

A "TAPPING" TECHNIQUE FOR THE COCONUT PALM

W. R. N. Nathanael

Summary

A survey of the recorded facts reveals that the practice of "tapping" for toddy is restricted to the palm family. In general, toddy is an exudate of plant sap, but it is not necessarily collected from a definite region or part of the palm. In the coconut palm it is the inflorescence at a particular stage of development that is stimulated to yield toddy.

In some coconut growing countries the practice of "tapping" coconut palms is of considerable commercial importance.

A tapping technique suitable for the *typica* variety of coconut palm has been evolved and described. Whilst it does not aim at "slaughter tapping" it is recommended as being suitable for the promotion of even production during a tapping period of eight months.

Introduction

The literature contains scattered references to observations made by several workers on the yields, characteristics and composition of certain palm saps which have been popularly described as "palm wines" by the early European visitors to eastern countries.

Though these saps have also been referred to under various other names such as *lagbi* (North Africa), *lubki* (Egypt), *tuba* (Philippines), *nira* (Malaya) and *tari* (India), they are all generally termed *toddies* at the present time.

A survey of the recorded facts reveals that the practice of "tapping" for toddy is restricted to the palm family. Many different genera and species of palms have actually been utilised for this purpose, from most remote times in various countries of the Orient. In some countries like India, Ceylon, Philippines, Malaya, Indonesia and North Africa, the practice of tapping palms is of considerable commercial importance.

"Tapping" of Palms

The term "tapping" collectively denotes the artificial extraction and the various processes of stimulating the different toddy yielding palms to exude juice from a selected part. Toddy itself is an exudate of plant sap, but it is not necessarily collected from a definite region or part of the palm.

In the cultivated date palm (*Phoenix dactylifera*) and the buri palm (*Corypha elata*), the entire growing point is cut off and the juice is collected from the naked stem of the exposed tender "cabbage" by cutting out ("ringing") a shallow circular depression. In the wild date palm (*Phoenix sylvestris*) and the African palmyra, tapping is done by puncturing the lateral region of the tender stem. In the sugar palm (*Arenga saccharifolia*) and Wight's sago palm (*Arenga wightii*) it is the stalk of the inflorescence (peduncle) that generally exudes sap. In the water coconut (*Nipa fruticans*), Indian sago palm (*Caryota urens*), palmyra palm (*Borassus flabelliformis*) and the coconut (*Cocos nucifera*) it is the inflorescence at a particular stage of development that is stimulated to yield toddy.

The Coconut Palm

The coconut belongs to the family of palms viz., Palmaceae. It is a unique species in respect of its stem and fruit characters and is very much unlike any other known species of *Cocos*.

The term *variety* is often used by many in the popular sense to include any variant whether it is a botanical variety, form or eco-type. In the strict sense however, it should denote a single strain or group of strains which distinctly differ in structural or functional characters from one another (or a group of the same species) which can be dependent upon to reproduce itself true to type. On this basis, the cosmopolitan species *Cocos nucifera* (Linn.), has been divided into the five following varieties by Narayana and John (1):—

Spicata. K. C. Jacob.

Typica. Nar.

Nana (Griff.) Nar.

Javanica. Nar. and *Androgena*. Nar.

All these varieties are stated to cross with each other freely.

In a recent publication Liyanage(2), has classified the 13 forms of coconut found in Ceylon into three botanical varieties as follows:—

Variety—Typica. Nar.

Forms (1) *typica* (2) *navasi* (3) *gan thembili* (4) *ran thembili* (5) *para pol* (6) *bodiri* (7) *kamandala nml* (8) *dikiri pol*.

Variety—Nana (Griff.) Nar.

Forms (9) *pumila* (10) *eburnea* and (11) *regia*.

Variety—Aurantiaca. Liy.

Forms (12) *thembili* or *king coconut* and (13) *navasi thembili*.

In terms of the latter classification, the form *typica* (of the variety *typica*), is the ordinary or common Tall coconut palm which is grown most extensively both on plantation and commercial scales in many coconut growing countries. This form thrives over a wide range of soil and climatic conditions and is relatively hardy. It flowers initially in 6 to 8 years after planting and remains economically productive for 60-70 years (under favourable conditions), and attains a height of about 40 to 60 feet,

The description that follows in this article refers to the *typica* form of the coconut only.

Developmental Aspects of the Coconut

The inflorescence of the coconut is what is known as a *Spadix*. It is monoecious (male and female flowers on the same plant), about 2 to 5 feet long, stout about the middle and tapering towards the ends, at the time it is ready to open.

The actual floral components are enclosed within two coverings—the outer and inner bracts. The outer bract ceases to grow a long time before the flowering branch is fully grown. The inner bract however continues to grow forcing its way through the outer bract, till the inflorescence is ready to open. The inner bract is deeply ribbed and grooved and this allows it to expand in girth as the inflorescence within it swells. Ultimately it splits along one of these grooves and liberates the flowering branch.

The opened floral cluster consists of many flower-bearing ramifications or spikelets (about 30-40), which arise in spiral succession from an elongated central axis or peduncle (FIGURE 1). Generally, the flowers open only after the spikelets are fully exerted. Whilst the lower part of these branches

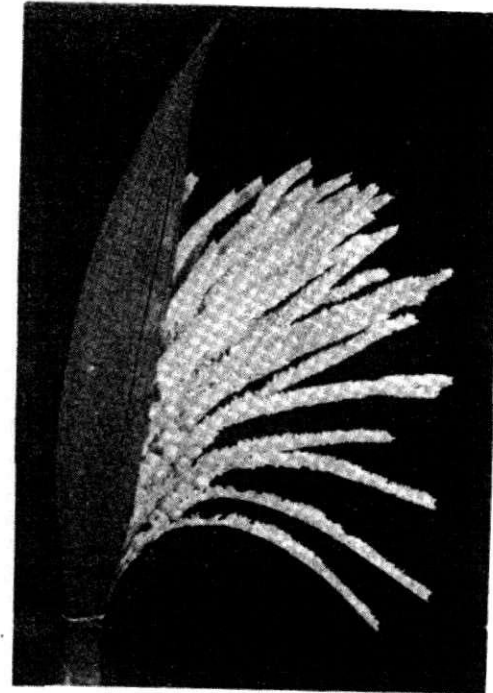


FIGURE 1
A newly opened coconut inflorescence

is bare for 2 or 3 inches, the rest is thickly studded with 200 to 300 male flowers, and the sessile female flowers (which number only about 20-40 in all) are situated towards the base of the spikelets (FIGURE 2). The flowers are uni-sexual and are cross-fertilised by a timing mechanism. The female flowers after fertilization, eventually develop into the familiar coconut.

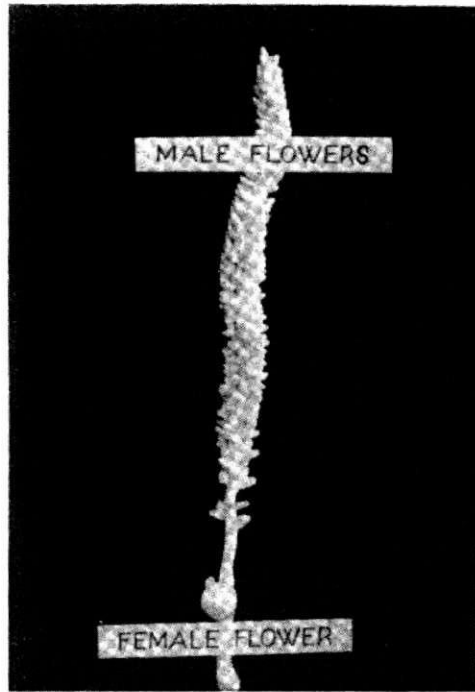


FIGURE 2

A spikelet from a coconut inflorescence showing male and female flowers

The intervals at which the coconut palm produces new flower spathes could vary a great deal. In the so-called 'regular bearers' the number of spadices produced every year could range between 12 and 18. The usual tendency is for palms with smaller nuts to produce spathes at somewhat shorter intervals.

Theoretically, every leaf axil is capable of producing an inflorescence, but due to various factors, some of these spathes abort during early development. A middle-aged palm would produce about 20 fronds and 14 spathes every year. In other words, about six spathes would abort prematurely.

In general, at any one time, if an average healthy palm is stripped into its components, it should be possible to isolate about 44 developmental stages of the floral branch. These would range between the initials of the primordial inflorescence (situated as a minute cone-like protruberance in the axil of the fourth rudimentary leaf from the growing point) and the cluster of ripe green nuts as harvested. These 44 stages could be categorised into 3 groups as follows:—

- I. Stages 1 to 10. Spathes very rudimentary, undifferentiated and tender.
- II. Stages 11 to 30. Inflorescence components differentiated to the stage when the spathe is about to open.
- III. Stages 31 to 44. Spathe just open to the stage when the drupes have matured (containing the rudimentary embryo).

On the basis that a new spathe appears every 25 days, it would take the primordial inflorescence (Stage 1):—

- (a) 1,100 days (approximately 3 years) to reach maturity (Stage 44).
- (b) 250 days (approximately 8 months) to reach stage 11.
- (c) 750 days (approximately 2 years) to reach stage 31.

Stage 30 would represent the state at which the spathe is suited for tapping purposes. This is indicated thus (x) in FIGURE 3. It is

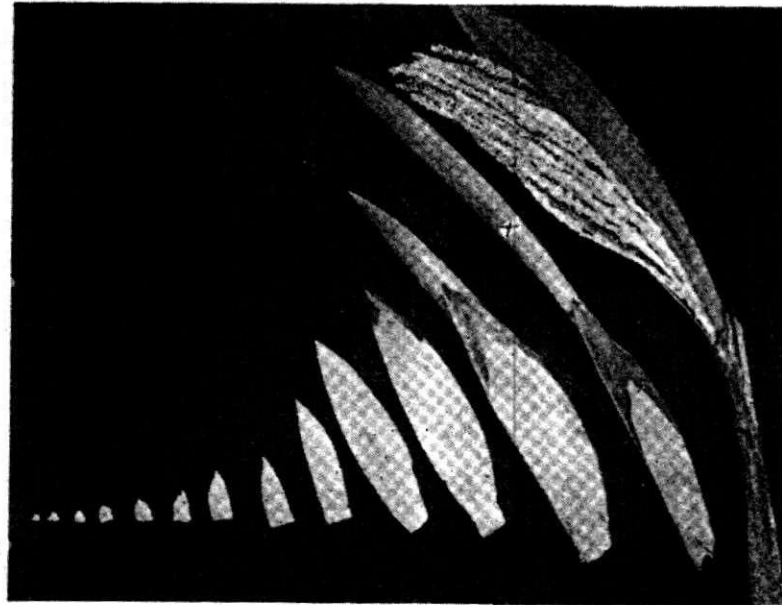


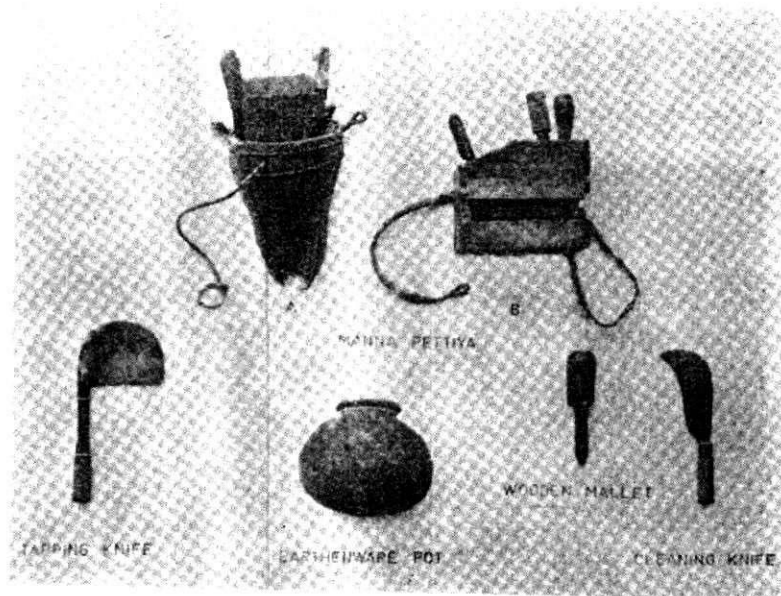
FIGURE 3

Progressive stages in the development of the coconut inflorescence

actually the tender flower spathe just prior to the splitting of the inner bract and the emergence of the spikelets therefrom. The development of pistillate flowers inside the spathe generally causes a bulge at the base of it, and the appearance of this swelling may be taken as a good indication of the appropriate stage for tapping. It should be noted in this connection that a palm that is being continuously tapped for toddy would not produce fruits.

Tapping Gear

The implements used for tapping the coconut palm for toddy are simple and comprise a hard wood mallet (with a smooth ovate head and a tapered handle) a broad blade razor sharp 'tapping' knife, a smaller knife with a curved blade, and a wide-mouth unglazed earthenware pot with a capacity of about 2-0.3-5 litres. With the exception of the pot, the other items are generally carried in a light 'kit' or box (popularly called 'mauna-pettiya') which is fastened round the waist of the tapper. These are illustrated in FIGURE 4.



To climb the palm the toddy-drawer generally makes use of segments of coconut husk fastened previously at convenient heights all the way up the trunk of the palm in the form of a primitive ladder. When he has to climb palms that have not been prepared this way, he passes a girdle or small loop (of soft rope, fibre or coconut leaflets) round his ankles to

hold his feet close together. With this simple contrivance he works his way up the palm like a looper caterpillar holding the trunk with his arms (FIGURE 5). When he reaches the crown of the palm he settles himself on one of the larger fronds and sets about his work after cleaning up the crown with his small knife.



The Mechanics of Tapping

Though the methods of tapping coconut palms differ in details in different places, the essential principles would appear broadly to remain the same throughout.

The tapping process is essentially an art and the results therefore are principally contingent on the skill of the tapper. In essence, the technique consists of carefully bruising and rupturing the tender tissues of the floral components of the composite inflorescence by gently hammering and pounding the spathe, without reducing the flower buds within to a pulp. These operations tend to direct the sap to the wounded parts and also stimulate the stalk of the flowering branch to produce a flow of juice.

Actually a variety of techniques are being used both in Ceylon and elsewhere for achieving this, but the method described below is one that has been evolved and adopted at the Coconut Research Institute (Ceylon), employing an indigenous Sinhalese tapper. The method has been found satisfactory in most respects, including yield coupled with rate and duration of flow of sap.



FIGURE 5b
Toddy tapper climbing a palm
(Two methods)

The Process of Tapping

The spathe that is ready for tapping would generally average about 2.5 feet in length and (in the region of maximum girth) about 3.5 inches in thickness. The orientation of this spathe in relation to the rest of the palm is illustrated diagrammatically in FIGURE 6.

First Day

The operations on the *first day* (morning) in initiating the process of tapping, consist of binding the pre-selected spathe firmly all along its length at intervals $\frac{1}{2}$ of to 2 inches with fibrous strands ($\frac{1}{4}$ to $\frac{1}{2}$ inch in width, stripped off from petioles of the somewhat tender green fronds of the palm) to prevent the splitting of the inner bract due to expansion of the floral

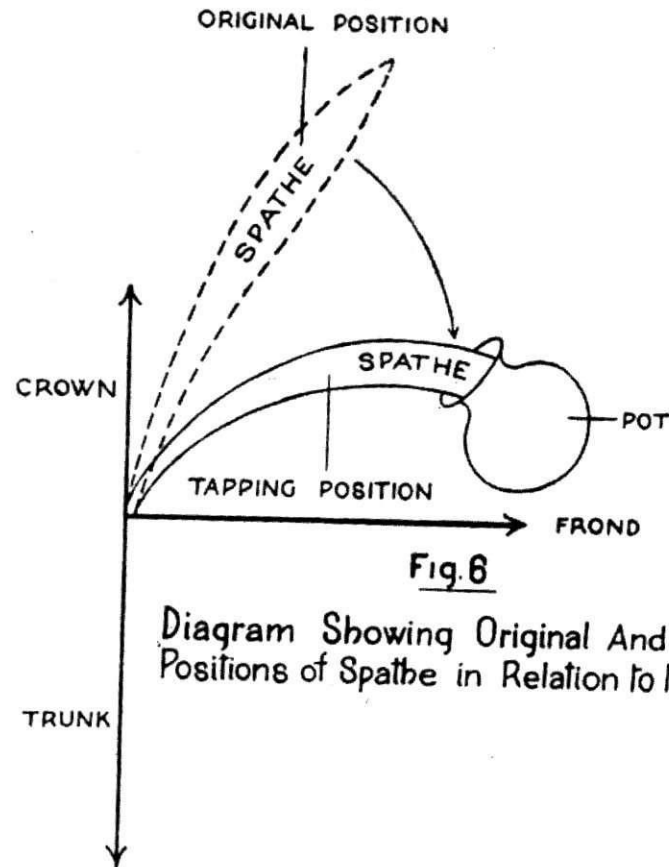


Fig. 6

Diagram Showing Original And Tapping Positions of Spathe in Relation to the Palm

components that are contained within. The outer surface of the spathe is then "tapped" or "beaten" all round with the hard-wood (generally tamarind) mallet which gives the characteristic sound reminiscent of a wood-pecker busily searching for a grub. In addition, the pointed apex of the outer bract is also gently pounded using the tapered end of the mallet.

Second Day

On the *second day*, the tapping and pounding operations are repeated in exactly the same manner.

Third Day

On the *third day* the tapping and pounding operations are followed by cutting off transversely a length of about 2 inches of the composite apical tissues with the tapping knife. The cut end with the exposed flower buds is then carefully pounded with the handle of the mallet. This last

operation is very essential and is restricted to the tip of the bound spathe only. The idea is to cause the crushed floral tissues to pack snugly at the apex thereby preventing the sap exuding from the xylem terminals of the spikelets from running through any interstices and collecting within the body of the spathe. If this happens, the spathe may have to be discarded as spoilage would invariably set in consequent on heat and other fermentative changes.

Fourth and Fifth Days

Once each day the operations of the third day are repeated (in the mornings, preferably before 11.00 a.m.) without however, cutting off any apical tissues.

Sixth Day onwards to flow of sap

From the sixth day onwards till about the twelfth (or until the flow of sap commences), a slightly modified technique is introduced whereby after tapping and pounding, a very thin slice (about 2mm. in thickness) of the apical tissues is pared off with the tapping knife. The slicing is done twice each day (before 11.00 a.m. and about 4.00 p.m.) but the tapping and pounding are done *only* in the mornings, until the flow of sap commences.

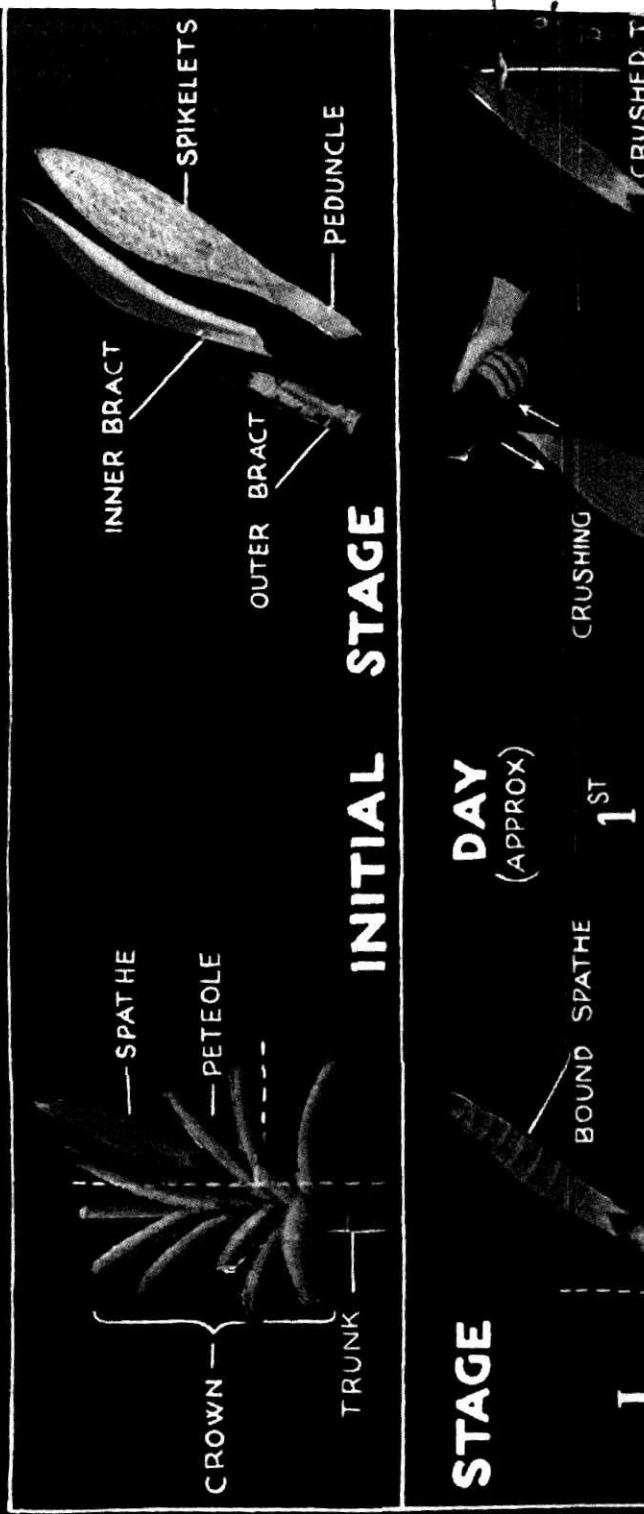
Though the tapper knows through experience the proper time when the toddy beings to ooze, yet the appearance of ants, bees, wasps and flies around the spathe and the characteristic smell of toddy are good indications of the time of exudation. Once the sap begins to drip, the tapping and bruising operations are discontinued, but the exposed end of the inflorescence is shaved off afresh twice a day as usual.

At this stage, the wide-mouthed (generally 2 litre capacity) earthenware pot is slipped over the free end of the spathe supported in position by its own weight or may be tied to a nearby frond. In the natural position, as the distal end of the spathe is considerably higher than the proximal, there is every chance of the juice flowing from the cut end trickling down along the spathe into the leaf axil. This could cause spoilage at the base. In order to obviate this, the free end of the spathe is gradually bent down till it slopes at an angle of about 25° to the horizontal, and is tied down with coir rope to the frond directly beneath it. To facilitate this flexure, a longitudinal incision about 4 to 5 inches in length near the base of the spathe (above the point of its union with the stem) splitting the outer and inner bracts *alone*, may be made without injury to the stalk of the inflorescence itself.

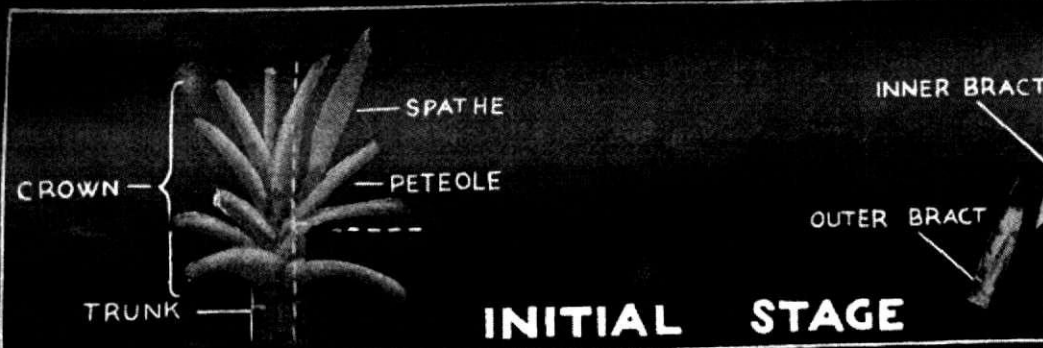
A contraption to direct the sap into the pot is to pin on suitably to the cut end of the spathe (with the midrib—"eekil") an improvised fluted spoute made from a 2 inch strip of the V-shaped green coconut leaflet—ventral side upwards.

The interval from the commencement of tapping to the dripping of the juice would depend on the skilfulness of the tapper, the seasonal conditions prevailing and the nature of the palm. In the literature, 10-35 days have been quoted by different writers. Employing the above method on selected palms, the time interval has been rarely found to exceed 12-15 days.

Progressive Stages in the Toddy Tapping Process

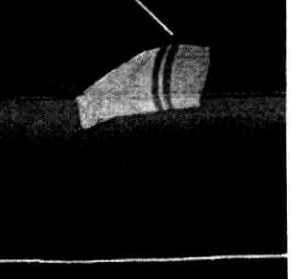
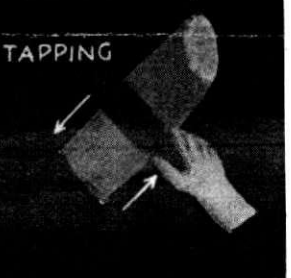
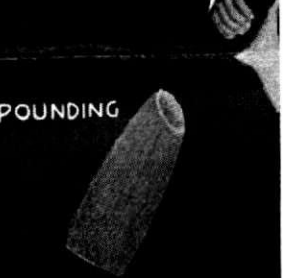
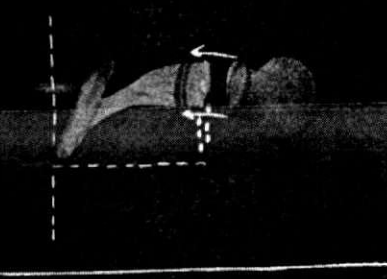
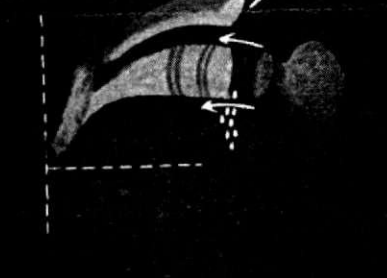
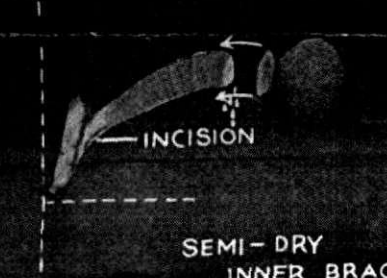
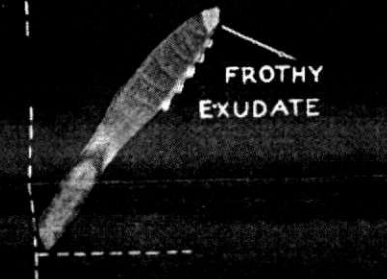
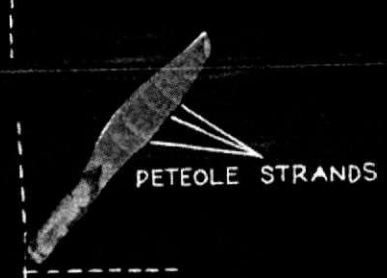


Progressive Stages in the Taddy Process



STAGE	DAY (APPROX)	Process
I	1 ST	CRUSHING
II	3 Rd	POUNDING
III	6 Th	SLICING
IV	15 Th	TAPPING
V	30 Th	
VI	38 Th	
VII	46 Th	

FINAL STAGE



For the first few days, only a meagre flow of juice could be anticipated. Thereafter, as the flow increases, the sap is collected twice a day (morning and afternoon), the tapper pouring off the contents in the pot into a bigger one which he himself carries on his visits from palm to palm.

Using the above technique, regularly paring the spathe and collecting the sap twice daily, it is usually possible to continue tapping a single spathe till it is reduced to a stump about 4-6 inches in length. The progressive stages in tapping described above are illustrated in FIGURE 7.

To prevent any break in continuity, about three weeks prior to the anticipated time of cessation of tapping on a spathe the acropetally younger spathe in the crown is gradually prepared and got ready for tapping. It has been found possible to continue this sequence without a break for a period of one year in good palms.

Where a tapper has to climb the palms individually, he should be able to manage about 25 to 30 during a working day. In tapping groves however where the palms are coupled with aerial ropeways (FIGURE 8), a man



FIGURE 8

Tapper passing from palm to palm on aerial rope couplings

should be able to tap about 75 to 90 in a day, provided he has an assistant on the ground to bulk the toddy that is collected and let down by ropes.

Yield of Toddy and other features

Judging from the various figures available from India, Malaya, Philippines, Indonesia and Ceylon, there would appear to be a wide divergence in the yield of sap obtainable from the coconut palm. Though the tall variety yields more toddy than the dwarf palm, yet there is found to be considerable variation in the yield of juice from day to day, season to season, spadix to spadix and palm to palm. The yield is also largely contingent on the expertness of the tapper. With eight months' tapping in the year, five palms may generally be expected to yield daily a gallon of toddy.

Regarding the duration of tapping for a single spadix, an experiment has shown that from the onset of exudation the period is in the region of 31 days for the *typica* variety of the coconut palm.

Judging from records in Ceylon, it would appear that coconut palms could be tapped for an indefinite number of seasons as long as the rainfall is satisfactory and the palms are rested for 4 months in the year. In the dryer areas however, the spathes after 3 to 5 consecutive seasons would progressively diminish in size and eventually abort. For best results it is always essential that the palms should be adequately manured. The practice of tapping alternate spathes though done in other countries has not been followed in Ceylon.

As far as the selection of palms for tapping, it is more a matter of instinct than communicable knowledge. However, it is generally believed that the following characters could be used as a guide in the pre-determination of suitable palms:—

- (a) Palms with somewhat shiny and pliable leaflets.
- (b) Palms with long inter-nodes.
- (c) Palms bearing the full complement of drupe developmental stages (generally fourteen).
- (d) The inner bract of the spathe should be thin.

Conclusion

Coconut toddy is vitally linked up with the economy of certain coconut growing countries of the world. In Ceylon, it forms the bed-rock of the island's fermentation industries.

The tapping technique that has been evolved and described above has given good results. It does not aim at 'slaughter tapping' whereby the palm is forced to maximum yields but aims at a practical and logical technique for promoting more even production. It has been found that by a careful renewal of the cut surface of the spathe, twice a day at 7 a.m.

and 4 p.m. continuous and satisfactory yields can be ensured during a tapping period of eight months. Apart from natural fluctuations in yield contingent possibly on limiting and stable environmental factors, this method of tapping has been found to give economic and productive yields without causing any adverse symptoms on the palms.

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- LIYANAGE, D. V. (1958). "Varieties and Forms of the Coconut grown in Ceylon". Ceylon Coconut Quarterly, 9, 3 '4, July/December, 1958.