

TODDY AND PALM WINE

FERMENTED PLANT SAPS

Virtually any sugary plant sap can be processed into an alcoholic beverage. The process is well known being essentially an alcoholic fermentation of sugars to yield alcohol and carbon dioxide. Many alcoholic drinks are made from the juices of plants including coconut palm, oil palm, wild date palm, nipa palm, raphia palm and kithul palm.

Palm wine

Palm 'wine' is an important alcoholic beverage in West Africa where it is consumed by more than 10 million people. Palm wine can be consumed in a variety of flavours varying from sweet unfermented to sour fermented and vinegary alcoholic drinks. There are many variations and names including emu and ogogoro in Nigeria and nsafufuo in Ghana. It is produced from sugary palm saps. The most frequently tapped palms are raphia palms (*Raphia hookeri* or *R. vinifera*) and the oil palm (*Elaeis guineense*). Palm wine has been found to be nutritious.

Raw material preparation

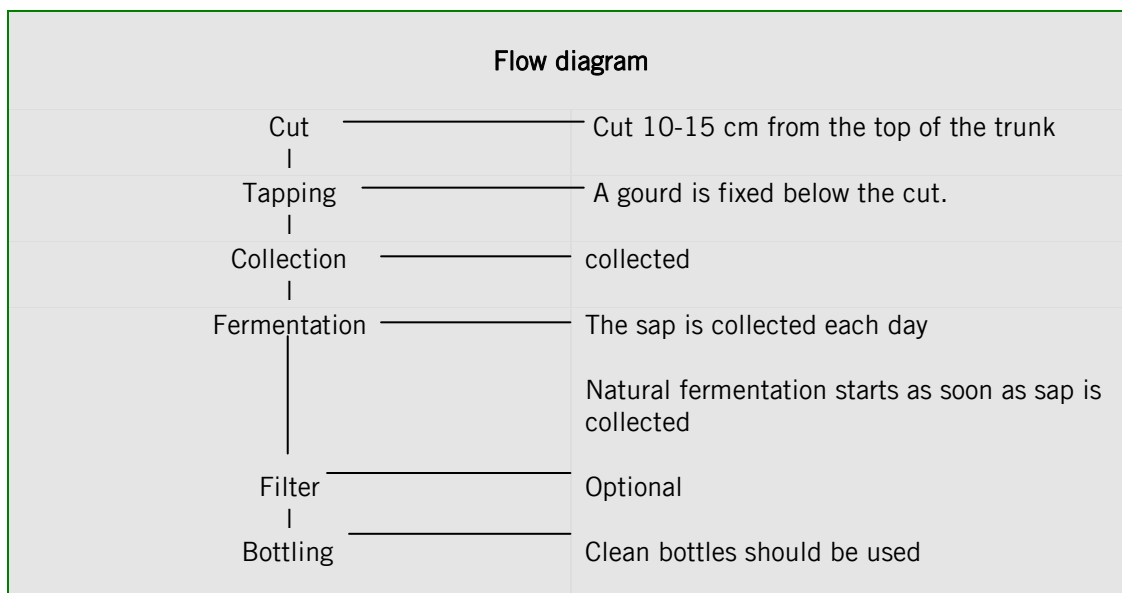
Sap is collected by tapping the palm. This is achieved by making an incision between the kernels and a gourd is tied around to collect the sap which is collected a day or two later. The fresh palm juice is a sweet, clear, colourless juice containing 10-12 percent sugar and is neutral. The quality of the final wines is determined mostly by the conditions used in the collection of the sap. Often the collecting gourd is not washed between collections and residual yeasts in the gourd quickly begin the fermentation.

Processing

The sap is not heated and the wine is an excellent substrate for microbial growth. It is therefore essential that proper hygienic collection procedures are followed to prevent contaminating bacteria from competing with the yeast and producing acid instead of alcohol.

Fermentation starts soon after the sap is collected and within an hour or two becomes reasonably high in alcohol (up to 4%). If allowed to continue to ferment for more than a day, it starts turning into vinegar. Some people like a vinegary flavour. The organisms responsible are mainly *S. cerevisiae*, and *Schizosaccharomyces pombe*, and the bacteria *Lactobacillus plantarum* and *L. mesenteroides*. There are reports that the yeasts and bacteria originate from the gourd, palm tree, and tapping implements. However, the high sugar content of the juice would seem to selectively favour the growth of yeasts which might originate from the air. This is supported by the fact that fermentation also takes place in plastic containers. Within 24 hours the initial pH is reduced from 7.4-6.8 to 5.5 and the alcohol content ranges from 1.5 to 2.1 percent. Within 72 hours the alcohol levels have increased from 4.5 to 5.2 percent and the pH is 4.0. The organic acids present are lactic acid, acetic acid and tartaric acid.

The main control points are extraction of a high yield of palm sap without excessive contamination by spoilage micro-organisms, and proper storage to allow the natural fermentation to take place.



Packaging and storage

Packaging is usually only required to keep the product for its relatively short shelf life. Clean glass or plastic bottles should be used. The product should be kept in a cool place away from direct sunlight.

Toddy

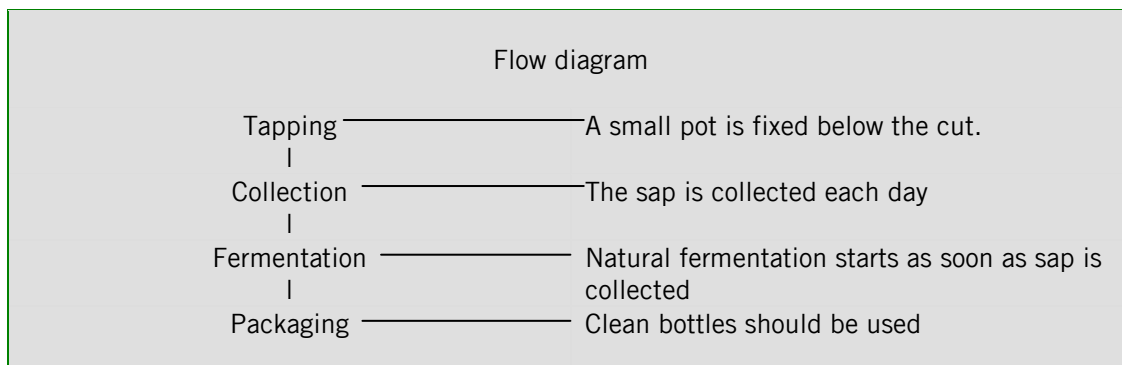
Toddy is an alcoholic drink made by the fermentation of the sap from a coconut palm. It is white and sweet with a characteristic flavour. It is between 4 and 6% alcohol and has a shelf life of about 24 hours.

Raw material preparation

The sap is collected by slicing off the tip of an unopened flower. The sap oozes out and can be collected in a small pot tied underneath.

Processing

The fermentation starts as soon as the sap collects in the pots on the palms, particularly if a small amount of toddy is left in the pots. The toddy is fully fermented in six to eight hours. The product is usually sold immediately due to its short shelf-life.



Packaging and storage

Packaging is usually only required to keep the product for its relatively short shelf-life. This is usually clean glass or plastic bottles. The product should be kept in a cool place away from direct sunlight.

Other fermented plant saps

Pulque

Pulque is the national drink in Mexico, where, it is claimed, it originated with the early Aztecs. Pulque is a milky, slightly foamy, acidic and somewhat viscous beverage. It is obtained by fermentation of aguamiel, which is the name given to the juices of various cacti, notably *Agave atrovirens* and *A. americana* which are often called the “Century plant” in English. Pulque contains between six and seven percent alcohol. The beverage made from distilling pulque is called “Mezcal. The juices are extracted from the plants when they are eight to ten years old and fermentation takes place spontaneously, although occasionally the juices are inoculated with a starter from previous fermentations. The juice is allowed to ferment naturally. It is a mixed fermentation although yeast (*Saccharomyces caribaji*) is the main actor. *Lacto-bacillus plantarum* produce lactic acid and the viscosity of pulque is caused by the activity of two species of *Leuconostoc* which produce dextrans

Ulanzi (Bamboo wine)

Ulanzi is fermented bamboo sap obtained by tapping the young bamboo shoots during the rainy season. It is clear, whitish drink with a sweet and alcoholic flavour. The bamboo shoots should be young to achieve a high yield of sap. The growing tip is removed and a container fixed in place to collect the sap. The container should be clean to prevent contamination of the fresh sap which may produce off-flavours. The raw material is an excellent substrate for microbial growth and fermentation starts immediately after collection. Fermentation can take between five and twelve hours depending on the strength of the final product desired. Packaging is usually only required to keep the product for its relatively short shelf life.

Basi (Sugar cane wine)

Basi is a sugar cane wine made in the Philippines. It is made by fermenting boiled, freshly extracted, sugar cane juice. A dried powdered starter is used to start the fermentation. The mixture is left for up to three months to ferment and up to one year to age. The final product is a light brown colour and has a sweet and a sour flavour. A similar product is made in Japan called shoto sake.

Muratina

Muratina is an alcoholic drink made from sugar cane and muratina fruit in Kenya. The fruit is cut in half, sun dried and boiled in water. The water is removed and the fruit sun dried again. The fruit is added to a small amount of sugar cane juice and incubated in a warm place. The fruit is removed from the juice after 24 hours and sun dried. The fruit is now added to a barrel of sugar cane juice which is allowed to ferment for between one and four days. The final product has a sour alcoholic taste.

References and further reading

- [*Fermented Fruits and Vegetables: A Global Perspective*](#), FAO, 1998
- [*Vino de Frutas: Serie Procesamiento de Alimentos 6*](#), ITDG Latin America, 1998
- [*Fruit Processing*](#), a selection of Practical Action Technical Briefs
- [*Fruit Waste Utilisation*](#), Practical Action Technical Brief
- [*Juices and Drinks*](#), a selection of Practical Action Technical Briefs
- [*Principles and practices of small and medium-scale fruit juice processing*](#). FAO Agricultural Services Bulletin 146, Food and Agriculture Organization of the United Nations (FAO), (2001).
- [*Technical manual on small-scale processing of fruits and vegetables*](#), Food and Agriculture

- Organization of the United Nations (FAO)
- [*Setting up and Running a Small Fruit or Vegetable Processing Enterprise: Opportunities in Food Processing*](#) CTA
- [*Starting a Small Food Processing Enterprise*](#) by Peter Fellows, Ernesto Franco & Walter Rios Practical Action Publishing/CTA 1996
- [*Small Scale Food Processing*](#) 2nd Ed. P Fellows & S Azam Ali, Practical Action Publishing, 2003
- [*Fruit and Vegetable Processing*](#) UNIFEM Practical Action Publishing, 1993
- *Elaboración de Vino: Proyecto San Martín, A. Puerta*, ITDG-Perú/CEPCO, 2000 (In Spanish)

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