



PM Formalisation of Micro Food Processing Enterprises Scheme

Processing of Grape Pulp



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CHAPTER 1

INTRODUCTION

1.1. Status and Market Size

Grapes are one of the world's most commonly produced fruit crops and very diversely used, as fresh fruit (table grape) and processed in wine and grape juice. Approximately 77.8 Million Metric Tonnes is the world production of grapes in 2018, of which 57% was used as wine grape, 36% as table grapes and 7% went on to be processed as dried grape (International Organization of Vine and Wine). 5 countries represent 50% of the world vineyard, namely Spain, China, France, Italy and Turkey, while the rest of the world contributes to the remaining global production.

Table grape cultivars (*Vitis vinifera* L. and *V. vinifera* hybrids with *V. labrusca* L. and *V. amurensis* Rupr.) are from the Vitaceae family of deciduous woody perennial plants, being few of the most consumed non-climacteric fruits worldwide. Table grape is a fruit with a relatively low rate of physiological activity which does not ripen further after harvest.

India ranks 9th in the world grape production. The grapes are one of the most important crops in India. Grapes are cultivated in an area of 151 thousand hectares with a total production 2.9 million tonnes in India, during 2018 (International Organisation of Vine and Wine). Major grape growing states are Maharashtra, Karnataka, Andhra Pradesh, and Tamilnadu and northern western region covering Punjab, Haryana, Delhi, Western Uttar Pradesh, Rajasthan and Madhya Pradesh.

1.1.1. Commercially grown varieties

Table 1: Varieties cultivated in different region of India

Regions	States	Varieties cultivated
Region - I. (Northern India)	Haryana, Punjab, Delhi, Western UP, Rajasthan	Thompson Seedless, Perlette, Beauty Seedless, Anab-e-Shahi, Black Hamburg, Black Prince, Dakh, Foster's seedling, Kandhari, Khalili, Pandhari Sahebi, Watham Cross, Pusa Seedless, Hur, Black Muscat, Early Muscat, Banquiabyad, Cardinal, Kairon

Region – II (Peninsular India)	Telangana & Rayalseema regions of AP, Nasik, Pune, Sholapur, Satara, Sangli, Bhir, Aurangabad and Ahmednagar districts of Maharashtra, Bijapur, Gulbarga, Raichur, Bellary districts of Karnataka	Anab-e-Shahi, Thompson Seedless, Cheema Sahebi, Pandari Sahebi, Gulabi, Bhokri, Kali Sahebi, Sonaka & Tas-A-Ganesh (clones of Thompson seedless).
Region – III (Peninsular India)	Madurai, Salem and Coimbatore districts of Tamil Nadu Bangalore, Kolar, Mysore & Tumkur districts of Karnataka	Bhokri, Anab-e-Shahi, Gulabi, Bangalore Blue, Black Champa, Convent Large Black, AngurKalan, TaifiRosovi, CoarnaResia, Queen of vineyard, Kandhari, Black Prince, Muscat, Pachadraksha

Table 2: Commercial varieties utilized for specific purposes

Category	Varieties
Table grapes	Anab-e-Shahi, Bangalore Blue, Beauty Seedless, Bhokri (Pachadrakshi), Cheema Sahebi, Delight, Gulabi (Panneer Drakshi, Muscat Hamburg), Himrod, Kali Sahebi, Kandhari, Khalili, Pandari Sahebi, Perlette, Selection 94, Pusa Seedless and Thompson Seedless.
Raisin Grapes	Thompson Seedless, Arkavati
Wine Grapes	Bangalore Blue, Thompson Seedless and Arka Kanchan

Commercial varieties can be grouped under four categories based on colour and seeds:

Table 3: Categorisation of varieties

Category	Varieties
Coloured seeded	Bangalore Blue, Gulabi (Muscat)
Coloured seedless	Beauty seedless and Shared Seedless
White seeded	Anab-e-Shahi, Dilkhush (clone of Anab-e-Shahi)
White seedless	Perlette, Pusa Seedless, Thompson Seedless and its clones (Tas-A-Ganesh, Sonaka & Manik Chaman).

1.1.2. Cultivation Scenario

Grape cultivation is one of the most remunerative farming enterprises in India. Grapevines are indeterminate, woody, perennial, deciduous, tree-climbing vines. Grape cultivation in India has been commercially taken up under a wide range of soil and climatic conditions. While there are three distinct regions, e.g., temperate (J.K. and H.P.), sub-tropical (Punjab, Haryana, Rajasthan and Western U.P.) and tropical (Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh), nearly 94% of the area falls in the tropical region. The current area under grape is estimated at 60,200 ha. Despite doubts of success of viticulture in tropical regions, this region has resulted in world's highest productivity in spite of numerous adversities for the normal growth and productivity of vines.

There has been a continuous shift in grape varieties commercially grown in different regions. While in the sub-tropics, early ripening variety Perlette is grown, Thompson Seedless, Sharad Seedless among seedless and Anab-e-Shahi, Gulabi and Bangalore Blue among seeded varieties are cultivated in Maharashtra and southern States. A number of clones of Thompson Seedless namely Tas-A-Ganesh, Sonaka and Manik Chaman are also being grown commercially primarily in Maharashtra.

While a single crop of grape can be taken in sub-tropics, it is possible to take more than 1 crop under tropical conditions. In India, while 78 percent of grape produce is used for table purposes, nearly 17–20 percent is dried for raisin production, while the remaining 2 percent is used for manufacturing of juice and wine.

1.1.3. Production status of Grape

The current annual production of grapes in India is estimated at 2.58 million metric tonnes. Maharashtra is one of the largest grapes producing state with an annual productivity of 774000 tons in 2015, accounting for more than 80% of the total national production. Other major producing states are Karnataka, Tamil Nadu and Andhra Pradesh with an annual production of 330.3, 53 and 27.6 thousand tons respectively.

Table 4: Area, Production and productivity of Grapes in India

Year	Grapes		
	Area ‘000 ha	Production ‘000 MT	Productivity MT/ ha
2007-08	68.0	1735.0	25.5
2008-09	80.0	1878.0	23.5
2009-10	106.4	880.7	8.3
2010-11	111.0	1235.0	11.1
2011-12	116.0	2220.9	19.1
2012-13	117.6	2483.1	21.1
2013-14	118.7	2585.3	21.8
2014-15	123.0	2822.8	22.9
2015-16	121.6	2590.0	21.3
2016-17	136.6	2921.7	21.4
2017-18	138.9	2920.1	21.0

Table 5: Area and Production of predominant varieties

Variety	Area (ha)	Production (t)
Anab-e-Shahi (white, seeded)	3,000	135,000
Bangalore Blue Syn. Isabella (black, seeded)	4,500	180,000
Bhokri (white, seeded)	500	15,000
Flame Seedless (red, seedless)	500	10,000
Gulabi Syn. Muscat Hamburg (purple, seeded)	1,000	30,000
Perlette (white, seedless)	1,500	60,000
Sharad Seedless (black, seedless)	1,000	20,000
Thomson Seedless and its mutants (white, seedless)	22,000	550,000
Total	34,000	1,000,000

Table 6: State-wise Area, production and productivity (2012-13)

State	Area ‘000 ha	Production ‘000 MT	Productivity Tonnes/ ha
Maharashtra	90.00	2050.00	22.78
Karnataka	19.70	320.90	16.29
Tamil Nadu	2.68	43.38	16.19
Andhra Pradesh	1.58	31.51	19.94
Mizoram	2.38	20.80	8.74
Other	1.30	16.51	12.70
Total	117.63	2483.0	21.11

Source: Indian Horticulture Database 2013, NHB, Gurgaon

1.1.4. Composition & Nutritive Value of Grapes

The grape is a good source of water, carbohydrates, proteins, and fat. Additionally, the grape contains significant amounts of potassium, vitamin C and vitamin A and also has a small amount of calcium and phosphorus. Grapes are also a major source of other nutrients like boron a possible substance for bone health.

Table 7: Composition & Nutrients of Grapes (per 100g)

Proximate Composition	Per 100 g
Water	74.796 g
Energy	61.740 kCal
Energy	257.600 kJ
Protein	0.580 g
Lipid (fat)	0.322 g
Ash	0.524 g
Carbohydrate (by difference)	15.778 g
Minerals	
Calcium	12.880 mg
Iron	0.267 mg
Magnesium	4.600 mg
Phosphorus	9.2 mg
Potassium	175.72 mg
Sodium	1.840 mg
Zinc	0.037 mg
Copper	0.037 mg
Manganese	0.661 mg
Selenium	0.184 mg
Boron ⁴	0.748 mg
Vitamins	
Vitamin C (total ascorbic acid)	3.680 mg
Thiamine	0.085 mg
Riboflavin	0.052 mg
Niacin	0.276 mg
Pantothenic acid	0.022 mg
Vitamin B6	0.101 mg
Folate (total)	3.680 mg
Vitamin A (IU)	92.00 IU
Vitamin A (RAE)	4.600 mg RAE
Vitamin E	0.313 mg ATE

Source: Nutritive value of Indian foods, NIN, 2019

1.1.5 Nutritional benefits of Grapes

Grapes contain 16% carbohydrate (most are glucoses), 0.5% plant fibers, potassium chloride, iron and phosphorus, digestible sugar. These substances contribute to the balance of blood acid, and the building of bones and nerves.

Grapes contain the highest iron content of all summer fruits. They are good for people with anemia. Grape can improve our immunity to diseases. As proved by scientists, every 100g grapes contain vitamin A 50 IUs, vitamin C 100 IUs, and vitamin B2 10 IUs. Grape is good for nephritis patients, because it can reduce the albumin and sodium chloride in kidney, as shown by researches. Grapes can improve liver function and promote choleresis. Some doctors include grape juice in the recipe of diabetics, because it contains substance like insulin. Grapes contain falconoid and polyphenol that can inhibit the platelet aggregation and prevent heart disease.

The major medicinal properties of grape and its constituents are antioxidant, anticarcinogenic, immuno- modulatory, antidiabetes, anti-atherogenic, neuroprotective, anti-obesity, anti-aging, and anti-infection. Resveratrol is a natural phytoalexin abundantly found in grapes and red wine, which has potent antioxidant property.

Another important group of components present in grapes is the anthocyanins, which belong to the flavanoid family. In recent years, several studies have shown that anthocyanins displays a wide variety of biological activities, including antioxidant, anti-inflammatory, antimicrobial, and anticarcinogenic activities.

1.1.6 Health benefits of Grapes

- **Heart Health**

The significant amount of polyphenols, especially resveratrol, lowers the risk of atherosclerosis and strokes. Those polyphenols are associated with lowering blood pressure and reducing the risk of cardiovascular disease.

- **Skin Health**

Resveratrol is the main reason for grapes appearing in cosmetic medicine. This powerful antioxidant protects cells collagen, helping the skin remain young and healthy.

- **Cancer**

In the eternal fight against cancer, polyphenols such as resveratrol and quercetin once again play the most important role. According to studies, resveratrol may be able to prevent tumor growth in various organs, such as liver, skin, stomach, breast, skin, colon, and lymph. Red wine contains resveratrol which if consumed wisely, could have beneficial effects. However, consuming high quantities of wine could increase the risk of various heart and liver diseases.

- **Improves Digestion**

Grapes are a source of fiber, which is known to boost the good functioning of the digestive system and may prevent constipation.

- **Vitamin C**

Grapes are a great source of vitamin C, which promotes skin health and boosts our immune system.

- **Eye Health**

Grapes also contain antioxidants such as lutein and zeaxanthin, which neutralize free radicals and prevent eye-damaging conditions, like cataracts.

1.2 Indian Market Outlook

More than 90 percent of the total production is consumed as table grapes in India, and more than 70 percent of the total production is harvested in March-April, but the cold storage facilities are inadequate, resulting in market gluts and fall of prices of grapes in March-April. Approximately, 2.5 percent of harvested fresh grapes are exported to the Middle East and European countries, while the rest of the produce is marketed within the country. Grapes are exported through three different agencies viz., Grower Exporters, Growers' Cooperatives and the Trader exporters. Only these agencies have established their own on-site pre-cooling and cold storage facilities.

India has an average yield of 30 tonnes/ hectare, with the scope of achieving the highest productivity in the world. The availability of a variety of agro-climatic regions suitable for cultivation for table, raisin and wine grapes aids in sustaining productivity and minimizing risks in cultivation. The strengths include the availability of technology to achieve high productivity as well as to produce export quality grapes and quality raisins and possibility of

double cropping in certain regions and harvesting round the year in certain varieties.

Although grape cultivation is considered as highly remunerative, the area under grapes less due to the constraints such as heavy initial investment for establishing a vineyard, high recurring costs in vineyard management, unprecedented changes in weather causing huge losses, low proportion of export quality grapes and marketing problems in table grapes.

1.3 Value added products from Grapes

1.3.1. Table grapes (fresh grapes):

Produced from vine varieties cultivated for this purpose, table grapes are destined for direct human consumption due to their sensory and commercial characteristics

1.3.2. Dried grapes:

Prepared from clean selected grapes of some vine varieties into a form of marketable dried grape, with or without coating.

1.3.3. Grape juice:

Grape juice is the simplest processed product made from grapes. Grape juice can be processed into a grape juice concentrate, which is obtained through partial dehydration of the juice. The aim of concentrating grape juice is to produce a form of the juice that is stable and easy to handle and store, but that can also be reconstituted to a high quality product that is as similar to the original juice as possible. In addition to providing material for reconstitution, grape juice concentrate can be mixed with other juices for the preparation of multi-fruit beverages; it can also be used as a sweetener and can provide a base for the production of sweet spreads. The grape juice market is a complex one to evaluate because of the various ways in which it can be processed and the differing characteristics of the final product.

The discovery that both the edible flesh of the grape and its by-products (such as the seeds and skin) contain components that are beneficial to human health (called nutraceuticals) has led to rapidly expanding markets for grapes and their by-products. For example, grape seed extracts have been used as nutritional supplements in fruitflavoured beverages, cereals, snack bars, and dairy desserts such as yogurt. In addition, grape fruit extract and grape seed extract are used in cosmetics and personal care products.

1.3.4. Jam and jelly

The grape pulp is combined with any fruits like banana, apple etc. The extract is boiled with suitable amount of sugar and pectin till the desired end point is achieved. The product is filled in the packing containers and allowed to set while cooling.

1.4 Harvest& Post Harvest handling of Grapes

1.4.1 Harvesting

Only attractive bunches fulfilling minimum quality requirement should be harvested. Harvesting should be done by skilled workers wearing soft rubber gloves and using sharp secateurs / scissors for cutting. Careful handling of grapes during harvesting, transporting, cleaning and packing is very essential to prevent injury and abrasion. The bunch should always be held the by the stem/ peduncle. Rough handling results in loss of bloom (thin wax coating on berry surface) making the berries susceptible to decay. Bunches should be harvested during the early morning hours before the berry temperature rises above 20°C. It is advisable to close harvest by 10 a.m. Otherwise the berry's temperature can't be bring down to 4°C by pre-cooling within the stipulated time of six hours. Bunches harvested during high temperature leads to loss of more physiological weight and pedicel desiccation. If rainfall has occurred just prior to harvest, the fruit should not be picked for at least 3-4 days, as the free moisture present on the surface of the berries can lead to fungal infections.

1.4.2 Maturity & quality indices

The table grape is a non-climacteric fruit with a relatively low rate of physiological activity. Optimal flavour attributes are usually obtained at commercial maturity. The main maturity index is the sugar content, total soluble solids (TSS), otherwise known as Soluble Solid Concentration (SSC) or °Brix. For certain specific cultivars and situations, the titratable acidity (TA) and SSC-TA ratio are used as maturity indices. Cultivars other than 'white' ones also have minimum colour maturity requirements, based on the percentage of berries in the cluster that show a certain minimum colour intensity and coverage. Other quality criteria for table grapes are good appearance, free of decay, thin skin, large size, good texture and flavour. The rachis should be fresh and green (i.e. not desiccated and brown). The bloom is also an important quality factor. It is destroyed by over-handling and rubbing which causes the berries to become shiny rather than lustrous

1.4.3 Harvesting method

A day prior to picking, the broken, along with decayed, deformed, undersized, and discoloured berries are removed by cutting their pedicels from the selected bunch, using long nosed scissors. Care must be exercised not to injure other berries by the scissors. Clusters should never be held against the naked palm while cleaning, harvesting or trimming. They should be held by their stalk, preferably by wearing rubber gloves. This care is taken not to erase the fine waxy coating called 'bloom' from the berry surface.

Harvested bunches are placed gently in clean perforated plastic crates and left in the shade of the vines for subsequent transfer to pack-house. The crates should be lined with clean bubble sheets for cushioning and kept over newspapers spread on the ground to avoid contamination with vineyard dust. Bunches are kept in such a way that their stalks should not injure berries from other bunches.

1.4.5 Postharvest Handling of grapes:

After harvesting, the bunches are often put directly in Corrugated Fiber Board Boxes/ Wooden Boxes/ Bamboo Baskets at the field itself for transportation to markets. But, it is desirable that soon after harvesting the produce should be properly screened to sort out damaged, shrivelled and diseased berries taking care to keep the natural waxy bloom on the surface. Sometimes, the harvested produce is treated/ fumigated with sulphur dioxide to sterilize the fruits. It prevents attack of bacteria and fungi from cuts/wounds. The following unit operations are performed before transporting the grapes for trading/ processing center.

a. Pre-cooling

Before storage grapes should be pre-cooled. As grape is a non-climateric fruit with a very short post-harvest life, pre-cooling is essential to minimize water loss, avoid decay and reduce the physiological and metabolic activities of grape by lowering the temperature. In pre-cooling, the temperature is quickly brought down within 2-6 hours by fast and prompt cooling to check drying and browning of the stems and maintaining the firmness of berries. Moisturised air is directly brought in contact by parallel flow system. In pre-cooling, temperature is maintained at 0-4°C and relative humidity at 90% and above. Unless the shelf life of grapes is extended to 60 days, it may not be possible to maintain quality during the post shipment transit period. The grapes are either pre-cooled directly or after packing into individual paper bags or in ventilated CFB cartons.

b. Grading

Grading means the sorting of the homogenous lots of the produce according to the fixed grade standards. Produce is graded in accordance with the various quality factors. The harvested bunches of grapes are graded as per their size of the berries and their colour. Before packing, the broken, decayed, deformed, undersized and discoloured berries are removed from the bunches, using a long nosed scissor.

c. Cold storage

Fresh grapes can be stored in cold storage temperature of 0-2°C and relative humidity of 90-95%, for a period of about 6 weeks. After pre-cooling, the boxes are closed and shifted to cold storage rooms where the temperature and humidity are maintained at 0-2° C and 90-95% respectively.

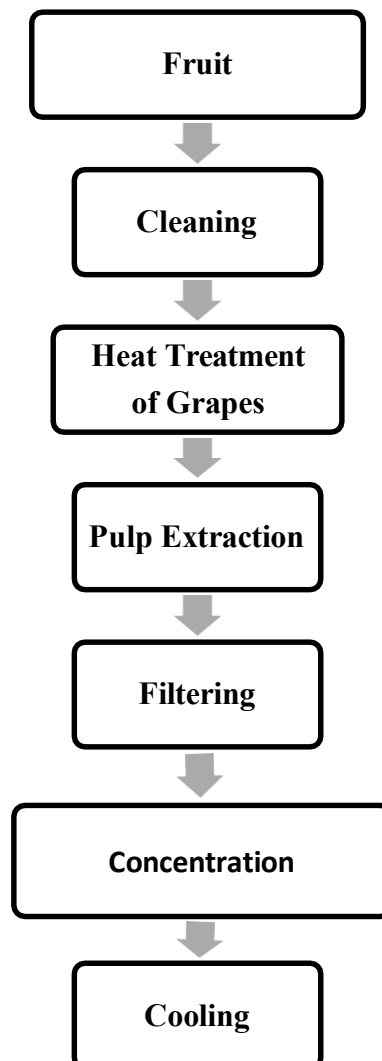
The post-harvest quality of the fruit depends fully on the proper care taken after harvesting of the crop. The removal of undesirable, diseased and injured berries at initial stage improves the appearance and reduces the infection at later stage. The clusters after thinning/ trimming must be handled with utmost care. Rough handling promotes more dry stems, brown stems, more weight loss and soft berries. Careless handling reduces shine and attractiveness of the berries.

CHAPTER 2

Processing of Grape Pulp

The pulp is the section of a grape where juice is contained. It surrounds and protects the seed, and the pulp is protected by the skin of the grape. The pulp contains sugars, organic acids, phenolic compounds, nitrogenous compounds, aroma compounds, minerals and pectin substances. Grape is specially used on large scale in the preparation grape pulp, here below is the process for gape pulp processing: -

2.1 Process Flow for Production of Grape Pulp



2.1.1 Fruit selection

The grapes are required to be fresh and mature, with good flavour. Unripe, overripe and mechanically damaged fruits are removed otherwise they may contaminate the juice quality. It is better to process the grapes the same day they are picked. Sometimes grapes are stored at temperature at 0°C and the moisture of 80%-85%.

To improve the efficiency of selection, experienced producers usually adopt a grape vibration separator. It can transmit grapes and separate the unqualified grapes, stems and impurities with high-frequency vibration.

2.1.2 Cleaning

After selection, the grapes are cleaned using a fruit cleaning machine. This can scour the grape surface and remove the dirt with tumbling water, without damage to the grapes. To achieve better cleaning effect, grapes are dipped in potassium permanganate solution for 3min and then rinse them with running water.

2.1.3 De-stemming

Grape stems account for 3-8% the weight of grapes. They are mainly made of lignin, with 1-2.5% tannin, 0.5-1.5% acid and a little bitter compound. They must be removed from grapes in case they contaminate the grape juice.

Grape destemmer is a specialized equipment to remove stems on grapes and protect the integrity of the grape grains. The crushing roller is made of non-toxic and high-elastic rubber, with no damage to the grapes. Then a single-screw pump transmits the grapes to the next process for juice extraction. The pore size of the drum sieve can be customized according to the size of grapes.

Modern crushing and de-stemming machines consist of a large steel or aluminum trough with a screw in the bottom. As the screw turns the grapes are gently squeezed and pulled from the stems at the same time. The crusher / de-stemmer shown here has a rubber edge on the screw so that the grapes are crushed as gently as possible.

Features of grape de-stemmer

- It adopts eccentric and adjustable de-stem blade. The rotating speed can be adjusted to adapt to different grape sizes. It improves the removing rate and the integrity of grains.
- The sieve is made of nylon, with resistance to acid, alkali and corrosion.
- For production capacity larger than 5t/h, it is equipped with wheeled separator.

2.1.4 Heat Treatment

The grapes are heated and held the heat until the peel gets separated. This process enhances the efficiency of pulp extraction.

2.1.5 Grape pulp extraction

After destemming, the grapes are extracted by a double screw grape crusher. It can crush the grapes into juice and separate skins and residues. The contacting parts with raw materials are made of SS304 stainless steel. It adopts low squeezing speed to achieve high juice yield. The pressure and humidity are adjustable. Besides, it also applies to fermentative grapes and high-fiber contents.

Figure: Grape pulp crusher



2.1.6 Pulp filtration

The grape pulp contains some slag after extraction. This could filtrate using filtering equipment and collect the pulp in stainless steel tanks.

2.1.7 Concentration

Juice may be concentrated by evaporation or freeze concentration. Historically, evaporation has been the most widely used concentration process for grape juice. Evaporators are used to concentrate juice between 68 and 70° Brix. Freeze concentration is capable of concentrating juices to 50°Brix without appreciable loss of taste, aroma, colour, or nutritive value.

- **Falling film evaporator**

This evaporator is the most popular type because it can handle more viscous fluids than the rising film evaporator is and can be operated at lower temperature differentials.

- **Centrifugal or conical evaporators**

These relatively new evaporators produce a thin film using centrifugal force in single or nested cones.

2.1.8 Packing

The concentrated grape pulp is packed into the suitable packaging materials and stored for marketing.

CHAPTER 3

Packaging of Grape Pulp

3.1 Product characteristics influencing packaging

The major deterioration that occurs in fruit beverages is loss of nutrition, physico-chemical changes and microbial growth. The product characteristics to be considered in relation to packaging are:

a. Acidity:

All the fruit juices usually maintain an acidic character because they contain organic acids. • Enzymes: Enzymes exist in all fruit juices. Sometimes they have to be destroyed and sometimes to be added. acid caused a delamination within a few days in packaging material.

b. Vitamin C (ascorbic acid) content:

The Vitamin C content of a fruit increases until just before ripening, and then decreases due to the action of an enzyme, ascorbic acid oxidase. When fruits are cooked, most of the ascorbic acid transfers from the tissue into the liquid or may be oxidized, oxidation occurring more easily in iron, copper or badly tinned vessels. Losses of Vitamin C also occur during storage. Storing at low temperature and preventing contact with air and light reduces this. Addition of sulphite has a preserving effect on Vitamin C.

vitamin C in fruit juice is quite stable when stored in metal or glass containers, whereas juice stored in plastic bottles has a much shorter shelf-life due to ascorbic acid degradation and darkening of color was triggered by the rise in oxygen in the headspace of the storage containers.

c. Colour and Flavour:

They are very important, and many fruit drinks contain certain legally permitted colors. These are added to overcome the bleaching effect of the sulphite used as a preservative, and to provide an attractive appearance.

3.2 Key parameters to consider when selecting a packaging material

- Process
- Distribution, shelf-life requirements, legislation

- Product composition and quality as produced and at full shelf-life
- Product protection required during storage, distribution and retail sale
- Pack size, printing options, display etc.
- Packing system concept, automation options, ability to integrate with existing and/ or future systems
- Consumer appeal, image of product and packing

3.3 Packaging material for Grape pulp

3.3.1 Glass Containers:

The use of glass bottles for the packaging of fruit beverages was widespread although the hot-fill/ hold/ cool process had to be applied with care to avoid breakage of the containers. Glass is still the preferred packaging medium for high quality fruit beverages. However, over recent years, an increasing proportion is being packed aseptically, into cartons. The improvements that have occurred in glass bottle packaging are:

- Light weight
- Surface coating to increase abrasion resistance
- Use of wide mouth containers fitted with easy-open-caps. 165

3.3.2 Metal Containers:

Tinplate cans made of low carbon mild steel of 99.75% purity, coated with tin with easy open ends are used. These tinplate containers are either 3 piece or 2 piece containers. They are lacquered internally to prevent corrosion.

3.3.3 Plastic Containers:

Fruit concentrates contain organic substances, which are sensitive to bacterial contamination. Packaging of such products is done through hot filling, to achieve extended shelf-life; PET bottles are usually used for hot filling applications. Special features are added to the containers through design and manufacturing process. The package is heat-set in order to improve the temperature resistance of the containers. PET resins with a higher T_g (glass transition) temperature and/or a faster rate of crystallization are used. Normally hot-filled PET bottles are designed about 1.5 times heavier than cold-filled bottles. Reinforcing ribs and grooves are also provided along the circumference and base of the bottle. After filling and

capping operations, the liquid continues to cool, which results in formation of vacuum. The bottle wall can deform under the influence of vacuum, and this problem is overcome by providing vacuum panels in the container side wall.

3.3.4 Bulk packaging

Bulk packaging is done from a minimum size of 25 litres and going over 1000 litres of product.

a) Bag-in-Box System:

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 material being packed, 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. Generally, the inner layer is not designed for barrier unless the product needs extra barrier, which the outer layer cannot provide. 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 the barrier requirements of the outer layer.

The standard outside layer is a metallised film laminate, which under standard conditions has an OTR of $1\text{cc/m}^2 / 24\text{hrs}$. 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.

b) Rigid Containers:

The purpose of this container is to hold the bag during storage, transportation and use. As is evident, the bag being made from flexible films is incapable of being stored and transported by itself. Hence, each bag is individually stored into rigid outer container post filling. For packs of capacity below 50 litres, corrugated fiber board cartons are generally used as the rigid containers. Beyond that plastics and metal drums are used. For very large bags, 1000 litres + polygonal (6-8 faces) corrugated fiber board containers made from 7 to 9 ply are used, though there are other alternatives as well.

CHAPTER 4

Food Safety Regulations & Standards

Regulation 2.3 Fruits and Vegetable Products under Food Safety and Standards and Additives Regulations, 2011

Regulation 2.3.17 Concentrated Fruit/ Vegetable Juice Pulp / Puree with Preservatives for Industrial Use Only:

1. Concentrated Fruit Vegetable Juice /Pulp / Puree with Preservatives for Industrial Use Only means an unfermented product, which is capable of fermentation, obtained from the juice or pulp or puree of fruit(s) / vegetable (s), from which the water has been removed to the extent that the product has a soluble solids content of not less than double the content of the original juice, pulp, puree prescribed under Regulation 2.3.6 and Regulation 2.3.7. It may be pulpy, turbid or clear.

(For grape pulp, TSS should be >30%)

2. The product may contain food additives permitted in these regulations including Appendix A. The product shall conform to the microbiological requirements given in Appendix B.
3. The container shall be well filled with the product and shall occupy not less than 90.0 percent of the water capacity of the container, when packed in the rigid containers. The water capacity of the container is the volume of distilled water at 20°C which the sealed container is capable of holding when completely filled.

❖ Food hygiene:

- (a) The product shall be prepared and handled in accordance with the guidance provided in the Schedule 4 of the Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011 and any other such guidance provided from time to time under the provisions of the Food Safety and Standards Act, 2006 (34 of 2006).

❖ Packaging and labelling:

The product covered by this standard shall be labelled in accordance with the Food Safety and Standards (Packaging and Labelling) Regulations, 2011.

Chapter 1 - General

1.2: Definitions

1.2.1 : In these regulations unless the context otherwise requires:

1. “Best before” means the date which signifies the end of the period under any stated storage conditions during which the food shall remain fully marketable and shall retain any specific qualities for which tacit or express claims have been made and beyond that date, the food may still be perfectly safe to consume, though its quality may have diminished. However the food shall not be sold if at any stage the product becomes unsafe.
2. “Date of manufacture” means the date on which the food becomes the product as described;
3. “Date of packaging” means the date on which the food is placed in the immediate container in which it will be ultimately sold;
5. “Lot number” or “code number” or “batch number” means the number either in numericals or alphabets or in combination thereof,
 - representing the lot number or code number or batch number,
 - being preceded by the words “Lot No” or “Lot” or “code number” or “Code” or Batch No” or “Batch” or any distinguishing prefix
 - by which the food can be traced in manufacture and identified in distribution.
10. “Use – by date” or “Recommended last consumption date” or “Expiry date” means the date
 - which signifies the end of the estimated period under any stated storage conditions,
 - after which the food probably will not have the quality and safety attributes normally expected by the consumers and the food shall not be sold
11. “Vegetarian Food” means any article of Food other than Non- Vegetarian Food as defined in regulation 1.2.1(7).

Regulation 2.1: Packaging

Regulation 2.1.1: General Requirements

2. Containers made of plastic materials should conform to the following Indian Standards Specification, used for packing or storing whether partly or wholly, food articles namely :-
 - i. IS: 10146 (Specification for Polyethylene in contact with foodstuffs);
 - ii. IS: 10142 (Specification for Styrene Polymers in contact with foodstuffs)
 - iii. IS: 10151 (Specification for Polyvinyl Chloride (PVC) in contact with foodstuffs);
 - iv. IS: 10910 (Specification for Polypropylene in contact with foodstuffs);
 - vii. IS: 12252 - Specification for Polyalkylene terephthalates (PET)

Regulation 2.2: Labelling

Regulation 2.2.1: General Requirements

1. Every pre-packaged food shall carry a label containing information as required here under unless otherwise provided, namely -
2. The particulars of declaration to be specified on the label shall be in English or Hindi in Devnagri script: Provided that nothing herein contained shall prevent the use of any other language in addition to the language required under this regulation.
3. Pre-packaged food shall not be described or presented on any label or in any labelling manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character in any respect;
4. Label in pre-packaged foods shall be applied in such a manner that they will not become separated from the container;
5. Contents on the label shall be clear, prominent, indelible and readily legible by the consumer under normal conditions of purchase and use;
6. Where the container is covered by a wrapper, the wrapper shall carry the necessary information or the label on the container shall be readily legible through the outer wrapper and not obscured by it;
7. License number shall be displayed on the principal display panel in the following format, namely: -



Provided that the existing products of a unit shall comply with the requirement of this clause on and after the six months of commencement of the Food Safety and Standards (packaging and labelling) Amendment Regulation ,2013.

Regulation 2.2.2 Labelling of Pre-packaged Foods

In addition to the General Labelling requirements every package of food shall carry the following information on the label, namely, —

1. The Name of Food: The trade name or description of food contained in the

package.

2. Ingredient: (For a single ingredient product, it can be mentioned as such.)

3. Nutritional information –

Nutritional Information or nutritional facts per 100 gm or 100ml or per serving of the product shall be given on the label containing the following: —
energy value in kcal;

the amounts of protein, carbohydrate (specify quantity of sugar) and fat in gram

4. Declaration regarding Veg or Non veg

Every package of Vegetarian Food shall bear a declaration to this effect by a symbol and colour code as stipulated below for this purpose to indicate that the product is Vegetarian Food.

The symbol shall consist of a green colour filled circle, having a diameter not less than the minimum size specified in the Table below, inside the square with green outline having size double the diameter of the circle, as indicated:



iv. Size of the logo (vegetarian)

S No	Area of principal display panel	Minimum diameter mm
1.	Upto 100 cms. Square	3
2.	100-500 cm square	4
3	500-2500 cm square	6
4	>2500 cm square	8

The symbol shall be prominently displayed on the package having contrast background on principal display panel, just close in proximity to the name or brand name of the product and on the labels, containers, pamphlets, leaflets, advertisements in any media.

5. Declaration regarding Food Additives-

- i. For food additives falling in the respective classes and appearing in lists of food additives permitted for use in foods generally, the following class titles shall be used together with the specific names or recognized international numerical identifications:

Acidity Regulator, Acids, Anticaking Agent, Antifoaming Agent, Antioxidant, Bulking Agent, Colour, Colour Retention Agent, Emulsifier, Emulsifying Salt, Firming Agent, Flour Treatment Agent, Flavour Enhancer, Foaming Agent, Gelling Agent, Glazing Agent, Humectant, Preservative, Propellant, Raising Agent, Stabilizer, Sweetener, Thickener

6. Name and complete address of the manufacturer

- i. The name and complete address of the manufacturer and the manufacturing unit if these are located at different places; in case the manufacturer is not the packer, the name and complete address of the packing unit shall be declared on every package of food;
- ii. Where an article of food is manufactured or packed by a person or a company under the written authority of some other manufacturer or company, under its brand name, the label shall carry the name and complete address of the manufacturing or packing, the name and complete address of the manufacturer or the company and on whose behalf it is manufactured or packed or bottled.

7. Net quantity by weight shall be declared on every package of food.

8. Lot/Code/Batch identification shall be given on the label.

9. Date of manufacture or packing.

The date, month and year in which the commodity is manufactured, packed or pre-packed, shall be given on the label.

If the 'Best before Date' of the products is

- More than three months, the month and the year of manufacture, packing or pre-packing shall be given.
- Less than three months, the date, month and year in which the commodity is manufactured or prepared or prepacked shall be mentioned on the label.

10. Best Before and Use by Date: the month and year in capital letters upto which the product is best for consumption, in the following manner, namely: —

“BEST BEFORE.....MONTHS AND YEAR

OR

“BEST BEFORE.....MONTHS FROM PACKAGING

OR

“BEST BEFORE.....MONTHS FROM MANUFACTURE (Note: blank be filled up)

11. Instructions for use:

(i) Instructions for use, including reconstitution, where applicable, shall be included on the label, if necessary, to ensure correct utilization of the food.

❖ Schedule H of FoSCoS: Sanitary and Hygienic Requirements for Food Manufacturer/Processor/Handler

The place where food is manufactured, processed or handled shall comply with the following requirements:

1. The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. All new units shall set up away from environmentally polluted areas.
2. The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain overall hygienic environment.
3. The premises shall be clean, adequately lighted and ventilated and sufficient free space for movement.
4. Floors, Ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster.
5. The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects.
 - No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises.
 - Windows, doors and other openings shall be fitted with net or screen, as appropriate to make the premise insect free The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.
6. Continuous supply of potable water shall be ensured in the premises. In case of intermittent water supply, adequate storage arrangement for water used in food or washing shall be made.
7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.

8. No vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. (Copper or brass vessels shall have proper lining).
9. All equipments shall be kept clean, washed, dried and stacked at the close of business to ensure freedom from growth of mould/ fungi and infestation.
10. All equipments shall be placed well away from the walls to allow proper inspection.
11. There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.
12. The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears.
13. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food.
14. All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work and every time after using toilet. Scratching of body parts, hair shall be avoided during food handling processes.
15. All food handlers should avoid wearing, false nails or other items or loose jewellery that might fall into food and also avoid touching their face or hair.
16. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food.
17. All articles that are stored or are intended for sale shall be fit for consumption and have proper cover to avoid contamination.
18. The vehicles used to transport foods must be maintained in good repair and kept clean.
19. Foods while in transport in packaged form or in containers shall maintain the required temperature.
20. Insecticides / disinfectants shall be kept and stored separately and away from food manufacturing / storing/ handling areas.

Annexure- I
Manufacturers & Suppliers List of Machineries

	Name of the company	Machineries
1	Sahara Engineers Plot No. W-245, MIDC, Near H Block, Ambad, Jalna-422010, Maharashtra	Washer, De-stemmer crusher
2	Economy Engineering Company Kirti Building Dr V B Gandhi Marg, Fort, Mumbai-400001, Maharashtra	De-stemmer crusher
3	Gardners Corporation 158 Golf Links New Delhi 110003 India Tel: +91 11 2334 4287/2336 3640 Fax: +91 11 2371 7179	Juice filters, weighing machinery, Boiling equipment
4	SS Fab Tech No. 56/1, Magadi Main Road, Kottigepalya, Srigandhada Kaval, Sunkadakatte, Bengaluru - 560091, Karnataka	Washer, Crusher, Kettles
5	Cadif Private Limited 21, 12th Cross, Thigalarapalya Main Road, Peenya II Stage, Bengaluru-560058, Karnataka	Evaporators
6	PM Industries And Process Equipments Pvt Ltd, Address : Gate No. 53, Chikhali-Dehugaon Road, A. P. Talawade, Pune - 412114, Maharashtra	Evaporators
7	Fabex Engineering W-45, MIDC, Ambad, In Front Of Dolphin Ink, Nashik-422010, Maharashtra	Evaporators
8	Geeta Food Engineering Plot No C-7/1 TTC Area Pawana MIDC Thane Belapur Road, Behind Davita Chemicals Ltd Navi Mumbai 400 705 Tel: +91 22 2782 6626/2766 2098 Fax: +91 22 2782 6337	Juice extractors and Pulpers

9	Sri Rajalakshmi Commercial Kitchen Equipment No.57, (old No. 30/1) Silver Jubilee Park Road, Bangalore - 560 002 Tel: +91 (0)812 2222 1054/223 9738 Fax: +91 (0)812 2222 2047	Boiling equipment
10	Raylons Metal Works Kondivita Lane J. B. Nagar Post Office Post Box No. 17426 Andheri (E) Andheri - Kurla Road, Mumbai - 400 059 Tel: +91 22 26323288 / 6325932	Boiling equipment
11	Acufil Machines S. F. No. 120/2, Kalapatty Post Office Coimbatore - 641 035 Tamil Nadu Tel: +91 422 2666108/2669909 Fax: +91 422 2666255 Email: acufilmachines@yahoo.co.in, acufilmachines@hotmail.com	Packaging equipment
12	Spursh Udyog 5th Avenue, Block D1/D2, 3rd Floor, Dhole Patil Road Aundh, Pune - 411001, Maharashtra, India	Filling & Packaging equipment
13	Shiva Engineers T Block, Plot No. S 33, Bhosari MIDC Pune - 411026, Maharashtra, India	Filling & Packaging equipment



Contact Us

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