



PM Formalisation of Micro Food Processing Enterprises Scheme

Processing of Jamun Wine



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TABLE OF CONTENTS

	Page No.
Chapter 1: Introduction	
1.1 Introduction	1
1.1.1. Socioeconomic significance	2
1.1.2. Origin and Distribution of Varieties	2
1.1.3. Nutritional facts of Jamun Fruit	4
1.1.4. Nutritive Value of Jamun Fruit	6
1.1.5. Uses	7
1.2 Marketing and Economics	8
1.3 Future Thrust	8
1.4 Value added products of Jamun Fruit	8
1.5 Harvesting and Postharvest Handling	9
1.5.1 Maturity Standards	9
1.5.2 Harvesting	9
1.5.3 Post Harvest Handling	10
Chapter 2: Processing of Jamun Fruit	
2.1 Process flow for production of Jamun Fruit	11
2.1.1 Extraction of Juice	11
2.1.2 Fermentation of Juice	12
2.1.3 Racking and Decantation	13
2.2 Aging (Maturation)	14
2.3 Bottling Wine	14
2.4 Pasteurization	14
2.5 Machinery Used	15
Chapter 3: Packaging of Jamun Wine	
3.1 Characteristics of packaging material for fruit beverages	17
3.2 Packaging material for fruit beverages	17
3.2.1 Glass	18
3.2.2 Light Weight Glass	19
3.2.3 Bag-In-Box	201
Chapter 4: Food Safety Regulations and Standards	
4.1 Food Safety Regulations & Standards	22
4.24.2 Specific Labeling Requirements for Alcoholic Beverages	24

CHAPTER 1

INTRODUCTION

1.1. Introduction

Jamun (*Syzygium cumini* also known as *Syzygium jambolanum* and *Eugenia cumini*.) commonly known as Java plum, Portuguese plum, Malabar plum, black plum, Indian black berry, jaman, jambu, jambul, and jambool, is an evergreen tropical tree in the flowering plant family Myrtaceae, and favored for its fruit, timber, and ornamental value. It has got very valuable place in Auyurvedic medicines. It is believed to be a boon for diabetic patients.

Historically, the *jamun* tree was exclusive to the Indian subcontinent but is today found growing throughout the Asian subcontinent, Eastern Africa, South Africa, Madagascar, and in the warmer regions of USA in states like Florida. In India, the maximum number of jamun trees are found scattered throughout the tropical and subtropical regions. It also occurs in the lower range of the Himalayas up to an elevation of 1,300 meters and in the Kumaon hills up to 1,600 meters. It is widely grown in the larger parts of India from the Indo-Gangetic plains in the North to Tamil Nadu in the South. The data about its total acreage in India are not available. *Jamun* is gaining popularity among the consumers due to its high nutritional values and for its several medicinal properties. *Jamun* fruits are good source of iron which is used as an effective medicine against diabetes, heart & liver trouble. Before the discovery of insulin, *Jamun* is useful in treatment of diabetes and as an integral part in the various alternative systems of medicine. fruits are a rich source of minerals like Mn, Zn, Fe, Ca and Na and also in sugars, tannins, anthocyanin and other phenolic compounds.

Botanical studies have shown that in the Indian subcontinent, there are two main morphotypes of jamun, and this is based on the morphological and organoleptic features, the *kaatha jamun* which is small and acidic to taste and the *ras jaman*, which is oblong, dark purple or bluish, and with pink, sweet fleshy pulp and small seeds. The trees grow up to a height of 50 ft and have large canopy. The young bark is pale brown in color, while the mature are darkish-brown and scaly. The leaves are elliptic to broadly oblong, smooth, glossy, leathery, and fibrous in nature. The trees flower once in a year, and in the Indian subcontinent, it is mostly during the month of June–July.

1.1.1. Socio-economic significance

Native to India, jamun is a pretty fruit with rich color and sweet taste. The fruit is popular for its deep blue or purple color. The leathery fruit holds a firm place in Indian mythology. Called the fruit of the Gods, it is said that Lord Ram lived on the jamun for years after his exile from Ayodhya. His skin is often compared to the slick texture of the fruit, and temples constructed in his honour will always house at least one jamun tree.

Jamun tree besides its nutritive fruits is useful in many ways. The foliage serves as fodder for cattle, especially during drought. The twigs form good datoon (tooth brush) and as rough painting brush. The timber is used in buildings, agricultural implements, railway sleepers and well work as it resists the action of water. Most commonly it is found planted along the avenues or as a wind break on the boundary of the orchards and also for fruits

The nutritive properties of the species have been extensively studied, particularly with reference to the pulp and seed. The fruit is a good source of anthocyanins, iron, pectin, phenols and protein. Fully ripe fruits are eaten fresh and can be processed into a variety of products like jelly, jam, squash, wine, vinegar and pickles. Fruit has sub-acid spicy flavour and squash is a very refreshing drink for quenching the thirst in summer season. Unripe fruit is used for making vinegar. The juice is also carminative, diuretic and gives a soothing effect to the human digestive system. The juice of ripe fruit is used for preparing sauces as well as beverages. It is also dried with salt and preserved as a digestive powder or churan.

Jamun fruit is known to reduce the blood sugar levels and is acclaimed very good for the management of Diabetes mellitus. Seeds contain glucoside “jamboline” and “ellagic acid” possessing abilities to check the conversion of starch into sugar in cases of excess production of glucose. “Shaligram Nighantu Pharmacopeia” in ancient India also recommended the use of jamun seeds for the management of diabetes as it reduced urine sugar quickly. Other constituents of the fruit include resin, albumen, gallic acid, essential oil and tannic acids (<http://www.healthandyoga.com/html/product/diabetic.html>). Tribals are long known to use the leaves as such further studies are needed to show the efficacy of the leaves in amelioration of diabetic conditions. A mixture of jamun and mango juices in equal quantity is very good for quenching thirst commonly seen in diabetic patients. A little quantity of fruit syrup is much useful for curing diarrhoea. The vinegar prepared from juice extracted from slightly unripe fruit is stomachic, carminative and diuretic apart from having cooling and digestive properties. Small jamun fruits, which constitute a large proportion of the genetic diversity, not suitable for table can be exploited in the beverage industry as they contained appreciable amounts of acid, tannins and anthocyanins. The seed as well as bark have found several applications in Ayurveda, Unani and Chinese systems of medicine. The seed is rich in protein and carbohydrates besides containing traces of calcium. These are widely used as cattle feed, a medicine against hyperglycemic conditions and antidote in soft-food poisoning. The fruit is a good source of carbohydrates, protein, vitamins, anthocyanins, pectin, minerals and tannins.

1.1.2. Origin and Distribution of Varieties:

It has originated from Indonesia and India, now growing abundantly in Southern Asia.

Table 1: Species distribution in the country

Species	Common name and use	Distribution
<i>S. aquem</i>	Watery Rose-apple, fruits edible	A small tree distributed in Assam and Meghalaya
<i>S. amottlanum</i>	Fruits edible Western Ghats,	The Nilgris, Palani and Anamalai hills
<i>S. aromaticum</i>	Clove, dried flower buds commercially important	Evergreen trees cultivated in Tamil Nadu and Kerala
<i>S. claviflorum</i>	Fruits edible	The Andamans
<i>S. fruticosum</i>	Wild jamun	Avenue tree
<i>S. jambos</i>	Rose-apple	Many parts of India
<i>S. mappaceum</i>	Ornamental plant	Assam, Meghalaya, Arunachal Pradesh and Tamil Nadu
<i>S. samarangense</i>	Wax Jambu, Fruits edible	The Andamans and many parts of India
<i>S. zeylanicum</i>	Fruits edible	Maharastra, Karnataka, Orissa, Kerala and Andamans
<i>S. javanica</i>	Water apple	South India and West Bengal
<i>S. zeylanicum</i>	Fruits edible	Western Ghats of India.

***Syzygium cuminii* (Java plum, Jamun):** Large, evergreen beautiful tree of the Indian

subcontinent but has also naturalized throughout Southeast Asia and the Pacific Islands. It is widely cultivated in Haryana as well as the rest of the Indo-Gangetic plains on a large scale.

Fruits are generally ovoid to oblong in shape, deep purple or bluish in colour, having juicy, sweet pulp and a small stone.

***Syzygium jambos* (Rose apple):** Trees are medium, evergreen and grown in Assam, Bihar, Andhra Pradesh, Tamil Nadu, West Bengal, coastal areas of Maharashtra and Gujarat. Leaves have very small petiole and calyx persistent. Fruits are light yellow- white in colour, rose scented and seeds are polyembryonic.

***Syzygium fruticosum*:** Trees are suitable for windbreak and have straight growth habit. Fruits are edible and small.

***Syzygium densiflora*:** Suitable for use as rootstock for *Syzygium cuminii*. It is resistant to termites attack.

***Syzygium uniflora* (Surinam cherry or Pitanga cherry):** A small tree and bears small-sized fruits having bright red colour and aromatic flavour. The tree is found in South India.

1.1.3 Nutritional Facts of Jamun Fruit

Jamun is a healthy and nutritious fruit that's packed with a variety of nutrients. It's a rich source of antioxidants, calcium, phosphorus, and flavonoids. It also contains other nutrients like sodium, thiamine, riboflavin, carotene, fibre, niacin, folic acid, protein, and fat.

It's a fruit that has been used in Ayurvedic treatments and medications since ancient times. You can find Jamun in two varieties – one is the white flesh variety, and the other is the purple flesh jamun.

- **Increases Haemoglobin:** Since jamun has loads of vitamin C and iron, it is helpful to increase the haemoglobin count.
- **Keeps the Heart Healthy:** The fruit contains potassium that helps in diseases like stroke, high blood pressure, and heart problems. Individuals who consume jamun regularly prevent the arteries from hardening.
- **Treats Digestive Problems:** Jamun has digestive properties that help with stomach problems. It comes with properties that reduce gas formation, thus helping with bloating, flatulence, and constipation.

- **Fights Respiratory Problems:** The popular jamun fruit is considered a traditional remedy for treating all types of respiratory problems. It's known to have many powerful antibiotic and anti-inflammatory properties that help in treating problems like asthma, common cold, and flu.
- **Helps with Weight Loss:** Since jamun is a low-calorie fruit and contains high fibre, it is perfect for including in weight loss recipes and diets. It improves digestion and helps reduce water retention in the body.
- **Keeps Skin Healthy and Radiant:** Jamun detoxifies and purifies your blood, leaving your skin radiant and glowing.
- **Diabetes Management:** According to Ayurveda, jamun helps with diabetes management. The ingredients like mimosine and jamboline present in the seeds slow down the amount of sugar released in the blood and increase insulin levels. Jamun reduces diabetic symptoms like frequent urination and thirst. Diabetes Management According to Ayurveda, jamun helps with diabetes management. The ingredients like mimosine and jamboline present in the seeds slow down the amount of sugar released in the blood and increase insulin levels. Jamun reduces diabetic symptoms like frequent urination and thirst.
- **Strengthens Teeth and Gums:** The anti-bacterial properties found in the leaves of Jamun help prevent bleeding gums. The leaves of the jamun fruit are dried and powdered and then used in the form of a tooth powder to strengthen the gums and teeth.
- **Protects Against Infections:** The anti-bacterial and anti-fungal properties present in the fruit extract not only get rid of germs and bacteria but also works to treat and heal wounds. The bio-active properties in jamun reduce fatigue and weakness, leaving you energised and fresh.

1.1.4 Nutritive value of jamun fruits (per 100g of edible portion)

Moisture (%)	70-80
Energy (kcal)	62 - 39
Acidity (%)	0.524 -0.772
Total sugar (%)	8.41 – 10.68
Reducing sugar (%)	8.40 – 9.85
Protein (%)	0.53-0.65
Carbohydrates (%)	14.0
Fat (%)	0.15
Crude Fiber (%)	0.6-1.2
Mineral matter (%)	0.4
Pectin (%)	2.3-3.7
TSS (%)	9.0 – 17.4
Anthocynins (mg/100g)	115.38- 210.76
Tannins (mg/100g)	201.50 - 386.25
Antioxidant value (FRAP mg AEAC/g)	112.38 - 907.75
Flavonoid (mg/g)	0.50 - 1.54
Carotenoid (mg /100g)	12.38 - 22.34
Vitamin C (mg/100g)	10.70 – 29.52
Amino acids (mg/100g)	7.2 - 9.0
Vitamin A (IU)	73 – 100 IU
Thiamine (mg)	0.008-0.03
Riboflavin(mg)	0.009-0.01
Niacin (mg)	0.2-0.29
Calcium (mg)	8.3 - 15
Iron (mg)	0.8 - 1.2
Magnesium (mg)	4- 35
Phosphorus (mg)	15 - 30
Sodium (mg)	26.2-- 34.1
Potassium (mg)	55 - 50
Copper (mg)	0.23 mg
Sulfur (mg)	13 mg

Source: Bose *et al*, 2001 and Anon., 2008

1.1.5 Uses

Jamun tree besides its nutritive fruits, is useful in many ways. The foliage serves as fodder for cattle, especially during drought. The twigs form good datoon (tooth brush) and as rough painting brush. The timber is used in buildings, agricultural implements, railway sleepers and well work as it resists the action of water. Most commonly it is found planted along the avenues or as a wind break on the boundary of the orchards and also for fruits (Anon., 1976).

Jamun (*Syzygium cuminii* Skeels) is a nutritious fruit with a variety of uses. The nutritive properties of the species have been extensively studied, particularly with reference to the pulp and seed. The fruit is a good source of anthocyanins, iron, pectin, phenols and protein. Fully ripe fruits are eaten fresh and can be processed into a variety of products like jelly, jam, squash, wine, vinegar and pickles. Fruit has sub-acid spicy flavour and squash is a very refreshing drink for quenching the thirst in summer season. Unripe fruit is used for making vinegar. The juice is also carminative, diuretic and gives a soothing effect to the human digestive system. The juice of ripe fruit is used for preparing sauces as well as beverages. It is also dried with salt and preserved as a digestive powder or churan.

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1.2 Marketing and economics of Jamun Fruit:

Marketing problems are acute in jamun owing to their high degree of perishability and season- bound availability. An analysis of the marketing cost indicated that the commission and the transport charges accounted for 80-90 per cent of the total marketing cost (Krishnamurthy and Sudhakar Rao, 2001). Seventy five per cent of the farmers sell their produce at the farm gate to village merchants, retailers and big producers or to the pre-harvest contractors. They can not afford to transport their produce to distant markets due to limitation of costs involved and market forces. Information regarding demand, supply, price, market outlook, knowledge of the consumer's preference and marketing channels is important for satisfactory marketing.

1.3 Future thrust:

- Development of early, medium and late maturing varieties.
- Standardization of production technology.
- Canopy architecture engineering for high productivity and agro techniques.
- Anti-diabetic activity guided fractionation and associated attributes in potential germplasm.
- Post -harvest handling and storage.
- Product diversification.

1.4 Value added products from *Jamun* fruit:

Various value added products that can be prepared from Jamun include jam, jelly, squash, seed powder etc.

- ❖ Primary Processing
 - Cleaning
 - Sorting & grading
 - Attractive packaging
 - Pulping
 - Juice extraction
- ❖ Secondary Processing:
 - RTS
 - Squashes, syrups
 - Jams, jellies
 - Dehydration of whole fruits
 - Fruit candies

- Preserves
- Canning
- ❖ Tertiary Processing :
 - Juice concentrates
 - Juice powders
 - Different wines
 - Confectionary items

1.5 Harvesting & Post Harvest handling of Jamun Fruit

1.5.1 Maturity standards

Optimum stage of maturity based on physico - chemical composition of the fruit. In jamun, three distinct phases of fruit growth, viz. during the first phase the rate of growth was slow (15-52 days after fruit set), in the second phase (52-58 days after fruit set) the rate of development was quite rapid and the third phase (58-60 days after fruit set) comprised slower growth with little increase in fruit weight, moisture content and total and reducing sugars. Fruit length, fruit weight, fruit volume and moisture content increased during maturation of jamun fruit. The total soluble solids and total and reducing sugars showed a continuous increase as the fruits developed with a marked increase during ripening.

1.5.2 Harvesting

The seedling plants start bearing after 8-10 years, while grafted ones after 4-5 years of planting. The fruits ripen in the month of June –July depending upon the variety and agro- climate. The ripe fruit at full size is deep purple or black in colour and picked immediately once ripens, as it cannot be retained on the tree at that stage. The fruits are delicate and picked singly by hand and care should be taken to avoid any possible damages to fruits. For harvesting, the picker climbs on the tree with a bag of cotton on the shoulder. When the bag is full, either the picker comes down from the tree and empties it into baskets or with the help of rope lowers the bag down to the ground and person standing below the tree empties the bag into baskets gently. The fruits are generally harvested daily and delivered to markets on the same day as they have very low shelf life. The average annual yield of fruit from a full-grown (20 years) seedling tree is about 80-100 kg and from a grafted one (10 years) it is around 60-70 kg.

1.5.3 Post-Harvest Handling

After the harvest, traders often place best quality fruits at the top of the containers but the practice neither helps the grower nor the consumer. Considerable variation exists in the quality of harvested fruit due to genetic, environmental and agronomic factors and, therefore, requires grading so as to get suitable returns. Systematic grading coupled with scientific packaging and storage reduces the post-harvest losses, which enables the producer to obtain a competitive price. Fruits should be graded on weight basis to fetch better prices.

Jamun fruit is highly perishable and can be kept satisfactorily for about 4-5 days under ambient conditions.



CHAPTER 2

Processing of Jamun Fruit

2.1 Process Flow for Production of Jamun Wine

Jamun fruits are available only for short duration in June-July. And Processing is required to enjoy this fruit for long time and save the fruit from getting waste. The fruits could be processed into jelly, jam, juice, squash, powder, dates/ raisins, vinegar and wine.

Jamun Wine: Wine is fermented fruit juice. No matter what the wine is made from, there must be fermentation, that is, that sugar has to be transformed into alcohol. If the amount of alcohol is relatively low, the result is wine. If it is high, the result is "distilled liquor," like gin or vodka.

Process can be divided into two steps- Extraction of Jamun Juice and Fermentation of Juice.

2.1.1. Extraction of Jamun Juice:

i. Harvesting:

Generally Jamun fruits come to ripening stage in June-July. The ripe *Jamun* fruits are bright purple in color and delicious in taste.

Fully ripen Jamun fruits should be harvested daily by shaking the tree branches or by hand picking & collect the fruits on a polythene sheet. Take fully ripened and undamaged jamun fruits for processing.

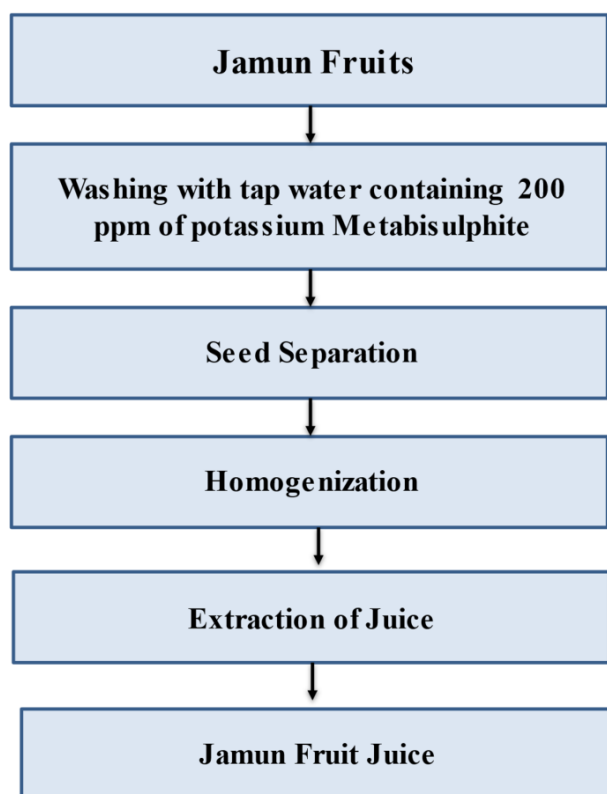
ii. **Washing:** add the Jamun fruits in a container and add a handful of crystal salt or 200 ppm of potassium Metabisulphite and stir the fruits thoroughly. Transfer the fruits to a strainer and clean with filtered water two to three times to remove the traces of salt.

iii. **Crushing and Seed Separation:** Transfer the fruits from the strainer to the clean container. Crush the fruits manually or by using Jamun Deseeding and pulping machine. Separate the seeds.

iv. Homogenization, Pressing and Extraction of juice:

The pulp is then homogenized in the blender to obtain fine pulp and juice is extracted. Different semi and fully automatic machines are available in market to perform this task.

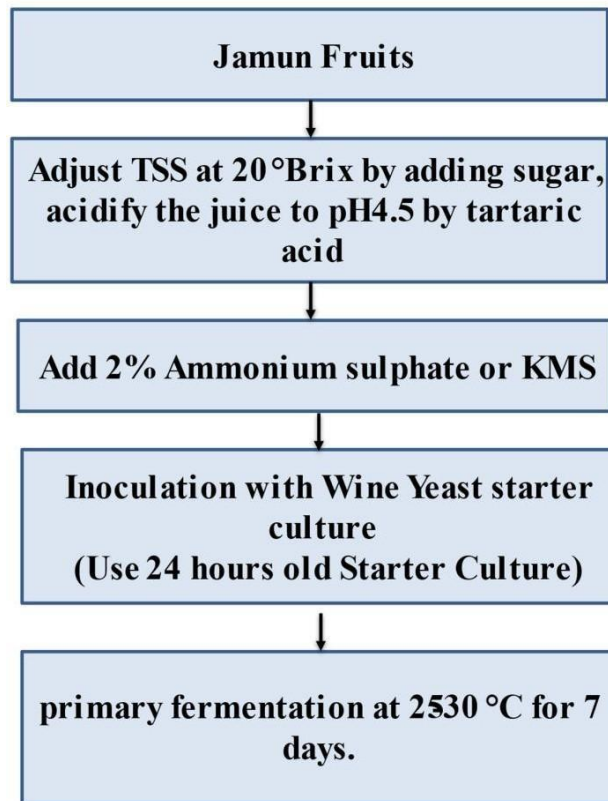
Flow Chart for extraction of *Jamun* juice



2.1.2. Fermentation of Juice:

- Measure the Total soluble solid (T.S.S.) and pH by using hand refractometer. Adjust TSS at 20°Brix. Cane sugar and tartaric acid can be added into the juice (amelioration) to attain 20°Brix and pH 4.5 respectively.
- Add 2% Ammonium sulphate or KMS (Potassium Metabisulfite) at the rate of 100ppm. as Preservative
- Inoculation: Inoculation should be done with wine yeast starter culture. Use 24 hours old starter culture. Measure the Yeast at the rate of 0.1% of juice.
- Add the above inoculums to the juice @ 5% starter culture and keep it for primary fermentation at 25-30 °C for 7 days.

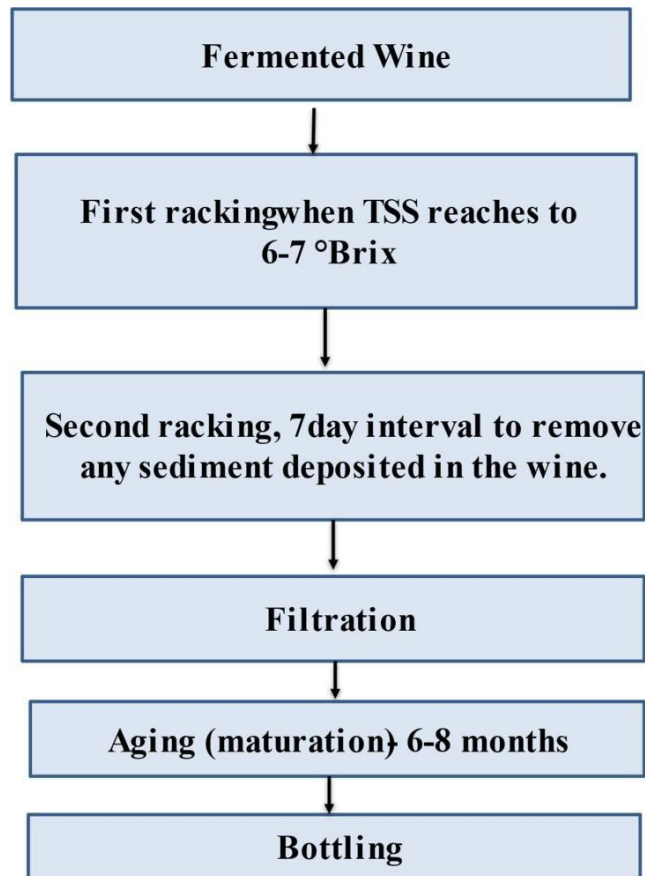
Fermentation of Juice:



2.1.3. Racking and Decantation:

Racking is the process by which wine is removed by pumping it from one holding tank to another in order to separate it from its lees. After fermentation completed and when total soluble sugars (TSS) reaches to 6-7 °Brix, first racking is carried out. This involves the wine to stand still until most yeast cells and fine suspended. One more racking should be done at 7day interval to remove any sediment deposited in the wine. The wine after racking should be clarified. The wine is then filtered without disturbing the sediment or the yeast.

Racking and Decantation:



2.2 Aging (maturation)- 6-8 months:

The final stage of this process is aging and bottling the wine. The wine can be instantly bottled or the winemaker can give additional aging to the wine. For aging, the wine is transferred to oak barrels, stainless steel tanks or bottles. Oak barrels, allow oxygen to enter and alcohol to escape,

2.3 Bottling wine

Once the aging process finishes, the wine is then bottled with screw cap or cork. Pasteurization: should be done after bottling at 60-82 °C for 20 minutes then cool the wine and store at refrigerated temperature for two months.

2.4 Pasteurization:

should be done after bottling at 60-82 °C for 20 minutes then cool the wine and store at refrigerated temperature for two months. Project Cost: a small wine processing unit can be established with 30- 35 lakhs expenditure. 35% of Capital Expenditure with a maximum capping of 10 Lakhs would be provided as subsidy grant by MoFPI

2.5. Machinery required:

Major equipment's required are Fruit washer, Pulper, Fruit mill, Steam Jacketed Kettles, Boiler, Refractometer, Pasteurizer, Bottle washing machine, Sealing machine & Hot air drier.



Jamun Fruit Pulp Making Machine



Hand Refractometer



Wine Fermentation Vessels



Steam Jacketed Kettles



Wine Pasteurizers machine



Oak Barrel

CHAPTER 3

Packaging of Jamun Wine

The packaging of beverages is a materials-intensive business, with steel, Al, glass, and plastics all finding a competitive niche. The cost of materials, processing, customer expectations, retention of flavor, corrosion resistance, environmental impact, etc. all enter into the decision concerning a final package.

The beverage industry is one among the front-liners where massive investments are being made for expansion and technological upgradation. The packaging of beverages both carbonated and non-carbonated, is a complex technological branch in the Food Processing /Packaging industry. The alcoholic beverages industry, covers Indian Made Foreign Liquors (IMFL), country liquor and beer. IMFL includes wine, whisky, gin, rum, brandy and other white spirits.

The following are the major functions of packaging, each of which must be understood by the food manufacturer

- Containing and safety of product that is of paramount importance.
- Increasing the shelf-life and ensuring longer availability
- Facilitating the handling, storage and distribution.
- Protecting against biological, chemical and distribution damages
- Providing convenience - at all stages of handling and to the consumer.
- Information about the product contained through the labelling.
- Security through a tamper evident design.
- Should be able to preserve the flavor and aroma of the product
- Environment protection by taking responsibility of empty packaging material after its use.

3.1 Characteristics of packaging material for Wine

- The major deteriorative reaction in wines is caused by oxidation, the oxygen gradually changing the wine character, leading to development of browning and undesirable flavors. The packaging material should not allow the oxygen inside the packaging.
- Another requirement of the package is that should be inert with respect to flavour migration from the package to the product or sorption of flavours from the product to the package (flavour scalping) .
- It must be absolutely leak-proof and able to prevent contamination by moisture, air and micro-organisms by assuring vacuum sealing.
- It should be sturdy in order to prevent handling and storage hazards.
- “Product quality maintenance” i.e. the package should not react with and change the properties of the product over a given period of storage and preservation.
- It should have resistance towards sunlight, storage temperature and atmospheric humidity.

3.2 Packaging material for Wine

The most common form of packaging used for wines is the glass bottle sealed with natural cork. Since wines are affected by sunlight, the bottles usually used are of coloured glass. Bottled wine is normally stored in the horizontal position so that the cork is kept moist, thereby providing a better barrier to the ingress of oxygen. Glass

3.2.1. Glass:

Glass along with a natural cork is still one of the most popular ways to package wine today, because of its inertness and clarity. Glass is still preferred for bottling of all different types of wine, because of its superior gas and vapor barrier protection, stability over time, transparency, and ability to be recycled. However, is it justifiable to store a short-lived product in such a long-lasting package.

Glass wine bottles still have their place in the wine industry despite some of the disadvantages associated with them. As previously stated, wine bottles do have a superior gas and vapor barrier protection over other packaging types. This is important when it comes to aging wine. Glass bottles are better able to protect wine against oxygen permutation; in other words, glass allows less oxygen through the package than other packaging types.



3.2.2. Light Weight Glass:

Glass manufacturers have developed a new technique called “light weighting” this allows them to reduce the overall amount of glass required to manufacture a bottle. “Light weighting”, as it is called, is done by reducing the amount of glass needed to make a bottle.

They do this by reducing or eliminating the punt or the indentation found on the bottom of a glass wine bottle. Modern manufacturing techniques have the capability to thin the walls of the glass bottles but still maintain the same even glass distribution characteristics of traditional weight glass bottles.

Just by eliminating the punt in their manufacturing process, the amount of glass usage required to make a single glass bottle reduces by 14–16%. This decreases the amount of raw materials (sand and soda ash) needed to make the bottle itself, resulting in an overall cost savings of approximately 10%.

3.2.3. Bag- in- Box System

The most significant change in the packaging of wine resulted from the development of the bag-in-box package: a flexible, collapsible, fully sealed bag made from one or more plies of synthetic films, a closure and a tubular spout through which the contents are filled and dispensed, and a rigid outer box or container.

It consists of a collapsible bag within a rigid container, a filling machine to introduce the liquid product into the bag and a dispenser to draw the product out. The outer container can be a box, a crate or a drum. The bag actually consists of two bags. An inner bag contains the liquid and an outer bag provides the barrier properties. Both are heat-sealed at the edges. The tubular spout fitted to the bag aids in filling and dispensing of the product.

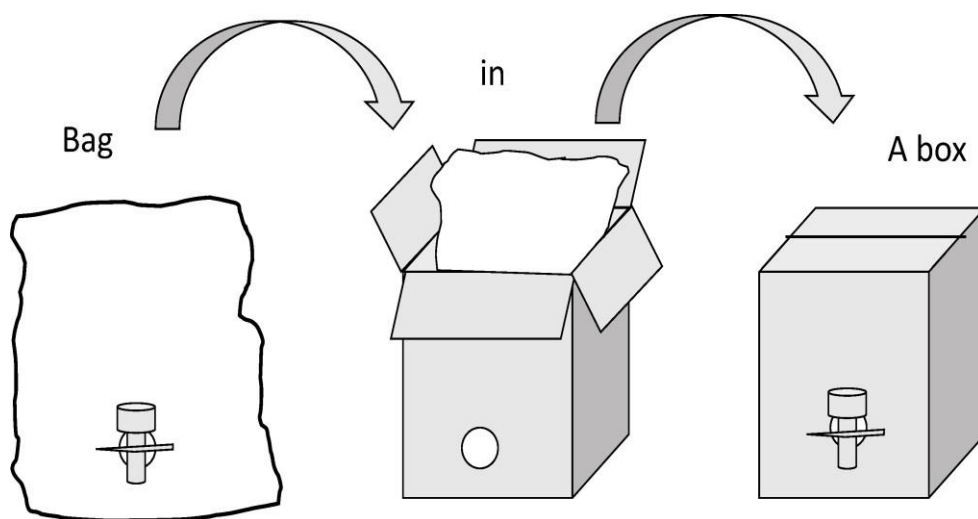


As little as 3 litres or as much as 1000 litres, can be packed. The bag is the “life” of the system. The bag itself consists of three components:

- i. An inner layer
- ii. An outer layer
- iii. A spout

The function of the inner layer, the one in contact with the product, is to provide the bag with seal integrity. The seals are to be strong enough to withstand constant mechanical and chemical “pressure” for at least twice the expected shelf-life of the product. Plastic films manufactured from high performance polyethylene, with excellent sealing and puncture properties are usually used as inner layer materials.

The function of the outer layer is to provide the bag with barrier commensurate with the expectation of the shelf-life of the product. In this respect, bag in box scores over other packaging forms, because unlike other packaging materials like jars and cans, the barrier property and hence the cost of this packaging form can be varied. The shelf-life expectations and storage condition play an important part in determining what the barrier requirements of the outer layer need to be. The standard outside layer is a metallised film laminate, which under standard conditions has an OTR of $1\text{cc} / \text{m}^2 / 24\text{hrs}$.



The spout and cap assembly are made of injection moulded plastics. The spout is provided with a flange, which is welded to the bag's inner layer during bag's manufacture. The spout and cap have two functions.

They are used to fill the product in the bag and are also used to dispense the product from the pack. Several spout types are available ranging from a simple bung like configuration to ones, which can only be opened on the filling machine. The caps come with various tamper evident features as well.

CHAPTER 4

Food Safety Regulations & Standards

4.1 Food Safety and Standards (Alcoholic Beverages) Regulations, 2018

The standards specified in these regulations shall apply to distilled and un-distilled alcoholic beverages.

1.2.3 “alcoholic beverage” “means a beverage or a liquor or a brew containing more than 0.5 per cent. abv. The ethanol used in the production of alcoholic beverage shall be of agricultural origin;

1.2.5 “Distilled Alcoholic Beverage” means a distilled beverage, spirit or liquor containing ethanol that is made by distilling ethanol produced by fermentation of cereal grains, fruits, vegetables, molasses or any other source of carbohydrates of agricultural origin;

1.2.16 “yeast” means a unicellular micro-organism responsible for fermentation of sugars to produce ethanol and carbon dioxide.

3.1 Save as specifically mentioned in different categories, wine shall be the un-distilled alcoholic beverage produced by the partial or complete alcoholic fermentation of the juice of fresh sound ripe grapes, including grape juice concentrate, restored or un-restored pure condensed grape must, and raisins:

According to Food Safety and Standards (Alcoholic Beverages) Regulations, 2018, Regulations for Wine:

S.No	Characteristics	Fruit Wine (other than grape wine)
1.	Ethyl alcohol content at 20°C, % by volume	7.0 to 15.5
2.	Residual extract (sugar free) g/l, <i>Max</i>	50.0
3.	Volatile acids as acetic acid g/l, <i>Max</i>	1.2
4.	Higher alcohols expressed as amyl alcohol (g/l) of absolute alcohol, <i>Max</i>	2.0
5.	Total acids expressed as tartaric (g/l of wine), <i>Max</i>	10.0
6.	Methyl alcohol (mg/l of wine), <i>Max</i>	400
7.	Esters expressed as ethyl acetate (g/l of absolute alcohol), <i>Max</i>	0.2
8.	Aldehydes expressed as acetaldehyde (g/ l of absolute	1.0

	alcohol), <i>Max</i>	
9.	Arsenic (mg/l), <i>Max</i>	0.25
10	Cadmium (mg/l), <i>Max</i>	0.01
11	Copper (mg/l), <i>Max</i>	5.0
12	Iron (as Fe) mg/l, <i>Max</i>	5.0
13	Lead (mg/l), <i>Max</i>	0.2
14	Ochratoxin A (ug/l), <i>Max</i>	20

¹[Wine based beverages shall comply with the standards of table wine in accordance with their ethyl alcohol content.]

3.1.4 Wine from fruits other than grapes

Fruit wine is a wine produced from fruit other than grapes ¹[(should be prefixed with the name of the fruit. Example wine such as plum wine, apricot wine, pear wine)]. It is produced by the normal alcoholic fermentation of the juice of sound, ripe fruit including restored or unrestored pure condensed fruit must.

3.1.5 Wine from other agricultural and plant sources:

Wine from other agricultural and plant sources may be produced by the normal alcoholic fermentation of the juice or sap of other agricultural and plant sources with or without the addition of sugar or jaggery.

1.3 General requirements:

1.3.1 Alcoholic beverages shall be free from chloral hydrate, ammonium chloride, paraldehyde, pyridine, diazepam or narcotic, psychotropic substances including caffeine except naturally-occurring caffeine.

1.3.2 ¹[The tolerance limit for ethyl alcohol content for upto 20% abv shall be ± 0.3 per cent (-0.5 per cent for upto 90 ml per bottle) and for more than 20% abv it shall be ± 1.0 per cent (-1.5 per cent for upto 90 ml per bottle) of the declared strength. In case of wine the tolerance limit shall be ± 0.5 .]

1.3.3 Sugar may be added for rounding off of the alcoholic beverage.

1.3.4 The water used for dilution to bottling strength shall meet the requirements as specified in Indian Standards for Drinking Water, IS:10500 as amended from time to time.

1.3.5 Alcoholic beverage may contain additives, enzymes and processing aids as permitted under the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011.

1.3.6 Any alcoholic beverages when labelled as “matured” , shall be matured for a period of not less than one year in oak or other suitable wood vats or barrels or with wooden

chips.

1.3.7 Where an age claim is made in conjunction with the word 'aged', the age must refer to the youngest spirit in the blend.

1.3.8 The test methods prescribed in the FSSAI "Manual of Methods of Analysis of Foods-Alcoholic Beverages" as amended from time to time shall be used for analysis.

1.3.9 Alcoholic beverage shall be packed in suitable containers as specified in the Food Safety and Standards (Packaging and Labelling) Regulations, 2011:

Provided that bulk containers shall have no upper limit for alcohol content, and shall meet the safety parameters of the product standards. Such products shall also carry a label declaring "For Manufacturer of Alcoholic Beverages only"

3.2 In addition to general requirement specified in Part 1 and the requirements specified in Table-2, wine shall also confirm to the following requirements:

- (i) It shall be clear with characteristic colour, taste, bouquet and form of its type.
- (ii) It shall be preserved by pasteurization or by using preservatives specified in Food Safety and Standards (Food Product and Food Additives) Regulations, 2011 and shall be free from coliforms and pathogenic microorganisms.
- (iii) 1[Water added in preparation of wine shall not be more than 70 ml per kg of grape or fruit:
 - (a) necessary to incorporate any permitted additive and processing aid
 - (b) necessary to facilitate fermentation; or
 - (c) incidental to the winemaking process.

Provided that water may be added to wine to facilitate fermentation if the water is added to dilute the high sugar grape must prior to fermentation and does not dilute the must below 13.5 degree brix.]

(iv) Wine may be amliorated by adding separately or in combination, dry sugar or jaggery (not more than 20 per cent) before, during or after fermentation.

4.2 Specific Labeling Requirements for Alcoholic Beverages

In addition to the general labeling provisions specified in the Food Safety and Standards (Packaging and Labelling) Regulations, 2011, as applicable, every package containing alcoholic beverages shall also provide the following information on the label:-

5.1 Declaration of alcohol content: Alcohol content shall be expressed as per cent.

abv or as proof.

1[5.1.1 The Pot distilled alcohol shall be labelled as "Pot - Still/Pot -Still Distilled/Pot-D
" on the package.]"

5.2 Labeling of standard drink: One standard drink is the amount of beverage that contains in it 12.7 ml of abv as measured at 20°C. The label may include a statement of the approximate number of standard drinks in the package.

Note: For example in the case of a bottle of 750 ml beverage containing 8 per cent. alcohol, the number of standard drinks, accurate to the first decimal place will be labelled as; "contains approximately 4.8 standard drinks"

1[5.3 Geographical indicators (GI) or names may be used on the label solely for the products originating from that geographical region.

Such products shall be registered under the Geographical Indications of Goods (Registration and Protection) Act, 1999 and meet the country specific regulations for such GI products of the country of origin.

Further, such products shall conform to the limits of heavy metals and microbiological requirements as specified under these regulations and other regulations notified under the Act. Labelling requirements as given under these regulations and other regulations notified under the Act shall also apply.]

5.4 In case of imported alcoholic beverage, the provisions of the Food Safety and Standards (Import) Regulations, 2017, shall apply.

5.5 Alcoholic beverage shall not contain any nutritional information on the label.

5.6 No health claim shall be made on alcoholic beverage.

5.7 The label of a package of a beverage containing more than 0.5 per cent abv shall not use the words 'non-intoxicating' or words implying similar meaning.

5.8 Food containing alcohol must not be represented in a form which expressly or by implication suggests that the product is a non-alcoholic confection or non-alcoholic beverage.

5.9 1[Labelling of Wine

5.9.1 In addition to requirements mentioned in sub-regulations 5.1 to 5.6, the label on wine shall also:

- i) Indicate the origin (country or state) of wine and declare the range of sugar.
- ii) Declare the generic name of variety of grape or fruit used in descending order of

quantity or raw material used, geographic origin, and vintage year, provided such claims are made.

iii) Declare the name of residues of preservatives or additives present as such, or in their modified forms, in the final product.

iv) Declare the name of the place, or region, sub-region or appellation, if 75 per cent the grapes come from that place.

v) Carry the name of a grape variety, the wine is made from at least 75 per cent from that grape variety.

vi) Carry a date of vintage, if at least 85 per cent of the wine comes from that vintage.]

5.10 Alcoholic beverage other than wine which contain less than 10 per cent alcohol shall mention the date, month and year of expiry on the label, in that order and shall precede by the words “Expiry date ____” or Use by_____” However, the manufacturer may use the expression “Best before” as optional or additional information.

5.11 Allergen warning:

5.11.1 If the wine contains more than 10 mg sulfur dioxide per litre, the label must declare “C sulfur dioxide or Contains s ”

5.11.2 If egg white or ising glass as fining, clarifying agent or any other processing aid of animal origin is used in wine, it shall be declared on the label with a non-vegetarian logo,if residues of the same are present in the final product.

5.12 There shall be a statutory warning as mentioned below, printed in English language. In case, respective states wish the same to be printed in their local or regional language, the same shall be allowed without the need for repeating the English version.

1[Size of statutory warning shall not be less than 1.5 mm for pack size of upto 200ml and for pack size above 200 ml, size of the warning shall not be less than 3 mm.]

CONSUMPTION OF ALCOHOL IS INJURIOUS TO HEALTH
BE SAFE-DONT DRINK AND DRIVE.



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