

DISTILLATION, MATURATION AND BLENDING OF ARRACK

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Introduction

The main raw material processed by the State Distilleries Corporation to manufacture arrack is coconut toddy. The fermented coconut sap has about 6.5%—7.5% (v/v), ethyl alcohol. The other volatile constituents present such as acids (acetic), esters (ethyl acetate and ethyl lactate), aldehydes (acetaldehyde) higher alcohols etc. are below 0.75% and balance is mainly water except for toddy sediment and other mineral matter present. Therefore, one could consider coconut toddy as a liquid mixture mainly consisting of ethyl alcohol and water. The technique adopted to separate ethyl alcohol from this liquid mixture (toddy) is distillation. In fact distillation is the most widely used method for separating and purifying liquid mixtures in industry.

Distillation

In coconut toddy distillation ethyl alcohol is separated and purified from coconut toddy to a concentration of 65%—85% v/v. It has been observed that when the distillate is collected at this alcohol strength optimum amount of other volatile constituents (congeners) are recovered with the distillate and most of the unwanted constituents present in toddy are eliminated. If the distillate is taken at a higher alcohol concentration than this, spirit becomes more pure and congeners present will be less. The bouquet and taste of the product will be unsatisfactory. On the other hand, if the distillate is collected at a lesser alcohol strength than this, too much of other volatile constituents will get into the distillate and the product will be inferior. The other important thing that should be taken into consideration is that all alcohol present in toddy should be recovered by the distillation process.

The equipment used for distillation are called stills. The earliest type of distilling equipment had been pot stills, and they were similar in construction in most of the countries. It consist of a pot, a container to put the raw material to be processed, made of clay, mild steel or copper, connected by a pipe to a coil cooled by water (condenser). The pot is heated directly by firewood or by steam coil and the alcohol vapours are cooled by circulating water. A product of high alcohol concentration is obtained. One defect observed in this type of stills is that the alcohol content of the condensate cannot be controlled or maintained during the major part of distillation. Initially the alcohol content of the distillate will be very high. This will

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drop gradually leading to a final low value. By making use of improved pot stills alcohol content of distillate could be controlled and maintained. A better product could be obtained.

State Distilleries Corporation make use of improved pot stills as well as multi-column continuous stills (patent) for toddy distillation. The technique adopted in these stills is fractional distillation. In fractional distillation vapours from the still are allowed to come in contact with a portion of the condensate in a counter current operation in the rectifier. By this, greater separation and purification could be obtained, and the alcohol content of the distillate could be maintained and controlled according to the requirements of the producer. Three types of distillations are carried out in improved pot stills. They are single distillations, low wine distillations and double distillations.

In single distillation of coconut toddy in pot stills, few gallons of distillate that comes first is separated as "Foreshots". This contains large proportion of low boiling constituents such as aldehydes. The distillate that comes after "Foreshots" is called "Middle Runnings" and is taken at an alcohol strength of 65%—85%. The condensate at last stages of distillation is separated out as "Tailings". It contains a large proportion of high boiling substances such as furfural, higher alcohols *etc.* By separating "Foreshots" and "Tailings" at correct stages and collecting the "Middle Runnings" at correct alcohol concentration optimum amount of other volatile components or congeners present in toddy could be recovered with the distillate. The congeners contribute to the aroma of arrack.

The second type of distillation carried out in pot stills is "Low Wine" distillation. In this distillation no fractions are separated and total condensate is taken to one receiver in such a way that the strength of the final product is 40% — 43% v/v. This is an intermediate product and it cannot be consumed directly without further processing since it contains large proportions of acids, esters *etc.*

The third type of distillations carried out in pot stills are Double Distillations. Alcohol content of "Low Wines" is further reduced to about 28% v/v by adding water and fed to the pot still. This is distilled and fractions are separated at pre-determined stages, depending on the quality of low Wines and the amount fed to the still. Finally, two products named "Double Distilled Middle Runnings" and "Second Fraction" are taken after separating "Foreshots" and "Tailings". During double distillation the rate of distillation and the alcohol content of distillate are carefully controlled and maintained at pre-determined values. By this way a pure product with required amount of congeners or secondary constituents could be obtained.

The other type of still used for toddy distillation is the patent or continuous still. Generally they consist of two columns, a boiling column and a rectifying column. Toddy is fed to the boiling column or stripper and is heated by

steam. Alcohol and water vapour, evaporated from toddy by steam in this column is fed into the rectifying column or the Analyser. In this column the alcohol vapours are allowed to come in contact with the condensate in a counter current way. By this process the alcohol concentration of distillate could be increased. With tall column consisting of large number of bubble cap plates the alcohol content of distillate could be increased to a maximum value of 96% v/v. In coconut toddy distillation, strength of distillate in patent stills, is maintained at 65%—80% v/v, since bouquet and taste of product will be best when collected at this range.

Maturation

Fresh coconut spirit even though distilled by most modern plants have unpleasant taste and disagreeable odour. They are eliminated by maturing coconut spirit in suitable containers for a period of 9 months and above resulting in development of acceptable flavour and pleasant odour. Single distilled patent arrack and pot arrack manufactured by the Corporation as well as those purchased from private manufacturers are matured in Halmilla and Teak Vats of 1000 gal. to 3000 gal. capacity for periods varying from 9 months to 7 years. Coconut spirit manufactured in different areas like Kalutara and Seeduwa are matured separately in different Vats. Patent and pot still arrack are generally matured separately but for special products like "Old Arrack" blended product is matured for over 2 years. Double Distilled Middle Runnings and second fraction are also matured in Halmilla and Teak Vats separately for over a period of 1½ years.

It has been observed that the period of maturation could be reduced if area of contact of wood with alcohol is increased. To achieve this selected Halmilla and Teak wood shavings are roasted carefully to the required level and put in stainless steel wire baskets and immersed in Vats. This is practised in a limited way when there is a shortage of matured arrack. Apart from this the Corporation do not practice any other force maturation techniques. The coconut spirit in vats are stirred thoroughly once a fortnight, to facilitate aeration and greater contact of wood with alcohol during maturation. Absorption of disagreeable odour by wood, oxidation and slight changes occurring in congeners present in arrack, and increase in total solid content as a result of extraction of tannins, resins and other material from wood make arrack mellow and pleasant after maturation.

Blending

It has been observed that sometimes single distilled pot arrack and double distilled second fraction contain slightly higher amount of furfural. Therefore, these types of arrack are generally blended with patent arrack before reduction and bottling. The different varieties of coconut spirit are matured for different period of time. When its bouquet and taste is acceptable they are blended and marketed under different brand names.