A Review on palm wine

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Introduction

Palm wine is the fermented sap of various palm trees especially Palmyra, silverdatepalm and coconut palms. Palm wine can be obtained from the young inflorescence either male (or) female ones palm wine is alcoholic beverage that are made by fermenting the sugary sap from various palm plants. It is collected by tapping the top of the trunk by felling the palm tree and boring a hole into the trunk it is a cloudy whitish beverage with a sweet alcoholic taste and very short shelf life of only one day, the wine is consumed in a variety of flavors varying foam sweet unfermented to sour,fermented and vinegary there are many various of the products and no individuals method or recipe palm wine is particularly common in parts of Africa, South India, Mayanmar and Mexico some of the local names for the product include emu and ogogoro in Nigeria and Nsafuo in Ghana, kallu in south India and tuba in Mexico.

Palm sap can be fermented (or) processed into an alcoholic beverage it just needs the correct the yeasts, temperature and processing conditions.

Throughout the world alcoholic drinks are made from the juices of locally grown plants including coconut palm, Palmyra and wild date palm. The term toddy and palm wine both used to describe similar alcoholic drinks the terminology varies from country to country in parts of India the unfermented sap is called “Neera”.

The wine is an excellent substrate for microbial growth fermentation starts soon after the sap is collected and within an hour (or) two. Becomes reasonably high in alcoholic (upto 4%) if allowed to continue to ferment for more than a day, it starts turning into vinegar.

The sap should be collected from a growing palm. It is collected by tapping the palm this involves making a small incision in the bark about 15cm from the top of the trunk a clean gourd is tied around the tree to collect the sap which runs into it the sap is collected each day and should be consumed with in 5-12 hours of collection fresh palm juice is a sweet, clear, colorless juice containing 10-12% sugar.

Classification:

In India mainly three types of palm wines are available.
(1). Palmyra palm wine.
(2) Silver date palm wine.
(3) Coconut palm wine.

(1) Palmyra palm wine obtained from Palmyra palm trees.
**Flow chart**

- **Cut**
  - Cut 10-15cm from the top of the trunk

- **Tapping**
  - A gourd is fixed below the cut

- **Collection**
  - The sap is collected each day

- **Fermentation**
  - Natural fermentation starts as soon as sap is collected

- **Filter**
  - Optional

- **Bottling**

**Clean bottles should be used.**

*Borassus* (Palmyra) is a genus of six species of fan palms it is present over all India, South Africa, Mexico and other countries they are tall palms, capable of growing up to 30m high, the leaves are long fan shaped 2-3 m in length the flowers are small in density clustered spikes followed by brown large round dish fruits.

The toddy is fermented to make a beverage called arrack, or it is concentrated to crude sugar called jaggery or palm sugar.

The tree sap is taken as a laxative and medical values are ascribed to parts of the plant.

In Cambodia the tree is a national flora symbol (Angkorwat.)

The sugar palm can live over 100 years.

### Scientific classification

<table>
<thead>
<tr>
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<th>Plantae</th>
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<tr>
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<td>Commelinids</td>
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</tr>
<tr>
<td>Species</td>
<td>P.sylvestris</td>
</tr>
<tr>
<td>Binomial name</td>
<td><em>Phoenix sylvestris</em></td>
</tr>
</tbody>
</table>

(2) Silver date palm wine obtained from silver date palm tree (or) sugar date palm trees:

Silver date palm is a species of flowering plant in the palm family it is present in southern Pakistan, most of India and Bangladesh.

Growing plains and scrubland to 1300m the fruit from this palm species is used to make wine and jelly the sap is boiled to make jaggery in west Bengal state of India and Bangladesh.

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<tbody>
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<tr>
<td>Species</td>
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<tr>
<td>Binomial name</td>
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</tbody>
</table>

(3) Coconut palm wine: collected from coconut trees

The coconut (*Cocos nucifera*) is an important member of the family Arecaceae (palm family) it is the accepted species in the genus Cocos and is a large palm, growing up to 30m tall with pinnate leaves 4-6m long.
The sap derived from incising the flower clusters of the coconut is drunk as Neera and fermented to produce palm wine also known as "tuba" in the Philippines the sap can be reduced by boiling to create a sweet syrup (or) candy.

Scientific classification

Kingdom : Plantae.
UN ranked : Angio sperms
UN ranked: Monocots
UN ranked: Commelinids.
Order : Arecales
Family : Arecaceae
Sub family : Arecoideae
Tribe : Cocoeae
Genus : Cocos
Species : C.nucifera
Binomial name Cocos nucifera

Importance of palm wine and palm sap:
The importance of palm wine especially in African societies extends across the cultural and medical divide.

A litter of palm wine contains approximately 300 calories , 0.5-2.0 g of proteins considerable of vitamins , a major component of which is vitamin A,C and K helps consumers eye sight it protect and improves the eye sight.

Palm wine is also the wine of choice at traditional wedding ceremonies the Igbo and Yoruba, a bride confirms a bridegroom as her husband by pretending to seek him out among the crowd and kneeling down to symbolically present a calabash of palm wine to him.

Palm wine also the drinks of choice at traditional religious ceremonies (or) festivals were wines are offered to the ancestors as a sign of worship.

Systematic studies on the odour active contributors to palm wine aroma were recently with identification of those compounds which induce the characteristic alcoholic, malty and floral-fruit notes of palm wine.

The analysis of palm wine by using Tenax GC, Gas-chromatography and Gas-chromatography – Mass spectrometry. 82 components were identified. i.e. 47 esters, 9 alcohols, 5 acids, 6 carbonyls 2 acetals, 4 terpenes and 9 hydrocarbons. These had all been found previously in conventional wines.

Palm wine contains bacteria, yeast and other useful chemical properties that are very good for treating some common ailments like eye problem; it is good for malaria when soaked with herbs and it generally good for consumptions because it does not contain any additives.

Some eye doctors and optometrists say as yeast is good for the eyes likewise palm wine helps in enhancing sight, but with a word of caution fermented palm wine should not be taken as it contains high quantity of alcohol which is injurious to organs of the body like liver, kidney and eyes. (Dr.alagu (4))

Palm wine contains good amount of yeast, though there are other formulated. Yeast tablets, it is also beneficial to the body as well.

By using palm wine to produce spirit. Palm wine is distilled to obtained spirit known as illicit (or) gin (or) kai-kai.

In Sri-lanka the sugar in palm sap is utilized in the production of “Coconut honey” and "jaggery" most palm sap produced in that country is used for these purpose.

Palm wine under goes longer fermentation produces vinegar. Palm wine is used for making vinegar as acetification occurs after alcoholic fermentation of the wine it is used for making house hold vinegar in Asia. In Nigeria there is an increasing interest in vinegar production from palm wine.

Palm wine from the fermentation results roomie palm sugar is also useful as menstruation Zest. In addition drink palm wine roomie is a powerful enough to fight pneumonia and mejan, palm sugar and has the properties as a drug fever and stomach pain.

Palm wine and its distillate are important solvent in herbal – medicinal administration, pregnant women consume it fresh for the sweetness and nutrition while nursing mothers drink it warm to enhance breast milk production (Ekpr,Pers.comm:2006)

Palm wine serves as a source of inoculum for other fermentations. In Asia it is the source of inoculum for cottage industry fermentations such as Nan (a native leavened bread) and Sonnon (steamed rice flours plus palm wine) (Batra and Millner, 1975)

Palm wine yeast is found capable of degrading hydrocarbons in kerosene and diesel (oil spills) confirmatory evidence was derived from gas chromatographic analysis yeast used hydrocarbons as a carbon source and energy source for growth by these isolate suggest its potential application in oil spill cleanup as well as in single cell protein production using hydro carbon feed stocks (S.C. Amanchukwu, A. Obafemi and G.C. Okpokwasili)

Palm wine contains microbes it enhances the fermentation of the palm sap

Microbial analysis

From the Microbial analysis Palm wine include both Yeast and Bacteria. Palm wine yeast isolated from freshly tapped palm wine from different palm trees, identified as...
Schizo saccharomyces pombe, Saccharomyces cerevisae, Debaryomyces hansenii and Zygosaccharomyces rouxii, each of this isolates was used to ferment wheat flour dough baked, sensory analysis of dough’s was carried out on leavening, texture, aroma, taste and appearance.

Palm wine yeast isolates for industrial utilization. The isolates were characterized for certain attributed necessary for ethanol production

Palm wine consists of many bacteria mainly Lactic acid bacteria include Streptococcus, Pediococcus, Leuconostoc and Lactobacillus.

Lactobacillus plantarum and Leuconostoc mesenteroides were the dominated lactic acid bacteria. Acetic acid bacteria were also isolated the pH of the lactic acid and acetic acid concentration 3.5-4%, 0.2-0.4%

Zymomonas mobilis is a bacterium belonging to the genus Zymomonas. Isolated from alcoholic beverages like the palm wine.

Zymomonas mobilis degrades sugar to pyruvate using the Entner-Doudoroff pathway. The pyruvate is then fermented to produce ethanol and carbon dioxide as the only products

The advantages of Z.mobilis over S.cerevisiae, with respect to producing Bio-ethanol

Palm wine and palm sap
Palm sap

The sap is extracted and collected by a tapper. The sap is collected from the cut flower of the palm tree it is a white liquid that initially collects tends to be very sweet and non-alcoholic before it is fermented.

Unfermented sap is called “Neera” (padaneer in Tamilnadu) Neera is said to contain many nutrients including potash, palm sap begins fermenting immediately after collection due to natural yeasts in the air.

The sap turns quickly to alcohol and vinegar it is essential to pasteurize it to arrest fermentation if the intended products are juice drink, sugar and syrup.

The sap of the palm, tapped from the immature inflorescence is a clear, sugary solution, many workers have studied the composition of palm sap (Bassir, 1962: chinarasa, 1968 ; Fararusi and Bassir, 1972; Okafor, 1978).

Alcohol % present in palm sap is 4% pH - 6-6.0,

Palm sap Table-(1)

Palm wine

Palm wine is the fermented sap of certain varieties of palm trees palm wine is called palm toddy (or) simple toddy is an alcoholic beverage created from the sap of various species of palm tree such as the Palmyra and coconut palm, short date palm ( or) silver date palm also. The drink is common in various parts of Asia and Africa and goes by various names such as 

Palm wine may be distilled to create a stronger drink kallu (a sour beverage made from fermented sap but not a strong as wine) is usually drunk soon after fermentation by the end of the day it becomes acidic and sour day by day

Palm wine alcohol percentage (5-8 %).

Palm wine Table-(2)

Micro organisms

Micro organisms reported in palm wine include both yeast and bacteria, the yeasts are mainly Saccharomyces and Candida, total 17 yeast were isolated from samples of palm wine fermented from the sap, twelve of the yeasts belongs to Saccharomyces, four were Candida species and one was as Endomycopsis species

Bacteria encountered in palm wine include Lactobacillus, Leuconostoc, Bacillus, Streptococcus, Zymomonas, E.coli, Brevibacterium, Micrococcus, Pediococcus, Corynebacterium and Klebsiella (Bassir, 1962; Fararusi; Okafor 1975 a)

Lactobacillus, Leuconostoc, Bacillus, Streptococcus, Saccharomyces are the probiotic organisms present in palm wine it will helps to produce vitamins, digestive enzymes and stimulates the immune system.

Fungi

Saccharomyces species

Saccharomyces cerevisae is a species of budding yeast it is perhaps the most useful owing to it use since ancient times in backing and brewing it is believed that it was originally isolated from fermented palm wine. It is one of the eukaryotic type organisms in molecular and cell biology Saccharomyces is used in brewing when beer when it is sometimes called a top-fermenting ( or ) top-cropping yeast. Uses in aquaria owing to the high cost commercial CO2 cylinder systems, CO2 injection by yeast is one of the most popular DIY approaches followed by aquatic plant, the yeast culture is in general maintained in plastic bottles and typical systems provide one bubble every 3-7 seconds various approaches have been devised to allow proper absorption of the gas into the water.

Candida

Candida is a genus of yeasts many species of this genus are endo symbionts of animals including humans
Palm sap Table-(1)
Palm sap containing sugars, vitamins and salts

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Sucrose (%)</td>
<td>4.29(+-)1.4</td>
<td>13</td>
<td>3.00</td>
<td>11.2</td>
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<tr>
<td>Glucose (%)</td>
<td>3.31(+-)0.9</td>
<td>1.20</td>
<td>1.20</td>
<td>0.95</td>
</tr>
<tr>
<td>Fructose (%)</td>
<td>-----</td>
<td>-----</td>
<td>0.80</td>
<td>1.0</td>
</tr>
<tr>
<td>Raffinose (%)</td>
<td>-----</td>
<td>0.36</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>-----</td>
<td>10</td>
<td>-----</td>
<td>18.6</td>
</tr>
<tr>
<td>Ammonia (%)</td>
<td>0.38-0.015</td>
<td>-----</td>
<td>160.00</td>
<td>160.00</td>
</tr>
<tr>
<td>Vit C (mg/100ml)</td>
<td>-----</td>
<td>18.6</td>
<td>160.00</td>
<td>160.00</td>
</tr>
<tr>
<td>Vit B12 (mg/100ml)</td>
<td>-----</td>
<td>16.0</td>
<td>160.00</td>
<td>160.00</td>
</tr>
</tbody>
</table>

Alcohol % percentage in palm sap is 4%

pH – 6.0-6.0,

Palm wine Table-(2)

After fermentation palm sap (Palm wine) containing sugars, acids and chemical salts

<table>
<thead>
<tr>
<th>Compounds in palm wine</th>
<th>Quantity (100ml/12 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascorbic acid</td>
<td>16 –30</td>
</tr>
<tr>
<td>Sucrose</td>
<td>12.3-7.4</td>
</tr>
<tr>
<td>Protein</td>
<td>0.23-0.32</td>
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<tr>
<td>Ash</td>
<td>0.11-0.41</td>
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<tr>
<td>Copper</td>
<td>0.286-1.630</td>
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<tr>
<td>Manganese</td>
<td>0.140-0.166</td>
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<tr>
<td>Sodium</td>
<td>50.1-78.2</td>
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<tr>
<td>Calcium</td>
<td>82.3-101.0</td>
</tr>
<tr>
<td>Lead</td>
<td>3.1-4.59</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.151-0.168</td>
</tr>
<tr>
<td>Potassium</td>
<td>669-710</td>
</tr>
<tr>
<td>Lithium</td>
<td>1.3-107</td>
</tr>
<tr>
<td>Nitrate</td>
<td>23-27.7</td>
</tr>
</tbody>
</table>

Palm wine alcohol percentage (5-8 %).
pH - 4.5-6.0,

Candida use. Some alternative medicine practitioners have recommended avoiding antibiotic both control pills and foods that are high in sugar (or) yeast hence one of the specific probiotic strains often recommended alongside a more general probiotic for any one on a Candida cleanse (or) Candida diet.

Bacteria

Two types of characteristic bacteria are present in palm wine.
They are (1) pathogenic bacteria
(2) Probiotic bacteria

Pathogenic bacteria:
Pathogenic bacteria are that cause bacterial infection
(a) Serratia: Serratia is a genus of gram-negative facultatively anaerobic rod shaped bacteria of the enterobacteriaceae. The most common species in the genus S.marcescens is normally the only pathogen causes nosocomial infections
(b) Micrococcus: Micrococcus is a genus of bacteria in the micrococaceae family range from about 0.5-3mm. It is a saprotrophic (or) commensal organism through it can be an opportunistic pathogen particularly in hosts with compromised immune system, pulmonary infections caused by micrococcus.
(c) Klebsiella: Klebsiella pneumonia is gram-negative, non-motile, encapsulated, lactose fermenting facultative anaerobic rod shaped bacteria klebsiella pneumonia can cause the diseases pneumonia it is also causes chronic pulmonary disease enteric pathogenicity, nasal mucosa atrophy and rhinoscleroma.
Probiotic organisms:

Probiotic organisms are beneficial to the host organism

Lactobacillus

Lactobacillus organisms are inhabitants of the human intestine they are the main ones that produce lactic acid in the digestive tract. This is important for overall health some nutritional benefits gained from lactic acid include an improved digestion of lactose control of some types of cancer and control of serum cholesterol levels

Lactobacilli are gram-positive facultative anaerobes; non-spore forming and non-flagellated rod (or) coccobacilli more than 56 species of lactobacillus have been identified

Lactobacillus acidophilus is the most commonly known probiotic bacterium it is found primarily in the small intestine where it produces natural antibiotics called “lactocidin” and “acidophillin”

Bacillus

Bacillus strains are found in soil. Plant matter and manure most species are harmless, some strains are used to produce \ make antibiotics while others are used as insecticides, it is also effective other organisms including bacteria mycoplasmas and fungi

The ability to its production “surfactin” a substance that has an antibiotic effect

Leuconostoc strains

Leuconostoc may be found in various environments the genus belongs to the lactic acid producing family bacteria used in fermenting foods to increase their nutritive quality some strains produce the characteristic flavor in cultured milk productions and vegetables (sauerkraut)

Leuconostoc produces CO₂ and which rapidly lower the pH and inhibit the development of undesirable Microorganisms.

Pediococcus strains:

Pediococcus are found in fermented foods and plant juices. They produce inactive lactic acid and are used mainly for beer and wort

P.acidilactici is a specific strain of lactic acid producing bacteria helping to keep a proper balance of micro flora in the digestive system.

Streptococcus

In combination with L.bulgaricus is used commercially to produce yogurt, this organism is known to be effective in breaking down lactose, a desirable trait for those who are lactose – intolerant. S.thermophilus is found in fermented milk products it is known to destroy such pathogens as Pseudomonas, E.coli, Staphylococcus and Shigella this activity is likely because of its ability to produce “methanol acetone” a potent anti-pathogenic agent . S.thermophilus can be improving the nutritional value of foods by making micro nutrients.

E.coli:

E.coli 1917 is the most studied probiotic strain of E.coli Its name is derived from the fact that it was isolated from a world war-1 soldier who survived a particularly severe out break of diarrhea the use of this strain in treating crohn’s disease and ulcerative colitis is generating some attention in well controlled double-blind trails,

Diseases:

Over fermented palm wine \ reputed to cause diseases or at least to be closely linked to diseases. As mentioned diarrhea, hernia and headaches can be caused.

References:


(2) Venugopal living with food allergies, food allergy pulmon. The J.Res.sci


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