

## Coconut Toddy Tapping and Cottage Manufacture of Treacle and Jaggery

W. R. N. NATHANAEL

"Tapping" is the term applied to the operations connected with the artificial extraction of "toddy" from palms. Toddy itself is an exudate of plant sap, which 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 sap is collected from the naked stem of the exposed tender "cabbage" by cutting out ("ringing") a circular depression. In the wild date palm (*Phoenix sylvestris*) and the African palmyra, tapping is done by puncturing the lateral region of the young stem. In the sugar palm (*Arenga saccharifera*) 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.

In the coconut palm, it is actually the tender flower spathe just prior to the splitting of the inner bract and the emergence of the spikelets therefrom that is best suited for tapping. 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.

The spathe that is ready for tapping would generally average about 2 feet in length and (in the region of maximum girth) about 3-4 inches in thickness. The operations on the *first day* (morning) in initiating the process of tapping consist of binding this spathe firmly all along its length at intervals of  $\frac{1}{2}$  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 premature splitting of the inner bract due to expansion of the spadix that is contained within. The outer surface of the spathe is then tapped or beaten all round with a 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 spathe is also gently pounded using the tapered end of the mallet.

On the *second day*, the tapping and pounding operations are repeated in exactly the same manner. On the *third day*, however, these are followed by cutting off transversely a length of about 2 inches of the apical tissues with a sharp tapping-knife. The cut end with the exposed flower buds is then carefully pounded with the handle of the mallet.

Once a day as before, for two more days, the process is continued (as usual in the mornings, preferably before 11.00 a.m.), without, however, cutting off any apical tissues.

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 crushing, a very thin slice (about 2 mm. in thickness) of the apical tissues is pared off with the knife. The slicing is done twice a day (before 11.00 a.m. and about 4.00 p.m.) but the tapping is done only in the mornings, till the flow of sap commences.

Though the tapper knows through experience the proper time when the toddy begins 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 bruising and hammering operations are discontinued, but the exposed end of the inflorescence is shaved off afresh twice a day as usual.

At this stage, a wide-mouthed, earthenware pot (approximately 2 litre capacity) 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 and trickling down the stem. In order to obviate this, the free end of the spathe is gradually bent down till it slopes at an angle of about 30° to the horizontal, and is tied down with coir (coconut fibre) rope to the frond directly beneath it. To facilitate this flexure, a longitudinal incision about 4 to 5 inches in length may be made near the base of the spathe (above the point of its union with the stem), splitting the outer and inner bracts *alone*, without injury to the stalk of the inflorescence itself. A device to direct the sap into the pot is to pin on suitably to the cut end of the spathe (with the midrib of a coconut leaflet—"eekel") an improvised spout made from a 2-inch piece of 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.

For the first few days, only a meagre flow of juice may be expected. 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 larger one which he 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.

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

*Yield of sugar.* In its fresh state, sweet coconut toddy is a liquid containing as its essential constituent about 15 per cent of cane sugar. For industrial use, sweet toddy compares very favourably with sugar cane juice, not only regarding its sugar content, but also in purity.

Though there are significant seasonal fluctuations in the yield of toddy, the concentration of the sugar in the sap does not alter very appreciably ( $\pm 3.0\%$ ), unless there is accidental contamination with rain water.

On the basis that 5 palms yield a gallon of sweet toddy per day—in a tapping season of eight months, a palm would yield approximately 50 gallons containing 80 pounds of crude sugar. Further, taking 70 palms to the acre (in tapping groves), the raw sugar recoverable per acre would be in the region of 5,600 pounds or 2.5 tons per season of eight months.

#### *Toddy syrup and jaggery*

Knowing that sweet toddy is essentially a water solution of sugar, the preparation of treacle and jaggery (crude sugar), is merely a process of concentrating the sugar by evaporation of water. By suitable means the process could also be carried a step further to obtain pure crystalline cane sugar. Though technically the project is possible, economically the manufacture of sugar from coconut toddy would prove much too expensive unless tapping costs could be considerably reduced.

Laboratory investigations have shown that to obtain coconut treacle of the proper consistency, the sweet toddy should be concentrated so that there is about 70-80 per cent of cane sugar in the finished product. On the basis that the sucrose content of the raw material is 15 per cent it would be evident that the sweet toddy would need to be concentrated 5 to  $5\frac{1}{2}$  times. In other words, about 5 to 6 bottles of sweet toddy would yield a bottle of treacle.

The principal difference between treacle and jaggery making is that in the latter procedure the strained sweet toddy is boiled down to crystallizing point when the partly caramelized sugar sets to a solid. Allowing for losses, the yield of jaggery would be somewhat lower than the percentage of sugar in the fresh sap and could be expected to range between 12 and 15 per cent. From fairly, good sap at least one-twelfth its weight of jaggery should be recoverable without difficulty.

Coconut jaggery has little keeping power and quickly runs into molasses when stored. Though 'Hal' bark (*Vateria acuminata*) can be satisfactorily employed as an anti-ferment in treacle-making, it is not satisfactory when the sweet toddy is to be used for jaggery manufacture. The bark merely retards fermentation but does not arrest it completely. The presence of enzymes produced during even a small degree of fermentation impairs the setting qualities of the resulting jaggery very considerably. Coating the inside of the collecting pots with freshly slaked lime has been found the most efficient method in jaggery manufacture, provided the quantity used is carefully adjusted and is not in excess.