be promoted for promoting NCD's with dwarfism in future planting. The genetic inheritance of these dwarfism syndromes remain unknown. The origin of this variant has been attributed to natural cross pollination between Dwarf and Tall types, being an apparent Dwarf x Tall hybrid. This hybrid palms show marked hybrid vigor in trunk and leaf size, number of bunches produced per year and number of nuts per bunch, kernel thickness etc. The dwarf varieties and hybrids with reduced height recommended for cultivation in the different states in India are:

Branching in coconut

Normally coconut fruit gives rise to one shoot and this in its turn one

Varieties with reduced height recommended for cultivation in India

Variety	State for which recommended
Chowghat Orange	All coconut growing areas
Gautami Ganga	Andhra Pradesh
Kalparaksha (Malayan Green Dwarf)	Root (wilt) disease prevalent tracts
Kalpasree (Chowghat Green)	Root (wilt) disease prevalent tracts
Malayan Yellow Dwarf	All coconut growing areas
DxT Hybrid	State for which recommended
Chandra Sankara (COD x WCT)	Kerala, Karnataka, Tamil Nadu
Kalpa Samrudhi (MYD x WCT)	Kerala, Assam
Kalpa Sankara (CGDx WCT)	Root (wilt) disease prevalent tracts

stem. It is not frequently met with wide variation from these normal phenomena. There are several instances where adult coconut palms have branches. All truly branched coconut palms are productive. Cases may occur where branched coconut may not start yielding for very long period but such cases before entering in to a conclusion, it has to ascertain whether un-productivity is due to lack of proper care. The crown of the tree is normal and have some what shorter leaves compared to normal leaves in un-branched trees. It is an occasional occurrence reported from major coconut producing countries. Several reasons for this abnormal phenomenon were enumerated by scientists. It may be due to development of lateral bud or due to injury to the terminal bud by red palm weevil or some mechanical injuries caused by strong wind, lightning, diseases, fire, storm etc. Failure of the inflorescence to become flowers is another reason reported for tendency. When the terminal bud of a palm is injured there seem to be a tendency for the auxiliary bud to develop and replace the destroyed terminal bud or growing point. This may be possible only when the inflorescence instead of producing flowers and fruits produce branches. Producing branches due to genetic disorder also can not be ruled out in some cases where poly-embryonic and premature branching have also been reported.

Thus it may be concluded that aerial branching in coconut may be either due to hereditary factors or accidental happenings. Most of the truly branched palms bear fruits more than normal ones. These palms with reduced height and braches also need to be promoted for future. Molecular characterisation of



A rare branched coconut tree found in Changanacherry in Kottayam District in the State of Kerala, India

genetic resources of such palms are to be studied. Research agencies may conceive and promote research projects devoted both to understanding the genetic inheritance of Dwarfism and branching which will probably play an important role in the future of coconut breeding.

Besides good dwarf mother palms located in the farmer's field could be selected for hybridization by farmer's collectives with the help of trained pollinators from their area. Decentralized nurseries for production and distribution Dwarf x tall hybrid seedling with reduced height in the farmer's field could also

be taken up successfully, as already proved by some of the farmer collectives with active participation of farmers. Further, in order to increase the production of dwarf x tall hybrids to meet the increasing demand, the dwarf mother palm base in the country need to be strengthened as limited number of mother palms are only available with the government agencies. More number of nuclear dwarf seed gardens shall be established in the private sector with active supervision of research and development agencies to ensure production and supply of varieties with reduced height to the farmers in future.