POST- HARVEST PROFILE OF GRAPES

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P R E F A C E

Grapes (*Vitis vinifera*) are an important fruit crop in India. Grapes are the third most widely cultivated fruit after citrus and banana. Globally grapes production contributes to about 16% of the total fruit production. India produced 1878.00 thousand tonnes during 2008 which was about 2.77 per cent of the total world production. Maharashtra is the largest producer of grapes in the country. It contributes about 75 percent of the total domestic production. Grape is one of the most delicious and nutritious fruit. Grapes are widely consumed as fresh fruit in India. It is also used for producing raisins, wine, juice, juice concentrate, squash, beverages, jams and marmalades.

The Inter-Ministerial Task Force on Agricultural Marketing Reforms (May, 2002), suggested several measures for strengthening agricultural marketing system in the country for benefiting the farming community to enhance the share of farmers in the ultimate price of their produce as well as for various market functionaries in the new liberalized global market opportunities and to foster true competition among the market players. This profile has been prepared on the recommendation of the Inter-Ministerial Task Force with a view to enable the farming community to scientifically manage the post-harvest operations and to widening awareness for better marketing of the grapes. The profile covers almost all aspects of the marketing, such as post-harvest management, marketing practices, quality standards, grading, packaging, transportation, storage, SPS requirements, marketing problems, marketing information, etc.

This "Post-Harvest Profile of Grapes" has been prepared by Shri Manoj Kumar, Marketing Officer under the supervision of Dr B. M. Mehrotra, Assistant Agricultural Marketing Adviser and guidance of Shri Rakesh Saxena, Dy. Agricultural Marketing Adviser, D.M.I. , B.H.O., Nagpur.

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The Government of India should not be regarded as assuming responsibility for any of the statements contained in this profile.

--Sd--
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POST- HARVEST PROFILE OF GRAPES

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1.0 INTRODUCTION

Grape is one of the important fruit crop grown in India. Grapes (*Vitis vinifera)* belong to the *Vitaceae* family. Grape is the third most widely cultivated fruit after citrus and banana. Globally grapes production was 67909.28 thousand tonnes during 2008 as per FAO data and grapes production contributes to about 16% of the total fruit production. European Union takes the lead position in grapes production with Italy occupying the top position with 11.48% followed by China with 10.73% and USA with 9.93%. India produced about 2.77 per cent (1878.00 thousand tonnes) of the total world production during 2008. Maharashtra (75.33 percent) is largest producer of grapes in the country. Maharashtra and Karnataka together contributes about 89.65 percent of India's grapes production. Grapes are widely consumed as fresh fruit in India. It is also used for producing raisins, wine, juice, juice concentrate, squash, beverages, jams and marmalades. Grapes are highly digestible and have a number of therapeutic properties. Grapes are non-climacteric fruit that grow on the perennial and deciduous woody vines. Cultivation of grapes is known as viticulture.

Nutritional value:

Table No. 1: Nutritional value of grapes per 100 grams

Edible part	94 %	**Sodium**	1 mg
Water	80.3 g	**Potassium**	192 mg
Proteins	0.5 g	**Iron**	0.4 mg
Lipids	0.1 g	**Calcium**	27 mg
Glucides	15.6 g	**Phosphorus**	4 mg
Fiber	1.5 g	**Niacin**	0.1 mg
Energy	61 kcal	**Vitamin C**	6 mg

Source: http://www.fao.org

Botanical description:

Grapes belong to the family Vitaceae. Plants are climbing vine which has thin and smooth shiny leaves. The vines produce round or oval berries. Grapes are borne in clusters, which consist of peduncle, rachis and berries. Grapes grow in clusters of 6 to 300 berries. Fruit are berries. Berries can be green, black, blue, golden, purple, red, pink, brown, peach or white. The berry consists of skin, pulp and seeds. The epidermis of the skin of the berries is composed of thick layer of cells, which are 5%-12% of the total weight of the berry. The skin is covered with cut in or bloom, comprises 1% to 2% of skin weight. Most varieties of the grapes are self-pollinated.

The genus *Vitis* is largely distributed between 25° and 50° N latitude in Europe, the Middle East, North America, and eastern Asia. The genus *Vitis* is divided into 2 sub-genera:

1. *Euvitis* - "True grapes"; characterized by elongated clusters of fruit with berries adhering to stems at maturity, forked tendrils, diaphragms in pith at nodes, also called "bunch grapes". Most of the cultivated species are in this sub-genera.

2. *Muscadinia* - Muscadine grapes; characterized by small fruit clusters, thick-skinned fruit, berries that detach one-by-one as they mature, simple tendrils, and the lack of diaphragms in pith at nodes. There are only 2-3 species in this section.

1.1 ORIGIN:

Cultivation of grapes originated in Western Asia and Europe.

1.2 IMPORTANCE:

Grape is one of the most delicious fruits. Grapes are widely consumed as fresh fruit in India. It is also used for producing raisins, wine and other products. The peel of grapes is the source of essential oil and pectin. It can also serve as a raw material for the production of cattle feed and in preparation of candies. Raisins are rich source of sugar most of which is fructose and antioxidants.

Grapes production occupies significance in the context that it is the third most widely cultivated fruit after citrus and banana. Globally grapes production contributes to about 16% of the total fruit production. Grapes are laxative and diuretic. They are useful in fighting dyspepsia, hemorrhoids, stones in the urinary tract and bile ducts. They also activate liver functions, ease digestion, help to reduce cholesterol level of blood and eliminate uric

acid. Its juice is used in cosmetics to bleach and soften skin. Grapes are rich source of flavonoids.

2.0 PRODUCTION

2.1 MAJOR PRODUCING COUNTRIES IN THE WORLD:

Grapes are cultivated in many countries of the world. During 2008, grape was grown in an area of 7423.72 thousand hectares with the production of 67909.28 thousand tonnes in the world. Italy (11.48 per cent), China (10.73 per cent), USA (9.93per cent), Spain (8.91 per cent) and France (8.34 per cent) together accounted for about 49.39 per cent of total world production. India produces only about 2.77 per cent of the total world production. In case of area, Spain ranked first with 16.16 per cent of the world acreage during 2008 followed by France (10.96 per cent) and Italy (10.37 per cent) whereas India's contribution to the world's acreage is only 1.08 per cent. However, in productivity India stood first with 23.50 tonnes /Ha followed by USA (17.80 tonnes/Ha), China (16.60 tonnes/Ha), South Africa (13.80 tonnes/Ha), Argentina (13.20 tonnes/Ha), Chile (12.90 tonnes/Ha) and Italy (10.10 tonnes/Ha). Area, Production and Yield of major grapes producing countries during 2006 to 2008 were as under:

Table No. 2: Area and production of grapes in major producing countries in world

Countries	Area (000'Ha)				Production (000'Tonnes)				Yield (Tonnes/Ha)		
	2006	2007	2008	% to world	2006	2007	2008	% to world	2006	2007	2008
Argentina	218.99	220.00	220.00	2.96	2880.93	2900.00	2900.00	4.27	13.16	13.18	13.20
Australia	158.17	163.95	166.19	2.24	1981.20	1530.44	1956.79	2.88	12.53	9.33	11.80
Chile	180.00	182.00	182.00	2.45	2300.00	2350.00	2350.00	3.46	12.78	12.91	12.90
China	484.00	503.50	438.23	5.90	6102.29	6250.00	7284.66	10.73	12.61	12.41	16.60
France	842.03	830.00	813.50	10.96	6692.55	6500.00	5664.19	8.34	7.95	7.83	7.00
India	64.30	63.70	80.00	1.08	1630.70	1667.70	1878.00	2.77	25.36	26.18	23.50
Iran	315.00	315.00	315.00	4.24	3000.00	3000.00	2900.00	4.27	9.52	9.52	9.20
Italy	786.30	770.00	770.00	10.37	8325.89	8519.42	7793.30	11.48	10.59	11.06	10.10
S. Africa	112.72	115.00	130.00	1.75	1550.42	1600.00	1791.64	2.64	13.75	13.91	13.80
Spain	1200.00	1200.00	1200.00	16.16	6401.50	6013.00	6053.00	8.91	5.33	5.01	5.00
Turkey	550.00	540.00	482.79	6.50	4000.06	3923.04	3918.44	5.77	7.27	7.26	8.10
USA	379.27	380.00	379.36	5.11	5757.27	6105.08	6744.84	9.93	15.18	16.07	17.80
Others	2229.82	2218.72	2246.65	30.26	16116.03	15913.00	16674.42	24.55	-	-	-
Total	**7520.60**	**7501.87**	**7423.72**	**100**	**66738.83**	**66271.68**	**67909.28**	**100**	-	-	-

Source: www.faostat.org

2.2 MAJOR PRODUCING STATES IN INDIA:

Grape is an important fruit crop of India. Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and Punjab are the major grapes growing states. Maharashtra was the largest grapes producing state accounting for 75.33 per cent of total country's production followed by Karnataka (14.32 per cent), Tamil Nadu (4.84 per cent), Andhra Pradesh (3.31 per cent) and Punjab (1.18 per cent) of total production during 2008-2009. Maharashtra and Karnataka together contributes about 89.65 per cent of total national grapes production. Maharashtra ranked first with 69.97 per cent of total area during 2008-2009 followed by Karnataka (18.71 per cent), Tamil Nadu (3.89 per cent), Andhra Pradesh (3.76 per cent) and Punjab (1.00 per cent) respectively during the year 2008-09 in the country. However in productivity Tamil Nadu stood first with 29.8 tonnes/hectare during 2008-2009, followed by Punjab (28.4 tonnes/hectare), Maharashtra (25.4 tonnes/hectare) and Andhra Pradesh (21.0 tonnes/hectare).

Area and production of grapes in major producing states of India during 2007-2008 and 2008-2009 is given in the Table No.:3

Table No. 3: Area and production of grapes in major producing states

State	Area(000' Hectares)			Production(000' Tonnes)			Yield (Tonne/Hectare)	
	2007-2008	2008-2009	% to Total Area	2007-2008	2008-2009	% to Total Production	2007-2008	2008-2009
Maharashtra	45.6	55.7	69.97	1290.0	1415.0	75.33	28.3	25.4
Karnataka	14.3	14.9	18.71	258.8	269.0	14.32	18.1	18.0
Tamil Nadu	2.8	3.1	3.89	83.5	91.0	4.84	29.8	29.8
Andhra Pradesh	2.8	3.0	3.76	58.0	62.2	3.31	21.0	21.0
Punjab	1.0	0.8	1.00	26.7	22.1	1.18	26.7	28.4
Others	1.9	2.2	2.76	17.6	19.0	1.01	9.4	8.7
All India	**68.3**	**79.6**	**100**	**1734.7**	**1878.3**	**100**	**25.4**	**23.6**

Source: **http://nhb.gov.in, National Horticulture Board, Ministry of Agriculture, Govt. of India.**

2.3 IMPORTANT VARIETIES GROWN IN INDIA

State	Varieties
Andhra Pradesh	**Thomson seedless, Sharad seedless, Crimson seedless, Anab-e-shahi,**
Haryana	**Anab-e-shahi, Perlette,**
Karnataka	**Bangalore Blue, Anab-e-shahi, Thomson seedless, Sharad seedless, Dilkhush, Flame seedless**
Madhya Pradesh	**Ganesh, Thomson seedless, Sharad seedless, Sonaka, Chirah**
Maharashtra	**Thomson seedless, Kali Sahebi, Sonaka, Sharad seedless, Flame seedless, H-5, Ganesh**
Punjab	**Anab-e-shahi, Perlette,**
Rajasthan	**Sharad seedless, Anab-e-shahi, Perlette,**
Tamil Nadu	**Thomson seedless, Panneer(Muscat), Sonaka, Bhokri, Gulabi,**

Hybrid varieties:

Arkavati, Arka Hans, Arka Kanchan, Arka Shyam, Arka Neel Mani, Arka Shweta, Arka Majestic, Arka Chitra, Arka Krishna, Arka Soma, Arka Trishna.

Exotic varities:

Italica Victoria, Assario, Almeria,

3.0 POST- HARVEST MANAGEMENT

3.1 POST-HARVEST LOSSES:

All fresh fruits including grapes are inherently perishable. During the process of distribution and marketing, substantial losses are incurred which ranges from a slight loss of quality to total spoilage. Post-harvest losses may occur at any point in the marketing process, from the initial harvest through assembling and distribution to the final consumer. The causes of losses are many: physical damage during handling and transport, physiological decay, water loss, or sometimes due to glut in the market and there are no buyer.

The following points should be kept in view to minimize post harvest losses and to get high quality berries:

- **Grape berries which contain more pulp percentage have longer shelf life.**

- **Glucose sugar helps in better storage than fructose sugar. The sugar content of berries is related directly with post harvest life. If it is more, the shelf life is more and vice-versa.**

- **The berry obtained from low nitrogen applied vines show better shelf life.**

- **Grape berries which retain shining for more time have better storage life.**

- **Green stemmed bunches of berries last longer.**

- **Healthy grape berries last longer in storage.**

- **Grapes harvested at low temperature and kept at low metabolic/physiological activities have more shelf life.**

- **By using grape guards, the freshness of berries can be retained which ultimately prolongs shelf life.**

3.2 HARVESTING CARE AND POST-HARVEST CARE:

A) HARVESTING CARE

The following harvesting care should be taken:

MATURITY:

As grape is a non-climacteric fruit, it should be harvested only when the berries are fully ripened on the vine itself. The optimum stage for harvesting of grape bunches is indicated by the characteristic colour of fruits, variety, change in colour of bunch stalk from green to yellow or brown, aroma/flavour, softening of berries, sweetness of pulp and thickening of juice. Stage of maturity at the time of harvesting determines the suitability of fruits for processing, domestic or export market.

Generally, all bunches in the vineyard do not ripen evenly at the same time and all the berries in the same bunch do not ripe at the same time. Therefore, it is desirable to thin them out by removing small sized berries at the developing stage. It will bring uniformity in maturity and size of berries.

HARVESTING SEASONS:

The harvesting season of grapes in major producing areas of India differ considerably. Different harvesting seasons of grapes in India are as under:

1)	**Southern India**	**-**	**May to June and December to April**
2)	**Western India**	**-**	**September to October and April**
3)	**Northern India**	**-**	**June**

Overall harvesting starts from December and lasts upto June. Peak period of harvesting is from February to March. However, harvesting of grapes can be advanced or postponed for about 10 to 15 days depending on the market situation. In case of early pruning, grapes become ready for harvest in about 130 days, in case of late pruning in about 150 to 180 days. Ripening period may be enhanced by spray of ethephon at the rate of 100 to 500 ppm 10-20 days before harvesting. The spray of 1% calcium nitrate 10 days before harvest decreases post harvest loss. To bring uniform colour development in berries, treatment of Ethrel (500 ppm) is advised 7 days before harvesting.

HARVESTING:

Harvesting is the detachment of bunches from the vine at the proper level of maturity. Great care should be taken at time of harvesting. It should be performed without mechanical damage and product loss, as quickly as possible.

The proper stage for harvesting the grapes is adjudged by the development of characteristic colour of a variety and also by touching the grapes from the apical portion of the bunch. In grapes three major colours, viz. white, red and black are found. The criteria used to judge ripening differ according to the use of the grapes. For making raisins, harvesting at a late stage is preferred, to get more sugar in grapes for increasing the weight of the dried product. For all other purposes, ripening is judged on the basis of sugar: acid ratio for getting proper blend required for table purpose or wine making. The correct blend of sugar acid ratio should be between 25-30.

For export market, the following parameters are considered during harvesting of grapes:

- Berry size- Berry size should be more than 16mm in diameter.
- TSS- TSS should be more than 17° Brix.
- Bunch weight- Bunch weight should be between 300-750 g.
- Bunch colour- Bunch colour should be milky green.

- The selected bunch should not be compact.
- All the berries should be of uniform colour and size in a bunch.
- Less than 2% sunburnt or sulphur bleached, bruised or crushed berries.
- Peduncle should be fresh and green.

For local markets, the grapes are harvested early in the morning by cutting selected bunches with long nose scissors. Care must be exercised not to injure other berries by the scissors. While harvesting, care should be taken to avoid erasing the waxy coating of berries by holding the stem of the bunch by hand. The harvested bunches are kept in perforated plastic trays. Bunches should be trimmed by removing the decayed or otherwise defective berries before packing.

For export purpose, harvesting has to be done in early hours of the day. It should be stopped when the berry temperature rises above 20°C. It is advisable to close the harvesting by 10 a.m. otherwise the berry temperature can not be brought down to 4°C within the stipulated time of six hours by precooling. The selected bunches are harvested by giving a cut above the knot present on the stalk of the bunch. Any type of mechanical injury to berries should be avoided while harvesting and handling. The injured portion of skin serves as the entry point for many fungi causing decay. Harvested bunches are placed gently in clean perforated plastic trays in not more than two layers and shifted to the packing shed without loss of time.

At present, hand harvest is the only harvesting system for table-grapes. Bunch is held in one hand and the stalk is cut with a pair of sharp scissors or sharp knife about two inches above the berries. The bunches should be nipped in such a way that no injury/cut or damage is caused to the bunches and individual berries. Harvesting of grapes is preferably done during early morning cool hours or cool late afternoons when the fruit is as cool as possible.

The primary advantages of hand harvest especially in developing countries like India where local investment is difficult:

- Manual picking avoids mechanical damage and maintains quality.

- Selection of fruits is based on visual observation of the picker regarding maturity and appearance.
- Multiple harvest for grading the bunches on the vine.
- Minimum capital investment.
- Sufficient availability of workers.
- Cost of labour is lower than in developed countries.
- Training of picker and packer is cheaper compared to investment required for equipments.

The main problems with hand harvest are labour management and picker skill. In a crude method of harvesting, stalk of the bunch is held between the thumb and the forefinger and is twisted till the bunch gets separated from the cane. But it is a faulty method and some berries may shatter due to jerk and pressure causing high percentage of loss. Berries dropped at the time of harvesting and handling fetch lower price in the market.

Quality is an important aspect in successful marketing and hand harvest is still the only method used for table grapes. A short training period is necessary for harvesting and packaging grape according to the market needs. At the present, table grapes harvesting is carried out by the picker who selects the bunch and cuts the stem using very sharp shears. Before keeping the bunch in the box, the picker generally removes brown and moldy berries.

Bruising of berries should be avoided due to compression especially to the bottom layers of the grapes packed in the box. The trays should be well ventilated on sides and bottom to facilitate air circulation. Inaccurate picking or packing procedures like over-filling the containers or beating bunches against container's hard surface dramatically reduce the fruit quality and post-harvest life of table grape.

TRIMMING AND HANDLING:

Grapes used as table purpose must attract the consumer attention to fetch better price. 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 reduce 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.

After harvesting, the bunches in some cases are put directly in CFB 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.

Some times, the harvested produce is treated/fumigated with sulphur dioxide to sterilize the fruits. It prevents attack of bacteria and fungi from cuts/wounds.

PHYSIO-CHEMICAL CHANGES DURING DEVELOPMENT OF GRAPE BERRY:

The growth of grape berry is three-phase process:

i) **During the first phase, volume of berry development increases rapidly and cell division of the pericarp attains highest rate.**
ii) **In second phase, auxin level reaches at the maximum and ascorbic acid which initially remains at a low level, increases towards the end of this phase.**
iii) **During the third phase, change in colour and consistency of berries further increase in volume due to the presence of inherent sugar water and decrease in ascorbic acid content. The state of colour change in berries is technically known as 'Verasion'.**

The stage of berry development can be further classified into green stage, ripening stage, ripe stage and over ripe stage. The green stage begins with setting up of berries and extends up to ripening stage which is characterised with rapid increase in size of berry, low quantity of sugar and consistently high acidity in hard structured berries. Ripening stage starts with initial level of ripening to the fully ripe stage of grape, during this stage berries become soft and exhibit changes in colour. The green coloured varieties turns into white or yellow with the increase in sugar content and decrease in acidity. The colour change in red and black coloured varieties become more intense. In over ripe stage, the sugar contents increase due to evaporation and decrease in acidity. The berries are subject to fungal infestation, pest attack, shriveling and drying in this stage. The strength of the skin provides safeguard for post harvest handling at various stages.

FACTORS AFFECTING GRAPE BERRY RIPENING:

The berry's maturity period varies from variety to variety. Cultural practices such as pruning, pinching of shoots, training system, irrigation, nutrition, atmospheric temperature, spray of growth regulators and other chemicals play important role in ripening period required by grape berries.

QUALITIES PREFERRED IN TABLE GRAPES:

- **The berry should be seedless.**
  - **The taste of the fruit should be a blend of sweet and sour with 18% - 20% sugar and 0.5 to 0.6% acidity. The sugar, acid ratio varies from one variety to another and on climatic conditions.**
- **The colour of berries should be uniform and turning green amber.**
  - **The skin of berry should be thin, crisp and should dissolve with pulp at the time of consumption.**
- **The berry should be fully developed, uniform and sound.**
- **The bloom on the skin of berries should be retained uniformly.**
  - **The stem and peduncle should look fresh and should be of medium thickness, greenish yellow in colour of moderate length.**
- **Berry drop is not preferred during handling and packing.**
  - **The fruit should be free from residual toxicity of pesticides, stains, diseases and pests.**
  - **Cracked berries, dried berries and off coloured berries are not preferred.**

POST HARVEST MANAGEENT OF PHYSIOLOGICAL DISORDERS:

To minimize post harvest losses, certain measures are adopted to check physiological disorders. The post harvest control of certain physiological disorders are as under:-

1) Stem browning: **The stems of grape bunches are important part of quality. It is essentially required for handling and trimming. It is the first part of the cluster to deteriorate. The stem turns brown early if temperature is high. The treatment of 10ppm N.A.A. 7 – 10 days before harvesting helps retention of stems green colour. The spray of calcium chloride (1 gm./litre of water) at the time of sugar conversion increases the strength of the stem, reduces berry drop and also keeps the stem green. Its spray given during last 20 days before harvesting also helps in retaining bloom and giving attractive appearance. Calcium orthophosphate 1.1 gram or Superphosphate 10 gram per 10 litre of water can also be used for this purpose.**

2) Water loss: **Humidity and temperature are the important factors which decide the degree of water loss. Low temperature and high relative humidity lower the water loss in grape berries. Due to water loss, the berries become soft shriveled and unattractive and quality deteriorates considerably. This water loss can be reduced and the quality can be maintained by quick movement of grape from the vineyard to pre-cooling after harvest. To minimize post-harvest loss, irrigation one day before harvesting should be avoided. It will reduce fungal infestation in packing also.**

3) Berry cracking: **It results due to heavy rain fall or irrigation at the final stage of development of grape berries. Formation of high pressure in the berries on the un-stretchable skin results in berry cracking. The moisture should be controlled at the harvesting stage to reduce this problem.**

B) POST-HARVEST CARE

To minimise post- harvest losses, the following measures should be followed.

- **The crop should be harvested on attaining maturity.**
- **While cleaning, harvesting or trimming bunches should be held by their stalk.**
- **During harvesting wear rubber gloves, to reduce erasing the fine waxy coating from the berry surface. Otherwise, it leads to rapid loss of water through the skin of berries and they shrivel during storage**
- **Use hygienic packaging material for storage and transport to avoid infestation.**
- **Before storage grapes should be pre-cooled.**
- **Grapes should be stored in cold storage (Temp.: 0 -2 ^{o}C and Humidity: 90-95%).**
- **Use proper techniques while handling (loading and unloading).**

PRE-COOLING:

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 by fast and prompt cooling to check drying and browning of the stems and maintaining the firmness of berries. In pre-cooling moisturised air is directly brought in contact by parallel flow system. The temperature of grape is brought down within 2 to 6 hours after the harvest by pre-cooling. In pre-cooling, temperature is maintained at 0-4 ^{o}C and relative humidity at 90% and above. The voyage transit period to the European markets ranges between 20 to 30 days. Therefore, 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 Mahagrape has already established 15 pre-cooling units in some of the major grape producing areas of Maharashtra. The need of the hour is the establishment of pre-cooling chambers and cold storages to boost up export of fruits and vegetables including grapes by reducing post harvest losses. The grapes are either pre-cooled in naked form or after packing into individual paper bags or in ventilated CFB cartons. The pre-cooling service has facilitated the export diversification of grapes to Gulf, Europe and South Asian countries.

3.3 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. While cleaning, harvesting or trimming bunches should be held by their stalk, preferably by wearing rubber gloves. Care is taken not to erase the fine waxy coating called 'bloom' from the berry surface. Otherwise, it leads to rapid loss of water through the skin of berries and they shrivel during storage.

Grading is one of the most important procedures to be followed in post-harvest handling as it determines the quality, shelf life and price of the fruits. In grading the produce is sorted according to the fixed grade standard, taking into consideration various quality factors to make a homogenous lot.

Benefits:

1. Grading is beneficial to the farmers, traders as well as to the consumers.
2. Grading of the grapes before sale enables farmers to get better price for their produce.
3. Grading helps the consumers to get standard quality produce at fair price.
4. After grading, it is easier for the consumer to compare the prices of different qualities of a produce in the market.
5. Grading also reduces the cost of marketing.
6. Grading helps in segregation of grapes for raisin making, juice making, wine making etc.

3.3.1 Grade specifications:

i) Grading under AGMARK:

The Agricultural Produce (Grading and Marking) Act, 1937 was enacted to maintain the quality of agricultural produce in India. The Act authorizes the Central Government to frame rules related to the fixing of grade standards and the procedure to be adopted to grade the agricultural commodities included in the schedules. In accordance with this Act, specifications have been drawn up for grapes considering various quality factors.

The grade standards specified for grapes are notified by the Directorate of Marketing and Inspection are as follow:

I] GRADE DESIGNATION AND QUALITY OF TABLE GRAPES:

1. Table Grapes shall be fruits obtained from varieties (cultivars) of *Vitis vinifera* L.
2. Minimum requirements:

i) Bunches and berries of Table grapes shall be:

a. clean, sound, free of any visible foreign matter;

b. free of pests, affecting the general appearance of the produce;

c. free of damage caused by pests and diseases;

d. free of abnormal external moisture;

e. free of any foreign smell and / or taste;

f. free of all visible traces of moulds;

ii) Berries shall be intact, well formed and normally developed,

iii) Table grapes shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

iv) Table grapes shall have minimum soluble solids of 16 degrees Brix.

v) Table grapes shall have minimum sugar / acid ratio of 20 : 1.

1. Criteria for grade designation :

Grade designation	Grade requirements	Provision concerning sizing	Grade tolerances
1	**2**	**3**	**4**
Extra class	Grapes must be of superior quality. The bunches must be typical of variety in shape, development and coloring and have no defects. Berries must be firm, firmly attached to the stalk, evenly spaced along the stalk and have their bloom virtually intact.	As per table 'A'	5% by weight of bunches not satisfying the requirements of the grade, but meeting those of class I grade or exceptionally coming within the tolerances of that grade.
Class I	Grapes must be of good quality. The bunches must be typical of variety in shape, development and coloring. Berries must be firm, firmly attached to the stalk and, as far as possible, have their gloom intact. They may, however, be less evenly spaced along the stalk than in the extra class. Following slight defects may be there, provided these do not affect the general appearance of the produce and keeping quality of the package. - a slight defect in shape. - a slight defect in coloring	-do-	10% by weight of bunches not satisfying the requirements of the grade, but meeting those of class II grade or exceptionally coming within the tolerance of that grade.
Class II	The bunches may show defects in shape, development and coloring provided these do not impair the essential characteristics of the variety. The berries must be sufficiently	-do-	10% by weight of bunches not satisfying the requirements of the grade, but meeting the minimum requirements.

	firm and sufficiently attached. They may be less evenly spaced along the stalk than Class I grade. Following defects may be there, provided these do not affect the general appearance of the produce and keeping quality of the package. - defects in shape - defects in coloring - slight sun scorch affecting the skin only, - slight bruising, - slight skin defects		

2. Other requirements:

i. Grapes must have been carefully picked and have reached an appropriate degree of development and ripeness in accordance with criteria proper to the variety and / or commercial type and to the area in which they are grown. The development and condition of the Grapes must be such as to enable them :

- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

TABLE 'A'

PROVISION CONCERNING SIZING

Size is determined by the weight of bunches (in gms). The following minimum (in gms) requirements per bunch are laid down for large and small berries grapes.

Grade	Large berries	Small berries
Extra class	200	150
Class I	150	100
Class II	100	75

Size tolerance:

Extra Class, Class I, Class II: 10% by weight of bunches not satisfying the size requirements for the grade, but meeting the size requirements for the grade immediately below.

ii) CODEX STANDARD FOR TABLE GRAPES:

(CODEX STAN 255-2007)

1. DEFINITION OF PRODUCE

This Standard applies to commercial varieties (cultivars) of table grapes grown from *Vitis vinifera* L., of the *Vitaceae* family, to be supplied fresh to the consumer, after preparation and packaging. Grapes for industrial processing are excluded.

2. PROVISIONS CONCERNING QUALITY

2.1 MINIMUM REQUIREMENTS

In all classes, subject to the special provisions for each class and the tolerances allowed, the bunches and berries must be:

- sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded;
- clean, practically free of any visible foreign matter;
- practically free of pests and damage caused by them affecting the general appearance of the produce;
- free of abnormal external moisture, excluding condensation following removal from cold storage;
- free of any foreign smell and/or taste;
- practically free of damage caused by low and/or high temperatures.

In addition, the berries must be:

- whole;
- well formed;
- normally developed.

Pigmentation due to sun is not a defect so long as this only affects the skin of the berries.

2.1.1 The bunches must have been carefully picked.

The development and condition of the table grapes must be such as to enable them:

- to withstand transport and handling; and
- to arrive in satisfactory condition at the place of destination.

2.1.2 Maturity Requirements

Table grapes must be sufficiently developed and display satisfactory ripeness.

In order to satisfy this requirement, the fruit must have obtained a refractometric index of at least 16° Brix.

Fruit with a lower refractometric index are accepted provided the sugar/acid ratio is at least equal to:

(a) 20:1 if the Brix level is greater than or equal to 12.5° and less than 14° Brix,

(b) 18:1 if the Brix level is greater than or equal to 14° and less than 16° Brix.

2.2 CLASSIFICATION

Table Grapes are classified in three classes defined below:

2.2.1 “Extra” Class

The bunches be characteristic of the variety in shape, development and colouring, allowing for the district in which they are grown.

The berries must be firm, firmly attached to the stalk, evenly spaced along the stalk and have their bloom virtually intact.

They must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.

2.2.2 Class I

Table grapes in this class must be of good quality.

The bunches must be characteristic of the variety in shape, development and colouring, allowing for the district in which they are grown.

The berries must be firm, firmly attached to the stalk and, as far as possible, have their bloom intact. They may, however, be less evenly spaced along the stalk than in the "Extra" Class.

The following slight defects, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package:

- a slight defect in shape;
- a slight defect in colouring;
- very slight sun scorch affecting the skin only.

2.2.3 Class II

This class includes table grapes which do not qualify for inclusion in the higher classes, but satisfy the minimum requirements specified in Section 2.1 above.

The bunches may show slight defects in shape, development and colouring, provided these do not impair the essential characteristics of the variety, allowing for the district in which they are grown.

The berries must be sufficiently firm and sufficiently attached to the stalk. They may be less evenly spaced along the stalk than in Class I.

The following defects, however, may be allowed, provided the table grapes retain their essential characteristics as regards the quality, the keeping quality and presentation:

- defects in shape;
- defects in colouring;
- slight sun scorch affecting the skin only;
- slight bruising;
- slight skin defects.

3. PROVISIONS CONCERNING SIZING

Size is determined by the weight of the bunch.

3.1 MINIMUM BUNCH WEIGHT

The minimum bunch weight shall be 75 gr. This provision does not apply to packages intended for single servings.

4. PROVISIONS CONCERNING TOLERANCES

Tolerances in respect of quality and size shall be allowed in each package for produce not satisfying the requirements of the class indicated.

4.1 QUALITY TOLERANCES

4.1.1 “Extra” Class

Five percent by weight of bunches not satisfying the requirements of the class, but meeting those of Class I or, exceptionally, coming within the tolerances of that class.

4.1.2 Class I

Ten percent by weight of bunches not satisfying the requirements of the class, but meeting those of Class II or, exceptionally, coming within the tolerances of that class.

4.1.3 Class II

Ten percent by weight of bunches satisfying neither the requirements of the class nor the minimum requirements, with the exception of produce affected by rotting or any other deterioration rendering it unfit for consumption.

4.2 SIZE TOLERANCES

Ten percent by weight of bunches not satisfying the size requirements as specified in Section 3.

5. PROVISIONS CONCERNING PRESENTATION

5.1 UNIFORMITY

The contents of each package must be uniform and contain only bunches of the same origin, variety, quality and degree of ripeness. In the "Extra" Class, the bunches must be of more or less identical size and colouring. In the case of Class I, the bunches may have slight variation in size.

However, consumer packages of a net weight not exceeding 1 kg may contain mixtures of table grapes of different varieties, provided they are uniform in quality, degree of ripeness and, for each variety concerned, in origin.

The visible part of the contents of the package must be representative of the entire contents.

5.2 PACKAGING

Table grapes must be packed in such a way as to protect the produce properly. The materials used inside the package must be new, clean, and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly of paper or stamps bearing trade specifications is allowed, provided the printing or labelling has been done with non-toxic ink or glue.

Table grapes shall be packed in each container in compliance with the Recommended International Code of Practice for Packaging and Transport of Fresh Fruits and Vegetables (CAC/RCP 44-1995).

In the case of the "Extra" Class, the bunches must be packed in a single layer.

5.2.1 Description of Containers

The containers shall meet the quality, hygiene, ventilation and resistance characteristics to ensure suitable handling, shipping and preserving of the table grapes. Packages must be free of all foreign matter and smell2.

6. MARKING OR LABELLING

6.1 CONSUMER PACKAGES

In addition to the requirements of the Codex General Standard for the Labelling of Prepackaged Foods (CODEX STAN 1-1985), the following specific provisions apply:

For the purposes of this Standard, this includes recycled material of food-grade quality.

A fragment of vine shoot no more than 5 cm in length may be left on the stem of the bunch as a form of special presentation without prejudice to the applicable plant protection rules.

6.1.1 Nature of Produce

If the produce is not visible from the outside, each package shall be labelled as to the name of the produce and may be labelled as to name of the variety.

6.2 NON-RETAIL CONTAINERS

Each package must bear the following particulars, in letters grouped on the same side, legibly and indelibly marked, and visible from the outside, or in the documents accompanying the shipment.

6.2.1 Identification

Name and address of exporter, packer and/or dispatcher. Identification code (optional)3.

6.2.2 Nature of Produce

Name of the produce “Table Grapes” if the contents are not visible from the outside. Name of the variety or, where applicable, names of varieties.

6.2.3 Origin of Produce

Country of origin or, where applicable, countries of origin and, optionally, district where grown or national, regional or local place name.

6.2.4 Commercial Identification

- Class;
- Net weight (optional);
- “Bunches below 75 gr. intended for single servings”, if appropriate.

6.2.5 Official Inspection Mark (optional)

7. CONTAMINANTS

7.1 PESTICIDE RESIDUES

Table grapes shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

7.2 OTHER CONTAMINANTS

Table grapes shall comply with those maximum levels for contaminants established by the Codex Alimentarius Commission for this commodity.

8. HYGIENE

8.1 It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice – General Principles of Food Hygiene (CAC/RCP 1-1969), Code of Hygienic Practice for Fresh Fruits and Vegetables (CAC/RCP 53-2003), and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

8.2 The produce should comply with any microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria for Foods (CAC/GL 21-1997).

3.3.2 TOXINS:

Hazards Analysis Critical Control Points (HACCP) has become mandatory in the developed countries. Thus, farmers from developing countries desirous to export to developed countries must know the commercial quality standards and the safety requirements. Good Agricultural Practices (GAPs) and Good Manufacturing Practices (GMPs) are always requested from the importers. Handling and storage are the two points, which requires more attention.

i) For table grapes, the problems related to concentration of SO_2 in the storage room as well as in the shipping box are very crucial, as on several occasions lots of table grapes have been blocked in the developed countries due to high concentration of SO_2. Unfortunately the concentration of SO_2 in the box is conditioned by the relative humidity inside the plastic bag and so it is difficult to control it. Safe limit for SO2 in grapes are 10 mg/kg. In Fig, the injury provoked by high content of SO_2 on the berries is shown.

Figure: Bunch injured by SO_2 treatment

ii) Other problems are the mycosis and the mycotoxins. Cleaning and disinfestations help in reducing the contamination. The evaporator, floor, ceiling and walls should be properly cleaned and hygeinic condition should be maintained.

Mycotoxins are more dangerous than mycosis. Raisins, decayed grapes and wine are generally contaminated, but due to low concentration, it is not dangerous for the consumer. The risks are not only for the consumers but also for the workers, which take up the fungal spores with the respiration. The aflatoxins are caused by the fungus *Aspergillus flavus* and *A. parasiticus*. In table grapes and in wine, the most important mycotoxin is ochratoxin A, which is produced by *Aspergillus ochraceous* and *Pennicillium verucosum.* The colonisation occurs in the field after the colour turning stage of the berries.

3.3.3 AGMARK GRADING FOR EXPORT:

During 2007-08, 36534.00 tonnes of grapes valued at Rs 18973.00 lakhs were graded for export while during 2008-09, 40008.10 tonnes of grapes valued at Rs. 18931.91 lakhs were graded.

Table No.4: Agmark grading of grapes for export

Commodity	2007-08		2008-09	
	Quantity (Tonnes)	Value (Rs lakhs)	Quantity (Tonnes)	Value (Rs lakhs)
Grapes	36534.00	18973.00	40008.10	18931.91

Source : Agmark Grading Statistics,2008-2009, DMI, Faridabad.

3.4 PACKAGING:

Packaging is very important as good packaging protect the produce from any damage during storage, transportation and other marketing operations. It provides convenience in handling during transportation and storage.

The grapes meant for the local market are packed in ventilated corrugated boxes (2kg and 10kg capacity), bamboo baskets (4kg-15kg) and plastic crates (6-12 kg). These boxes are lined with newsprint paper. Fine paper shred or fine hay is spread at the bottom and top of the box for cushioning. The open flaps of the box are secured firmly by an adhesive tape. The cartons are printed with information such as name of the variety, date of packing, weight, name of the consignee and consignor, destination for domestic markets.

Table grapes for overseas market are packed in 5 ply corrugated boxes of size 500x300mm accommodating 5 kg of grapes. The graded bunches are weighed into 5 kg lots in plastic trays. One or two bunches weighing between 350-650 g are placed in small and thin polythene pouches. Before placing the pouches in the carton, the bubbled polythene cushion is placed at the bottom of the carton. A white and soft polythene liner is spread over the top of the bubble sheet. These pouches are arranged in a single layer in a slanting fashion in the carton. The flaps at the open end of the carton are folded before precooling. After precooling, dual purpose SO_2 releasing pads are placed over the pouches. A few opening points are also provided in the cartons for free circulation of air. Attractive printing and marking of cartons is also done for the export packing.

The Corrugated Fiber Board boxes made of craft paper is sufficiently available and also lighter in weight and recyclable. In addition, desired strength may also be reinforced in to the C.F.B. cartons through the judicious selection of lining material. The boxes which could be designed in varying forms are amenable to printing of quality parameters and other pertinent related information on the package itself. These cartons can also be made waterproof and therefore are ideally suited for pre-cooling treatment, storage in cold storage and transportation in insulated containers, especially for exports from the ports through sea route or by air from airports.

BRUISING, PACKAGING SHED & GRAPEGUARD:

BRUISING:

The surface injuries in fruits are regarded as bruising. It may occur during handling, harvesting, packing, pre-cooling, storage, transportation, etc. It is increased in stacked packs during transit and rough handling. It adds to rupture of fruits, fungal infection, spread of juices, breaking of stems and detachment of stems with shattering of berries.

The post harvest losses by bruising can be minimized by providing adequate pads on the bottom of the container, smooth liners to prevent the fruit from rubbing the sides and ends. The tight fill setting in place of conventional packing reduces these problems. Where road is rough, transportation on head loads is preferred in comparison to tractor trolleys and bullock carts.

PACKAGING SHED:

It should be clean, free from dust, dirt, lumps, etc and should have low temperature. Sufficient space should be provided for free movement, tables should be arranged for weighing and packing and maintain highly hygienic sanitary conditions. Standard weighing machine should be used.

GRAPEGUARD:

It is a paper, chemically treated with Sodium metabisulphate or Potassium metabisulphate, which when it comes in contact with moisture releases Sulphur dioxide which helps in retaining freshness of fruits and checks fungal infection in transit and storage. Fast release grapeguard is used for transport and slow release grapeguard is used for storage; while dual release paper is used to take care of both. To eliminate discolouration and to avoid direct contact with fruits it should be wrapped in suitable material before keeping in cartons meant for export or domestic trade.

Rupturing, pressing, rotting and shattering are main causes of losses in packaging. The percentage of losses in packaging depends on the number of layers of bunches arranged in containers and distance transported between markets.

Criteria for selection of packaging material:

Packaging material should;

- Be food grade.
- Protect the quality and quantity of the produce.
- Prevent spoilage during transportation and storage.
- Maintain the freshness of grapes.
- **Convenient and suit the need of the consumer.**
- Attractive for display.
- Gives information about quality, variety, date of packing, weight and price.
- Be convenient in handling operations.
- Be environment friendly and biodegradable.
- Be free from contaminating chemicals.

3.5 TRANSPORTATION:

The post- harvest losses in transit can be minimized substantially by quick and efficient transportation.

The following points should be considered during transportation of grapes:-

1. **Transportation should be quick.**
2. **Rough handling of boxes/cartons during loading/unloading should be avoided.**
3. **Over loading by using tier system should be avoided.**
4. **Low temperature should be maintained during transportation.**
5. **To reduce bruising, good shock absorbers should be used on rough roads.**
6. **Use of pallets be made to avoid handling losses.**
7. **Rail reefer container should be preferred over road transport.**
8. **No mixing of grape packs with the packs of other commodities.**
9. **Excessive rough roads should be avoided.**
10. **Use of reefer containers should be encouraged.**

3.6 STORAGE:

Fresh grapes can be stored in cold stores for a period of about 6 weeks. Grapes should be pre-cooled promptly after harvest in separate rooms with large refrigeration capacity, high air velocity and high relative humidity. They are normally pre-cooled at 1-2° C within 6 hours of harvest. After pre-cooling, the dual releasing Sulphur dioxide pads (Grape guard) are placed with their coated surfaces downwards

on the filled plastic pouches and covered with the polythene liner. The boxes with sufficient air circulation are closed and shifted to cold storage rooms where the temperature and humidity are maintained at 0-2° C and 90-95% respectively. In the cold storage ensure uniform cooling within a box and it's surroundings.

Cool chain:

Cool chain is essential during the transport of export quality commodity all the way from the farm to the customer. This helps in maintaining the temperature inside the box at the same low level as in the cold storage.

The various stages of the cool chain are:

1. Coldstore at the farm.
2. Refrigerated truck from farm to the airport
3. Coldstore at the airport.
4. Building up of the pallet in a coldstore at the airport.
5. Loading the aircrafts directly from the coldstore in a short time.
6. Cargo aircraft maintains coldstore temperature in hold.
7. Off loading direct into a coldstore in the receiving country.
8. Refrigerated truck to the customers.

Optimum Temperature

Grapes can be stored at 0.0 to 2° C. The highest freezing point for berries is -2.1° C, but freezing point varies depending on SSC.

Optimum Relative Humidity

90-95% RH and an air velocity of approximately 6-10 meter per minute (MPM) is suggested during storage.

COLD STORAGE:

The cold storage of grape is done at the temperature varying between 0-2° C and relative humidity ranging from 90% to 95%. Cold storage of grapes extends the shelf life of grapes by 3 to 4 months. Besides, it also preserves the freshness of fruit, prevents decay and discoloration. In addition, it also minimizes the discolouration on account of moisture loss and maintains the stem in good

condition. Use of slow release grape guards further enhance the storage period in a cold storage.

Since the cold storage do not have pre-cooling air movement facilities for quick cooling, pre-cooling prior to cold storage is a basic requirement for rapid removal of field heat. During storage, shattering of berry can be minimized by avoiding rough handling. Freezing is more in less sugar containing clusters and water loss is more in fruits of heavy bearing vineyards. The uniform maintenance of temperature and humidity prevents berry cracking.

3.6.1 MAJOR DISEASES AND DISORDERS AND THEIR CONTROL MEASURES:

Diseases	Characteristics of diseases	Control measures
Anthracnose (*Elsinoe ampelina*)	This disease attacks mainly the leaves and young shoots. Small light brown or greyish black lesions develop on tender shoots, young leaves, flowers and young berries. It causes shot holes in the leaves and thus, reduces the effective leaf area. Affected blossoms fail to set fruits. The fungus also causes cankers on the petioles and veins, and leaves become twisted and deformed. On berries, the disease causes circular brown sunken spots with dark brown margins. Rain and dew are highly favourable for the spread of the disease. 	Prophylactic measures should be followed for effective control. All affected twigs showing cankers should be removed while pruning. The pruned twigs and leaves should be burnt or buried deep in the soil. This disease is more problematic during October and November. The new shoots and young branches should be given protective sprays during this period. Spraying of the grapevines at 3-4 leaf stage with fungicides like Bordeaux mixture @ 0.8% or Copper Oxychloride @ 0.25% or Carbendazim @ 0.1% are effective against this disease.

Powdery Mildew (*Uncinula necator*)	It leaves blemishes on the affected berries and deforms them. The diseases is characterized by the presence of white powdery (ash like) coating in patches on both sides of the leaves, young shoots and immature berries. The affected leaves turn pale and curl up. Affected shoots remain weak and immature. When young berries are attacked they become corky. Berries attacked at 50% maturity stalk turn dark and become distorted in shape. If, severely attacked they are enveloped with a white powdery coating and crack eventually. Loss results from both berry drop and reduced size of berries. 	Powdery mildew can be controlled easily by spraying Wettable Sulphur (1.5kg/200 litres of water). Sulphur dusting (20kg/ha) in the morning hours controls the disease effectively. Systemic fungicides like Bayleton (1g/litre of water) or Calaxin (3-4 ml/10 litres of water) or Benomyl (5g/10 litres of water) offer better and prolonged control of the disease. Fungicidal spray against this should be done from November to February. No single chemical should be sprayed more than twice.

Downy Mildew (*Plasmopara viticola*)	Light and continuous rains or heavy dew associated with high humidity and low temperatures favours the development of the disease. The disease attacks the leaves, flowers, cluster and young fruits. Initial symptom appear as light yellow spots on the upper surface of young mature leaves with corresponding white spots on the lower side. Affected portions of the leaves turn brown and can not support the bunch development due to reduced photosynthetic activity. The losses are very high when the clusters are attacked before fruit set. Entire cluster decays, dries and drops down. Infected small berries turn brown and become mummified. However, once berries begin softening and change colour, they cease to get infected. 	Pruning of the vines after the second week of October helps to minimize the damage. All affected portions of the vine should be removed at the time of pruning and be destroyed immediately. Bordeaux mixture (1%), Copper Oxychloride (0.2%), Mancozeb (0.2%), Metalaxyl (0.2%) or Fosetyl Al (0.2%) are effective against this disease. Systemic fungicides are more effective than non-systemic ones.
Bacterial Leaf Spot (*Xanthomonas campestris*)	Disease infects leaves, shoots and berries. The symptoms appear as minute water soaked spots on the lower surface of the leaves along the main and lateral veins. Later on these spots coalesce and form larger patches. Brownish black lesions are formed on the berries, which later become small and shriveled.	Collecting and burning the infected plant parts minimizes the spread of the disease. Streptocycline (500 ppm) is very effective as a prophylactic spray. Weekly sprays of copper fungicide and Bordeaux mixture given from last week of October are effective to prevent the incidence and spread of the disease.

Rust (*Phakopsora euvitis*)	The symptoms are in the form of numerous orange coloured pustules on the lower surface of the leaves. In case of severe infection such pustules cover the entire leaf surface leading to severe defoliation.	Rust controlled in vineyards by applying 3-4 sprays of Baycor (0.1%) or Chlorothalonil (0.2%) at fortnightly intervals.
Leaf Blight and Bunch Necrosis (*Alternaria alternata*)	The disease attacks both leaves and fruits. Small yellowish spots first appear along the leaf margins, which gradually enlarge and turn into brownish patches with concentric rings. Severe infection leads to drying and defoliation of leaves. Symptoms in the form of dark brown-purplish patches appear on the infected berries, rachis and bunch stalk just below its attachment with the shoots.	Bordeaux mixture (1.0%), Mancozeb (0.2%), Topsin-M (0.1%), Ziram (0.35%) or Captan (0.2%) is to be sprayed alternatively at weekly intervals from Jun-August and again from December until harvest to keep this disease under check. Two to three sprays of systemic fungicides should be given per season.
Bitter Rot (*Greenaria uvicola*)	The disease causes losses in field, storage and in transit. The disease infects the leaves, canes and berries. The disease is most serious on older leaves. Initially the infection starts as dark brown water soaked spots covering the entire leaf. The infection on the cane is prominently visible which initially becomes white and later turns black. The infected cane shows reduced growth and wilts. The young infected green berries get shriveled and turn black.	IIHR, Bangalore recommends that the canes should be prunned and followed by sprays of Rovral (0.2%),Baycor (0.1%) and Thiophanate Methyl (0.1%) for effective control in the field and the storage.

Black Rot (*Aspergillus niger*)	High storage temperatures and humid conditions favour the development of the disease.  The fungus enters the berries through the injuries caused due to poor post harvest handling operations. The pulp of infected berries is reduced to watery consistency.	Careful handling and prompt refrigeration to 1-2^0 C or below prevents the disease in storage. Inclusion of SO_2 releasing pads in the boxes while packing helps to control the disease.
Dead Arm (*Phomopsis viticola*)	The disease is first noticed as angular small spots on the leaves, stems, canes and flower clusters. Most of the spots have yellowish margins with dark centres. Frequently the spots grow together and form large brown areas on the canes. Later on the canes start to dry rapidly. In case of severe infection the drying extends to the roots and the whole plant wilts. The disease is mostly prevalent in South India.	The pruned canes should be collected and destroyed. The dead canes should be pruned to the region where healthy tissues are seen and it can still be further pruned so as to avoid any chance of mycelial growth left out in the canes. Such pruned cane should be pasted with Bordeaux paste immediately after the pruning. Later on the vines should be sprayed with Bordeaux mixture (5:5:50) followed by Difolatan (0.2%) or Daconil (0.2%) or Dithane Z-78 (0.2%) at fortnightly intervals till the canes become hard.

Botrytis Rot/Grey Mould (*Botrytis cinerea*) :	 It is one of the most important diseases in storage of grapes. It is capable of growing at low temperature. In the vineyards, the fungus attacks the shoots and clusters or destroys stalks leading to premature fruit drop. In the early stages of infection the skin of the affected berries just below the infection become loose. When rubbed with fingers the skin slips from the berry leaving the firm pulp exposed. The infected berries shrivel, rot and turn dark brown showing the presence of greyish growth of the fungus.	Careful handling in the field, precooling and refrigeration helps in controlling the disease. Pruning and thinning of the vineyard reduces humidity around the clusters. Prophylactic sprays with Captan (0.2%) and Benomyl or Bavistin (Carbendazim) (0.1%) minimize the development of the fungus during transit and storage.
Rhizopus Rot (*Rhizopus sp*.)	The fungus grows rapidly under warm and moist conditions producing a  coarse grey mat of mycelium. Injury caused to the berries by tight packing and storage temperature help the fungus grown during storage. Under ideal storage conditions it does not occur if the infected berries are trimmed at harvest.	Pre-harvest fungicidal sprays of Captan or Benomyl reduce the disease inoculum on berries. Inclusion of SO_2 releasing pads in the boxes while packing, removing of diseased berries during grading, avoiding injury to the berries while packing and handling helps to restrict the growth of fungi. Maintaining cold storage temperature between 0-1^0 C prevents fungal growth.

Disorders:

i) Water Berries:

Water berry is associated with fruit ripening and most often begins to develop shortly after berry softening. The affected berries become watery, soft, and flabby when ripe. They are almost normal in size but their flesh is not firm. They shrivel and dry by the time of harvest. Such berries mostly confine to the tip of the main rachis or its branches. This disorder occurs due to dense cultivation and inadequate nourishment available to all the berries in a cluster. Excessive irrigation and nitrogenous fertilizers should be avoided during berry development to reduce water-berry formation.

ii) Cluster-Tip Wilting:

Light brown lesions on the apical end of the rachis affect the conductivity of the rachis. This results in shriveling and drying of the rachis at the tip of the bunch. Cluster pinching or berry thinning should be done to reduce excessive crop load on the vines. Ensuring adequate irrigation during the berry development and protection of bunches from direct sunlight also help in reducing the incidence of cluster-tip wilting.

iii) Shot Berries:

Shot berries are smaller, sweeter, round and seedless as compared to normal berries. They are formed due to delay in pollination and fertilization of a few flowers or due to inadequate flow of carbohydrates into the set berries. Boron deficiency, incorrect application of Gibbrellic Acid and girdling are the reasons for shot-berry formation. Boron or Zinc deficiencies should be corrected. Application of GA at proper stage should be ensured.

iv) Pink Berry:

As the bunch approaches maturity some berries in the bunch develop pink colour at random. The pink colour changes to dull red colour rendering the bunch unattractive. Incidence of pink berries is low in the early season crop and increases with the rise in temperature late in the season. Indiscriminate use of Etherel for berry colouration can also cause this disorder. This is a serious problem in Thompson Seedless variety in Maharashtra.

v) Bud and Flower Drop:

Flowers drop from the clusters just before and after opening. The buds drop on shaking the panicle. Excessive bud and flower drop results in reduction of yield. Atmospheric temperature, high phosphorus and total salt contents of the soil are the different factors causing this malady. Judicious irrigation practices and canopy management practices to improve ventilation during the flower development helps to minimize the flower bud and young berries drop. This phenomenon is prevalent in North India in the states of Punjab, Haryana and Rajasthan.

vi) Poor Cane Maturity:

In this disorder, shoots fail to mature and their barks remain green until late in autumn. Such shoots turn pink-red due to low temperature in winter. It is more serious in vineyards, where the shoot growth is vigorous and dense; vines are planted closely and excess nitrogen and irrigation are provided.

Judicious shoot pinching to check excessive vegetative growth; shoot thinning 30 days after summer pruning to prevent mutual shading of the shoots and promote light interception are some of the suggested remedial measures. Poor cane maturity is a common phenomenon observed in peninsular India.

3.6.2 STORAGE STRUCTURES:

Storage is an important aspect of post harvest operations. Grapes should be pre-cooled promptly after harvest. After pre-cooling, the dual releasing Sulphur dioxide pads (Grape guard) are placed with their coated surfaces downwards on the filled plastic pouches and covered with the polythene liner. Grapes are stored in cold storage where the temperature and humidity are maintained at 0-2° C and 90-95% respectively. The arrangement of boxes in the cold storage to ensure uniform cooling of all berries and surroundings is very important.

4.0 MARKETING PRACTICES AND CONSTRAINTS:

4.1 ASSEMBLING:

Major assembling markets:

Important assembling markets of grapes in different states are as under:

States	Important markets
1.Andhra Pradesh	Gaddiannaram, Medak, Anantpur, Rangareddy, Mehboobnagar, Kurnool
2. Haryana	Fatehabad, Jakhal, Ratia, Tohna
3. Karnataka	Bangalore, Malur, Mulbhagilu, Hubli, Mysore, Tumkur, Kolar, Bijapur , Gulbarga,Raichur and Bellary
4.Madhya Pradesh	Jabalpur, Katni, Chhindwara, Indore, Bhind, Morena, Shivpuri, Guna
5. Maharashtra	Nashik, Nagpur, Pune , Sangli, Solapur, Satara, Ahmednagar, Latur,Beed, Aurangabad
6.Punjab	Amritsar, Bhatinda, Faridkot,Ferozpur, Gurudaspur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Moga, Muktsar, Narashahar, Patiala, Ropar, Sangrur, Fatehgarhsahib
7.Rajasthan	Jaipur,Jodhpur,Ajmer, Bikaner, Sri Gangapur, Udaipur
8. Tamil Nadu	Coimbatore, Madampatti, Dindigul, Kodai Road, Semapatti, Madurai, Oodaipatti, Surulipatti, Kadayanallur
9.Uttar Pradesh	Lucknow, Jhansi, Sultanpur, Kanpur, Meerut, Moradabad, Muzaffarnagar, Bareilly, Allahabad, Agra

4.1.1 ARRIVALS:

During 2005-2006, the total arrivals of grapes in the markets of Maharashtra were reported to be 13066.40 tonnes whereas the arrivals in Andhra Pradesh, Karnataka, Punjab, Rajasthan and Tamil Nadu were 2553.0, 49886.0, 13561.1, 13548.0 44106.0 tonnes respectively. The arrivals of grapes during 2003-2004 to 2005-2006 in important markets of major producing states are given as under.

Table No. 5: Arrivals of Grapes in important markets of major producing states in India

Sl. No.	Name of the states	Arrivals (in tonnes)		
		2003-2004	2004-2005	2005-2006
1.	Andhra Pradesh (1 market)	2585.0	1881.0	2553.0
2.	Harayana	6000.0	450.0	450.0
3.	Karnataka	44330.0	89801.0	49886.0
4.	Madhya Pradesh (3 markets)	1231.1	1677.4	2175.3
5.	Maharashtra (1 market)	5038.30	9288.00	13066.4
6.	Punjab (17 markets)	12060.9	15314.4	13561.1
7.	Rajasthan (6 markets F & V)	10471.0	12284.0	13548.0
8.	Tamil Nadu(9 markets)	29304	34852	44106.0

Source: Sub-offices of Directorate of Marketing and Inspection.

4.1.2 DESPATCHES:

Grapes were mostly despatched to the markets within the state or to the markets of the adjoining states. Grapes from major producing states Maharashtra were mainly despatched to Uttar Pradesh, Delhi and West Bengal whereas from Karnataka, they were despatched to Tamil Nadu, Andhra Pradesh and Kerala. During 2003-2004 to 2005-2006, the despatches of grapes from different states are as under:

States from where despatched	States to which arrived
1. Andhra Pradesh	Within Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Gujarat
2. Harayana	Within Harayana
3. Karnataka	Within Karnataka, Tamil Nadu, Andhra Pradesh, Kerala
4. Madhya Pradesh	Within Madhya Pradesh,Delhi, Karnataka, Maharashtra
5. Maharashtra	Within Maharashtra, Uttar Pradesh, Delhi, West Bengal
6. Punjab	Chandigarh, Harayana, Rajasthan
7. Rajasthan	Within Rajasthan
8. Tamil Nadu	Within Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, West Bengal, Puducherry,
9. Uttar Pradesh	Within Uttar Pradesh

Source: Sub-offices of Directorate of Marketing and Inspection.

4.2 DISTRIBUTION:

Assembling and distribution of the agricultural produce are closely related. The assembling deals with the movement of grapes from the farm to the assembling centre while the distribution deals with its further movement to the consumer. The producer makes the movement of grapes from the farm to the assembling centers, while a number of market functionaries are involved in the distribution dealing with its subsequent movement to the ultimate consumer.

The following agencies are involved in distribution of grapes at various stages of marketing:

* **Producers**
* **Pre-harvest contractors**
* **Commission agents**
* Wholesale merchants
* Retailers
* Co-operative organisations
* Government organisations
* Exporters and importers

4.2.1 INTER-STATE MOVEMENTS:

Maharashtra, Karnataka and Tamil Nadu together accounted for nearly 93 percent of total production of grapes in the country during the year 2005-2006. These states play major role in its inter-state movements. Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Punjab and Tamil Nadu are the major exporting states while Delhi, Uttar Pradesh, Tamil Nadu, Karnataka, Orissa, West Bengal, Gujarat, Chandigarh, Harayana, Rajasthan, Andhra Pradesh and Madhya Pradesh are the main importing states.

Table No.6: Estimated Interstate movements of grapes (in Tonnes)

States from where despatched	States to which arrived	2003-04	2004-05	2005-06
Andhra Pradesh	Tamil Nadu, Karnataka, Orissa, West Bengal	540	430	510
Karnataka	Tamil Nadu, Andhra Pradesh, Maharashtra	66500	13470	7483
Maharashtra	Delhi, West Bengal, Karnataka, Uttar Pradesh, Gujarat	44000	NA	NA
Punjab	Chandigarh, Harayana, Rajasthan	1809	2297	2034
Tamil Nadu	Kerala, Andhra Pradesh, Karnataka, West Bengal	8701	12426	15416

Source: Sub-offices of Directorate of Marketing and Inspection.

4.3 EXPORT AND IMPORT:

Export:

World's total fresh grapes export was 3505850 tonnes valued at 3320214.35 thousand US dollars during 2005 and India's export was 53190 tonnes valued at 48505 thousand US dollars. India's share of total world's export was 1.46 percent. India exported 140 tonnes of raisins to other countries whereas world's export of raisins during 2005 was 714350 tonnes.

Import:

During the year 2005, import of world's total fresh grapes was 3235740 tonnes valued at 4533047.08 thousand dollars and India's import was 1500 tonnes valued at 1761 thousand dollars. India imported 7770 tonnes of raisins from other countries which was 1.28 percent of world's import (749870 tonnes) of raisins.

During the year 2005, export and import of grapes, raisins, wine and grape juice from India and their value are given in Table No.:7.

Table No. 7: Export & import of various products of grapes at global level and from India during 2005

Quantity (in tonnes)
Value (in 1000$)

Products	World		India			India's position in world (Value)
	Quantity	Value	Quantity	Value	Percent share of world (%) (value)	
Export of Grapes	3505850	3320214.35	53910	48505	1.46	16
Export of Raisins	714350	877805.71	140	178.27	0.02	32
Export of Wine	7929850	20625371.42	480	1204.54	0.006	62
Export of Grape juice	723330	540862.41	10.00	3.00	0.0006	42
Import of Grapes	3235740	4533047.08	1500	1761	0.039	74
Import of Raisins	749870	917589.77	7770	11732	1.28	20
Import of Wine	7717760	20715326.04	1690	9424	0.046	107
Import of Grape juice	799430	540028.44	190	259	0.048	71

Source: http://nrcgrapes.nic.in/

4.3.1 SANITARY AND PHYTO-SANITARY (SPS) REQUIREMENTS:

The Sanitary and Phyto-sanitary (SPS) measures are an integral part of export and import trade under WTO. The aim of the agreement is to prevent risk of introduction of new pests and diseases in new regions i.e. importing countries. As per provisions made under this agreement, the standards framed should be such that the minimum level of protection required by an importing country should be fulfilled. In order to achieve this objective, the agreement provided setting up of international standards and guidelines under the aegis of Codex Alimentarius Commission (Codex). Under the joint aegis of FAO/WHO, guidelines and related texts such as Codex Code of Practices was finalised. Food standard programmes were aimed to protect health of the consumers and ensuring fair trade practices in the food trade as well as to promote co-ordination of all food standards work undertaken by international government and non-government organisation.

The SPS agreement applies to all Sanitary and Phyto-Sanitary measures, which may directly or indirectly, affect international trade. Sanitary measures deal with human or animal health, and Phyto-Sanitary measures are related to plant health.

SPS measures are applied in four situations for the protection of human, animal or plant health:

- Risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease causing organisms.
- Risks coming from additives, contaminants, toning or disease-causing organisms in foods, beverages or feedstuffs.
- Risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests.
- Prevention or limitation of damage caused by the entry, establishment or spread of pests.

4.3.2 EXPORT PROCEDURES:

Export process followed by Mahagrapes for export of grapes:

1. Importer-Exporter code (IE code) number is to be obtained from the Director General of Foreign Trade (DGFT).

2. Register with the concerned Export Council/Authority e.g. Agricultural and Processed Food Export Development Authority (APEDA) to obtain registration cum membership certificate and it is also required to obtain permissible benefit from government.

3. Quality of grapes is to be assessed by inspecting agency to obtain the certificate.

4. Registration of grape farm by State Horticulture Department.

5. Residue Analysis and Agmark Inspection by laboratories.

6. The residue monitoring document in the form of a regulation to control pesticide residues in excess of the MRLs in grapes exported to the European Union.

7. Cosignment creation, online application for issue of CAG and PSC.

8. Certificate of Agmark Grading(CAG) by Regional Agmark Office.

9. Issue of Phytosanitary Certificate by PSC Authorities.

10. Monitoring of Residue Analysis by National Referral Laboratory (NRL).

11. Packing: Grapes are packed in corrugated boxes under supervision and hygienic conditions at the farm itself and are then transported to societies.

12. Transportation to Societies: Packed boxes are transported to the Member societies in Covered vehicles (Refrigerated / Ordinary) for pre-cooling treatment.

13. Pre-cooling: Grapes are pre-cooled to 2 degree C to prolong it's shelf life from 60 days to 90 days.

14. Cold Storage: Pre-cooled grapes are then packed in corrugated boxes in 4.5/5/9 kgs and kept in cold storage. Boxes are specially designed with perforations to allow cool air to pass through.

15. Container filling: The 40ft. reefer containers are pre-cooled to 2 degrees C and then are filled with the packed produce under supervision of an Central Excise & Customs supervisor.

16. Sealing of containers: Boxes containing the grapes are loaded in the container. Prior to loading the conditions of the grapes are checked by surveyors appointed by the shipping companies. The container is then sealed by Central Excise and Customs Inspector.

17. The filled containers are then transported and shipped to various destinations.

4.4 MARKETING CONSTRAINTS:

i)	**Lack of marketing information**	**:**	Due to lack of market information regarding prices, arrivals etc., prevailing in other markets, producers sell their grapes to the contractors.
ii)	**Adoption of grading**	**:**	Grading of grapes ensures better prices to producers and better quality to consumers. However, most of the markets are lagging behind in providing grading service.
iii)	**Inadequate cold storage facilities**	**:**	Due to inadequate cold storage facilities substantial quantity of grape is lost as it is a highly perishable crop. Farmers are forced to sell their produce at lower rate.
iv)	**Lack of cool chain/ refrigerated van facilities**	**:**	There is a lack of precooling, refrigerated van and other facilities from farm level to consumer point. This is a big hindrance in grapes marketing and due to it post harvest losses of grapes are very high.
v)	**Training of producer**	**:**	The farmers are not properly trained in harvesting, transportation and marketing of grapes. Training will improve their skill for better marketing of their produce.
vi)	**Financial problem**	**:**	Lack of market finance is one of the major marketing constraints in operating of marketing chain.
vii)	**Infra-structure facilities**	**:**	Due to inadequate marketing infra-structural facilities with producers, traders and at market level, the marketing efficiency is affected adversely.
viii)	**Inadequate processing units**	**:**	Due to the inadequate number and capacity of processing units, excess production during peak season is sold at distress rate or even gets perished at farm level.

5.0 MARKETING CHANNELS, COSTS AND MARGINS

5.1 MARKETING CHANNELS:

The following are the marketing channels through which grapes are marketed in India:

i) Producer – Pre harvest contractor – Wholesaler – Retailer –Consumer

ii) Producer – Commission agent/ Wholesaler – Retailer –Consumer

iii) Producer – Commission agent – Retailer –Consumer

5.2 MARKETING COSTS AND MARGINS:

Marketing costs:

Marketing costs are the actual expenses incurred in bringing goods and services from the producer to the consumers. The marketing costs normally include;

- **i) handling charges at local points,**
- **ii) assembling charges,**
- **iii) transport and storage costs,**
- **iv) handling charges by wholesalers and retailers,**
- **v) expenses on secondary services like financing, risk taking and market intelligence, and**
- **vi) profit margins taken by different agencies.**

Marketing margins:

Margin refers to the difference between the price paid and received by a specific marketing agency such as a single retailer, or by any type of marketing agency, i.e. retailers or wholesalers or by any combination of marketing agencies in the marketing system as a whole. The total marketing margin includes cost involved in moving the grapes from producer to consumer and profits of various market functionaries.

The absolute value of the total marketing margin varies from market to market, channel to channel and time to time. The marketing cost incurred by farmers and traders at Regulated markets includes i) Market fee, ii) Commission, iii) Taxes, and iv) Other miscellaneous charges.

i) Market fee: Market fee or entry fee is collected by the market committee of the market. It is charged either on the basis of weight or on the basis of the value of the produce. It is usually collected from the buyers. The market fee differs from state to state. It varies from 1.0 per cent to 2.5 per cent ad valoram.

ii) Commission: It is paid to the commission agent, and may be payable either by seller or by the buyer or sometimes by both. The charge is usually made in cash and varies considerably.

iii) Taxes: Different taxes are charged in different markets such as toll tax, terminal tax, sales tax, octroi etc. These taxes leviable differ from market to market in the same state as also from state to state. These taxes are usually payable by the seller.

iv) Miscellaneous charges: In addition to the above mentioned charges, some other charges are levied in markets. These include handling and weighment charges (weighing, loading, unloading, cleaning etc.), charity contribution in cash and kind, grading charges, postage, charges payable to water man, sweeper, choukidar etc. These charges may be payable either by the seller or by the buyers.

Market fee, commission charges, taxes and other miscellaneous charges in different states are given in the Table No.8.

Table No.8: Market fee, commission, taxes and miscellaneous charges on grapes in major producing states

State	Market fee	Commi-ssion	Sales tax	License fee Rs. Per annum	Other charges
1.Andhra Pradesh	1%	4%	--	Rs1000 to 3000/- for 5 yrs depends on value of transaction in the financial year.	
2.Haryana	2%	5%	--	Rs.- 60/-	HRDF-2%
3.Karnataka	1.5%	5%	NIL	Trader-Rs. 200/- Commission Agent-Rs. 200/- Broker-Rs. 100/- Processor- Rs. 100/- Exporter –Rs. 100/- Stockist –Rs. 100/- Retail Trader- Rs 25/-	
4.Maharashtra	1.0%	7.0%	--	Rs.200/-	Octroi-Rs 10/- per trip in 24 Hrs
5. Punjab	2.0%	5.0%		Rs.- 100/-	--

Source: Sub-offices of Directorate of Marketing and Inspection.

6.0 MARKETING INFORMATION AND EXTENSION:

Marketing information:

Marketing information is important in all the stages of marketing right from farm to ultimate consumption and simultaneously, for all the participants in marketing. Marketing information is essential for producers in market led production. It is equally important for other market participants for trading and also for consumers. Government of India has launched Agricultural Marketing Research and Information Network Scheme through Directorate of Marketing & Inspection (DMI) to bring out improvement in the present market information scenario by linking all Agricultural produce wholesale markets in the States and Union Territories in a phased manner. The data received from markets is being displayed on the website www.agmarknet.nic.in and www.nhb.gov.in

Marketing extension:

Market extension is a vital service to enlighten the farmers about proper marketing and improving their awareness in various aspects of post-harvest management for efficient and cost effective marketing.

Benefits : It;

- ✶ Provides the up-to-date information on the arrivals and prices of agricultural commodities of different markets.
- ✶ Helps the producers to take right decision, when, where and how much to produce and market the same efficiently.
- ✶ Educates the producers/traders about the post-harvest management i.e.
  a) Harvesting care
  b) Techniques to minimize losses during post-harvest period.
  c) Value addition to the produce by proper cleaning, processing, packaging, storage and transportation.
- ✶ Orients the producers/traders/consumers about price trends, demand and supply situation etc.
- ✶ Orients the producer regarding the importance of grading, proper storage, co-operative/group marketing, direct marketing, contract farming, futures trading etc.
- ✶ Provides the information about the sources of credit availability, various Govt. schemes, policies, rules and regulations etc.

Sources of Marketing Information: The following are the sources of marketing information available in the country:

Source / Institution	Activities for marketing information and extension
1.Directorate of Marketing and Inspection (DMI), NH-IV, CGO Complex, Faridabad. Website: www.agmarknet.nic.in	➢ **Provides information through nationwide Marketing Information Network ("**AGMARKNET" **portal).** ➢ **Marketing extension through training to consumers, producers, graders, etc.** ➢ **Marketing research and surveys.** ➢ **Publication of reports, pamphlets, leaflets, Agricultural Marketing journal, Agmark standards etc.**
2.National Horticultural Board Ministry of Agriculture, Govt of India 85,Institutional Area, Sector-18,Gurgoan - 122015 Website : www.nhb.gov.in	➢ Provides market information regarding fruits including grapes. ➢ Strengthen horticulture database
3.National Horticulture Mission (NHM) Ministry of Agriculture, Krishi Bhavan, New Delhi, Website : www.nhm.nic.in	➢ Provides information regarding market arrival and price of different horticultural commodities, covering fruits, vegetables, spices, flowers, medicinal and aromatic plants and plantation crops on a yearly basis from source of Agmarknet. ➢ Provides State wise information on the above and for the country as a whole.
4.Directorate of Economics and Statistics, Shastri Bhavan, New Delhi. Website: www.agricoop.nic.in	➢ Compilation of agricultural data on area, production and yield for development and planning. ➢ Dissemination of market intelligence through publication and Internet.
5. Directorate General of Commercial Intelligence and Statistics (DGCIS), 1, Council House Street, Kolkata-1 Website: www.dgciskol.nic.in	➢ Collection, compilation and dissemination of marketing related data i.e. export-import data, inter state movement of food grains etc.

6. Agricultural Produce Market Committees (APMC),	➢ Provide market information on arrivals, prevailing prices, despatches etc. ➢ Provide market information of adjoining / other market committees. ➢ Arranges training, tours, exhibitions etc.
7. State Agricultural Marketing Boards, at different state capital	➢ Provide marketing related information to co-ordinate all the market committees in the state. ➢ Arrange seminars, workshops and exhibitions on subjects related to agricultural marketing. ➢ Provide training facilities to producers, traders and employees of the Boards.
8.Federation of Indian Export Organisations (FIEO), PHQ House(3rd Floor) Opp. Asian Games, New Delhi-110016	➢ Provide information to its members about latest developments of export and import. ➢ Organise seminars, workshops, presentations, tours, buyer-seller meets, sponsoring participation in international trade fairs, exhibitions and providing advisory services. ➢ Provide information about market development assistance schemes. ➢ Provide useful information on India's export and import with diverse database.
9. Kisan Call Centers	➢ **Provides expert advise to the farmers.** ➢ **These centers operate through toll free telecom lines throughout the country.** ➢ **A country-wide common four digit number** 1551 **has been allocated to these centers.**
10.Agricultural & Processed Food Products Export Development Authority (APEDA), NCUI Building 3, Siri Institutional Area, August Kranti Marg, New Delhi - 110 016 Website: www.apeda.com	➢ **Provide Market Information Services for Horticulture Crops.** ➢ **Provide Horticulture Promotion Services.** ➢ **Provide information regarding export.**
11. Different websites on Agricultural Marketing Information	www.agmarknet.nic.in www.agricoop.nic.in www.nhb.gov.in www.ncdc.nic.in www.apeda.com www.mahagrapes.com www.icar.org.in www.fao.org www.agriculturalinformation.com www.kisan.net

	www.nic.in/eximpol www.nhm.nic.in www.mofpi.nic.in

Kisan Call Centre:

The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, Government of India launched Kisan Call Centres on January 21st,2004 throughout the country. It has the objective of affording instant solution to the problems faced by the farmers during cultivation under diverse challenging situations by using local language. The call centres are acting as composite help centres, which consist of a complex tele-communication infrastructure, computer support and human resources organized to manage effectively and efficiently the queries raised by farmers instantly in local languages. The subject matter specialists using telephone and computer are used to interact with farmers to understand their problems and answer their queries as soon as possible. This is a new dimension in agricultural extension management, which makes the full use of on-going information and communication revolution by connecting the farming community in the remotest areas of the country with the experts in agricultural field.

7.0 ALTERNATIVE SYSTEMS OF MARKETING

7.1 DIRECT MARKETING:

Direct marketing is an innovative concept, which involves marketing of produce i.e. grapes by the farmer directly to the consumers/processors without any middlemen. Direct marketing enables producers and processors and other bulk buyers to economize on transportation cost and improve price realization. It also provides incentive to large scale marketing companies i.e. processors and exporters to purchase directly from producing areas. Direct marketing by farmers to the consumers has been experimented in the country through *Apni Mandis* in Punjab and Haryana. The concept with certain improvements has been popularised in Andhra Pradesh through *Rythu Bazars.* In these markets, alongwith fruits and vegetables other commodities are marketed.

Benefits:

- **It increases profit of the producer.**
- **It helps in market oriented production.**
- **It helps in better marketing of grapes.**
- **It minimizes marketing cost.**
- **It encourages distribution efficiency.**
- **It promotes employment to the producer.**
- **Direct marketing enhances the consumer satisfaction-since the farmer bring the produce in a manner acceptable to consumer.**
- **It provides better marketing techniques to producers.**

- **It encourages direct contact between producers and consumers.**
- **It encourages the farmers for retail sale of their produce.**

7.2 CONTRACT FARMING:

Contract farming is a system of farming, where selected crop is grown for marketing by farmers under a 'buy-back' agreement with an agency (entrepreneur or trader or processor or manufacturer). In the wake of economic liberalization, it has gained momentum as the national and multinational companies enter into contracts for marketing of agricultural produce. They also provide technical guidance, capital and input supply to contracted farmers. Contract farming ensures continuous supply of quality produce at pre-determined price to contracting agencies, as well as ensures timely marketing of the produce. Contract farming is beneficial to both the parties i.e. farmers and the contracting agencies.

Advantages to farmers: -

- Price stability ensuring fair return of produce.
- Assured marketing and free from involvement of middlemen.
- Prompt and assured payments.
- Proper production planning.
- Technical advice in the field of production till harvesting.
- Fair trade practices.
- Credit facility.
- Crop insurance.
- Exposure to new technology and best practices.

Advantages to contracting agency: -

- Assured supply of produce (raw materials).
- Control on need based production/post-harvest handling.
- Control on quality of produce.
- Stability in price as per mutually agreed contract terms and conditions.
- Opportunities to acquire and introduce desired varieties of crop.
- Help in meeting specific customer needs/choice.
- Better control on logistics.
- Strengthen producer-buyer relationship.

7.3 CO-OPERATIVE MARKETING:

"Co-operative marketing" is the system of marketing in which a group of producers join together and register them under respective State Co-operative Societies Act to market their produce jointly. The members also deal in a number of co-operative marketing activities i.e. purchasing of produce, grading, packing, processing, storage, transport, finance, etc. The co-operative marketing means selling of the member's produce directly in the market, which fetches remunerative prices.

Co-operative societies market the member's produce collectively and secure advantages
of economy of scale to its members. It also provides fair trade practices and protect against manipulations / malpractices. The main objectives of co-operative marketing are to ensure remunerative prices to the producers, reduction in the cost of marketing and monopoly of traders.

MAHAGRAPES:

"MAHAGRAPES" is a co-operative partnership firm which was established on 19th January, 1991 with the help of the Maharashtra State Agricultural Marketing Board to encourage and boost export of grapes from Maharashtra. At present 16 Grapes Grower Co-operative societies are the member of Mahagrapes from Sangli, Solapur, Nashik, Latur and Pune. Mahagrapes has provided the facilities of pre-cooling and cold storage to each society to boost the export. Due to it's effort, Mahagrapes has become an established brand in European Union and Middle East markets for the last ten years. MAHAGRAPES exported 1529.36 tonnes of grapes valued at Rs 1047.09 lacs during 2007-08, 1428.65 tonnes valued at Rs 892.67 lacs during 2008-09 and 1425.10 tonnes valued at Rs 879.39 lacs during 2009-10.

Benefits:

- Remunerative price to producers.
- Reduction in cost of marketing.
- Reduction in commission charges.
- Effective use of infrastructure.
- Credit facilities.
- Provide facilities of cold storage.
- Marketing information.
- Help in export to other countries.
- Supply of agricultural inputs.
- Collective processing.
- Timely and easy transportation service.

8.0 INSTITUTIONAL FACILITIES

8.1 Marketing related schemes of Government / Public Sector:

Name of the scheme/imple-menting organisation	Facilities provided/salient features/ objectives
1.Marketing Research and Information Network, Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.	▶ To establish a nationwide information network for speedy collection and dissemination of market data for its efficient and timely utilization. ▶ To ensure flow of regular and reliable data to the producers, traders and consumers to derive maximum advantage out of their sales and purchases. ▶ To increase efficiency in marketing by effective improvement in the existing market information system. ▶ The scheme provided connectivity to 3026 nodes comprising the State Agricultural Marketing Department (SAMD) /Boards/ Markets. These concerned nodes have been provided with one computer and its peripherals. These SAMD/Boards/ Markets are to collect desired market information and pass on to respective state authorities and Head Office of the DMI for forward dissemination. The eligible markets will get 100 percent grant by Ministry of Agriculture.
2.Gramin Bhandaran Yojana (Rural Godowns Scheme), Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.	▶ It is a capital investment subsidy scheme for construction/renovation/expansion of rural godowns. The scheme is implemented by DMI in collaboration with NABARD and NCDC. The objectives of the scheme are to create scientific storage capacity with allied facilities in rural areas to meet the requirements of farmers for storing farm produce, processed farm produce, consumer articles and agricultural inputs. ▶ To prevent distress sale immediately after harvest. ▶ To promote grading, standardization and quality control of agricultural produce to improve their marketability. ▶ To promote pledge financing and marketing credit to strengthen agricultural marketing in the country for the introduction of a national system of warehouse receipt in respect of agricultural commodities stored in such godowns.

	▶ The entrepreneur will be free to construct godown at any place and of any size between 100 to 10,000 MT except for restrictions that it would be outside the limits of Municipal Corporation area. In special conditions, godowns upto 50 MT is also eligible for subsidy and in hilly region it may be 25 MT. ▶ The scheme provides credit linked back-ended subsidy @15 per cent of the project cost with a ceiling of Rs. 28.12 lakh per project and @ 25 per cent of the project cost with a ceiling of Rs. 46.87 lakh per project. For the projects located in North-Eastern states and hilly areas with altitude of more than 1000 m above mean sea level and those belonging to Women Farmers/ their self help groups/ Co-operatives and SC/ST entrepreneurs and their self help groups/ Co-operatives, maximum subsidy admissible is @33.33 percent of the project cost, with a ceiling of Rs. 62.50 lakhs.
3.Scheme for Development/ Strengthening of Agricultural Marketing Infra-structure, Grading & Standardization, Directorate of Marketing and Inspection, Head Office, N.H.-IV, Faridabad.	▶ To provide additional agricultural marketing infra-structure to cope up with the expected marketable surpluses of agricultural and allied commodities including dairy, poultry, fishery, livestock and minor forest produce. ▶ To promote competitive alternative agricultural marketing infrastructure by inducement of private and co-operative sector investments that sustain incentives for quality and enhanced productivity thereby improving farmers' income. ▶ To strengthen existing agricultural marketing infra-structure to enhance efficiency. ▶ To promote direct marketing so as to increase market efficiency through reduction in intermediaries and handling channels thus enhancing farmers' income. ▶ To provide infra-structure facilities for grading, standardization and quality certification of agricultural produce so as to ensure price to the farmers commensurate with the quality of the produce. ▶ To promote grading, standardization and quality certification system for giving a major thrust for promotion of pledge financing and marketing credit, introduction of negotiable warehousing receipt system and promotion of forward and future markets so as to stabilize market system and increase farmers' income. ▶ To promote direct integration of processing units with producers. ▶ To create general awareness and provide education and training to farmers, entrepreneurs and market functionaries on agricultural marketing including grading and quality certification.

	▶ This is Reform linked investment scheme. Applicable only in such states/Union Territories, which undertake reforms in APMC Act to allow "Direct Marketing", "Contract Marketing" and to permit agricultural produce markets in "private and co-operative sectors". ▶ The scheme provides credit linked back-ended subsidy @ 25 per cent of the capital cost of the project with a ceiling of Rs. 50.00 lakh per project. For the projects located in North-Eastern states, in the states of Uttarakhand, Himachal Pradesh, Jammu & Kashmir, hilly and tribal areas, and entrepreneurs belonging to SC/ST and their co-operatives, maximum subsidy admissible is @33.33 percent of the capital cost of the project, with a ceiling of Rs. 60.00 lakhs.
4.Agmark grading and standardization Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.	▶ Promotion of grading of agricultural and allied commodities under Agricultural Produce (Grading & Marking) Act.1937. ▶ Agmark specifications for agricultural commodities have been framed based on their intrinsic quality. Food safety factors are being incorporated in the standards to compete in the world trade. Standards are being harmonised with international standards keeping in view the WTO requirements. Certification of agricultural commodities is carried out for the benefit of producer and consumer.
5. Capital Investment Subsidy for Construction / Modernization Expansion of Cold Storage and Storage's for Horticulture Produce National Horticultural Board, 85, Institutional Area, Sector – 18 Gurgoan - 122015 (Haryana) Website : www.nhb.gov.in	▶ To promote setting up of cold storages in the country for reducing post harvest losses. ▶ Creation and modernization/rehabilitation of cold storages. ▶ **Pattern of Assistance:** • The assistance will be as credit linked back-ended subsidy @ 40% of the capital cost of project in general areas and 55% in case of Hilly and Scheduled Areas for a maximum storage capacity of 5000 MT per project.
6. Development of commercial Horticulture through	▶ To develop post-harvest management infrastructure; ▶ To develop high quality horticultural farms in identified belts. ▶ To improve linkages between horticulture producers and

Production and Post-Harvest Management, National Horticultural Board, 85, Institutional Area,Sector – 18 Gurgoan - 122015 Website : www.nhb.gov.in	marketers ▶ To create integrated network for marketing of horticulture produce. ▶ To increase producer's share in consumer price. ▶ To encourage networking of schemes for resource mobilization with all other related agencies/organizations
7. Schemes for Infrastructure Development, Agricultural & Processed Food Products Export Development Authority (APEDA), NCUI Building 3, Siri Institutional Area, August Kranti Marg, New Delhi - 110 016 Website: www.apeda.com	▶ Establishment of common infrastructure facilities. ▶ Assistance for purchase of specialised transport units for animal products horticulture and floriculture sector. ▶ Assistance to exporters / producers / growers / Cooperative organization and federations for horticulture and floriculture sector for : i) Mechanisation of harvest operation of the produce. ii) Setting up of sheds for intermediate storage and grading / storage / cleaning operation of produce. iii) Setting up of mechanized handling facilities including sorting, grading, washing, waxing, ripening, packaging & palletisation etc. iv) Setting up of both pre cooling facilities with proper handling system as well as cold storage for storing. v) Providing facilities for preshipment treatment such as fumigation, X-ray screening, hot water dip treatment, Water softening Plant. vi) Setting up of integrated post harvest-handling system (pack houses / green houses with any two or more of the above facilities). vii) Setting up of specilised storage facilites such as high humidity cold storage deep freezers, controlled atmosphere (CA) or modified atmosphere (MA) storage etc.
8.Schemes for Market Development, Agricultural & Processed Food Products Export Development Authority (APEDA), NCUI Building 3,	▶ Development of packaging standards and design. ▶ Up-gradation of already developed packing standards. ▶ Assistance to exporters for use of packaging material. ▶ Development and dissemination of market information with base on products, infrastructure etc. ▶ Assistance for conducting surveys, feasibility studies etc.

Siri Institutional Area, August Kranti Marg, New Delhi - 110 016 Website: www.apeda.com	
9. National Horticulture Mission Govt. of India Ministry of Agriculture Department of Agriculture & Cooperation New Delhi http://nhm.nic.in/	▶ To provide holistic growth of the horticulture sector through an area based regionally differentiated strategies which include research, technology promotion, extension, post harvest management, processing and marketing, in consonance with comparative advantage of each State/region and its diverse agro-climatic feature. ▶ To enhance horticulture production, improve nutritional security and income support to farm households. ▶ To establish convergence and synergy among multiple on-going and planned programmes for horticulture development. ▶ To promote, develop and disseminate technologies, through a seamless blend of traditional wisdom and modern scientific knowledge. ▶ To create opportunities for employment generation for skilled and unskilled persons, especially unemployed youth.
10. Scheme of technology mission for integrated development of horticulture in North Eastern states Jammu & Kashmir, Himachal Pradesh and Uttarakhand (TMNE) Government of India Ministry of Agriculture Department of Agriculture & Cooperation (Horticulture Division) Krishi Bhawan, New Delhi www.dacnet.nic.in/t	▶ To ensure adequate, appropriate, timely and concurrent attention to all the links in the production, post-harvest management and consumption chain in North Eastern states including Sikkim. ▶ To maximise economic, ecological and social benefits from the existing investments and infrastructure created for horticulture development. ▶ To promote ecologically sustainable intensification, economically desirable diversification and skilled employment to generate value addition. ▶ To promote the development and dissemination of eco-technologies based on the blending of the traditional wisdom and technology with frontier knowledge such as bio-technology, information technology and space technology. ▶ To provide the missing links in ongoing horticulture development projects. **<u>The Technology Mission have four Mini Missions:</u>** i) Mini Mission-I: Research: Coordinated and implemented by ICAR. ii) Mini Mission-II: Production and Productivity: Coordinated by DAC and implemented by the Agriculture / Horticulture Departments of the States. iii) Mini Mission–III: Post-harvest management, marketing and

echmissionscheme	export: Coordinated by DAC and implemented by NHB, DMI, NCDC, NAFED and APEDA. iv) Mini Mission-IV: Processing: Coordinated and implemented by MFPI.
11. National Agriculture Development Programme-Rashtriya Krishi Vikas Yojana (RKVY) Government of India Ministry of Agriculture Department of Agriculture & Cooperation Krishi Bhawan, New Delhi http://india.gov.in	▶ To incentivise the states so as to increase public investment in Agriculture and allied sectors. ▶ To provide flexibility and autonomy to states in the process of planning and executing Agriculture and allied sector schemes. ▶ To ensure the preparation of agriculture plans for the districts and the states based on agro-climatic conditions, availability of technology and natural resources. ▶ To ensure that the local needs/crops/priorities are better reflected in the agricultural plans of the states. ▶ To achieve the goal of reducing the yield gaps in important crops, through focussed interventions. ▶ To maximize returns to the farmers in Agriculture and allied sectors. ▶ To bring about quantifiable changes in the production and productivity of various components of Agriculture and allied sectors.
12.(i)Scheme for Infrastructure Development Ministry of Food Processing Industries, Ministry of Food Processing Industries, Panchsheel Bhavan,August Kranti Marg, New Delhi-110 049 **Website:** www.mofpi.nic.in	To provide financial assistance for development of facilities like common processing, cold storage, food testing and analysis laboratory, effluent treatment plant, power, water etc. in Food Park, Packaging Centre, Integrated Cold Chain, Value Added Centre, Irradiation Facilities.
12(ii)Scheme for Technology Upgradation /Establishment /Modernization of Food Processing Industries	To provide financial assistance for the cost of plant and machinery/TCW.

12(iii)Scheme for Quality Assurance, Codex Standards and Research & Development	Financial assistance for Setting Up/ Upgradation of Quality Control/ Food Testing Laboratory for implementation of Hazard Analysis and Critical Control Points (HACCP), ISO 9000, ISO14000, Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP) for Total Quality Management, Bar Coding, Codex Standards Research and Development in Processed Food Sector.
12 (iv)Scheme for Backward and Forward Integration and other Promotional Activities	**Backward Linkage**-To increase capacity utilization of Food Processing Industry by ensuring regular supply of raw material through contract farming. **Forward Integration**-To increase capacity utilization of Food Processing Units by ensuring regular market for their products by establishing linkages with the market. **Promotional Activities-** To build awareness among the consumers about the advantages of processed food and their quality assurance mechanism. Dissemination of information about the processed food industry through publications, journals, press advertisements. Financial assistance for seminars/workshops /symposiums, studies/ surveys/ feasibility reports to assess the potential and other relevant aspects of Food Processing Industries.

8.2 INSTITUTIONAL CREDIT FACILITIES:

Institutional credit facilities are the vital factor in agricultural development. The main emphasis is laid down on adequate and timely credit support to the farmers, particularly small and marginal farmers for encouraging adoption of modern technology and improved agricultural practices.

The institutional credit to agriculture is offered in the form of short term, medium term and long term credit facilities:

Short term and medium term loans:

Name of scheme	Eligibility	Objective/Facilities
1. Crop Loan	All categories of farmers.	➢ To meet cultivation expenses for various crops as short term loan. ➢ This loan is extended in the form of direct finance to farmers with a repayment period not exceeding 18 months.
2.Produce	All categories of	➢ This loan is given to help farmers to store produce

Marketing Loan (PML)	farmers.	on their own to avoid distress sale. ➢ This loan also facilitates immediate renewal of crop loans for next crop. ➢ The repayment period of the loan does not exceed 6 months.
3. Kisan Credit Card Scheme	All agriculture clients having good track record for the last two years.	➢ This card provides running account facilities to farmers to meet their production credit and contingency needs. ➢ The scheme follows simplified procedures to enable the farmers to avail the crop loans as and when they need. ➢ Minimum credit limit is Rs. 3000/-. Credit limit is based on operational land holding, cropping pattern and scale of finance. ➢ Withdrawals can be made by using easy and convenient withdrawal slips. The Kisan Credit Card is valid for 3 years subject to annual review. ➢ It also covers personal insurance against death or permanent disability; a maximum amount of Rs. 50,000 and Rs. 25,000 respectively.

4.Modified National Agricultural Insurance Scheme	Scheme is available to all farmers – loanee and non-loanee both-irrespective of the size of their holding.	➢ To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crops as a result of natural calamities, pests and diseases attack. ➢ To encourage the farmers to adopt progressive farming practices, high value in-puts and higher technology in agriculture. ➢ To stabilize farm incomes, particularly in disaster years. ➢ General Insurance Corporation of India (GIC) is the Implementing Agency. ➢ Sum insured may extend to the value of threshold yield of the area insured. ➢ Provides subsidy of 50 percent in premium of small and marginal farmers. The subsidy will be phased out over a period of 5 years on sunset basis. ➢ Actuarial premiums will be paid for insuring the crops, hence the claims liability would be on the insurer. ➢ The unit area of insurance for major crops is village panchayat. ➢ Indemnity amount shall be payable for the prevented sowing/planting risk and for post-harvest losses due to cyclone. ➢ On account payment upto 25% of likely claims would be released as advance for providing immediate relief to farmers. ➢ Uniform seasonality discipline for loanee and non-loanee farmers. ➢ More proficient basis for calculation of threshold yield and minimum indemnity level of 70% instead of 60%. ➢ Modified NAIS with improved features will have two components i.e. compulsory and voluntary. Loanee farmers will be insured under 'compulsory category' while non-loanee farmers will be insured under 'voluntary category'. ➢ Private sector insurers with adequate infrastructure and experience would be allowed in the implementation of MNAIS.

Long term loans:

Name of scheme	Eligibility	Objective/Facilities
Agricultural Term Loan	All categories of farmers (small/medium and agricultural labourers) are eligible, provided they have necessary experience in the activity and required area.	➢ The banks extend this loan to farmers to create assets facilitating crop production/income generation. ➢ Activities covered under this scheme are land development, minor irrigation, farm mechanization, plantation and horticulture, dairying, poultry, sericulture, dry land / waste land development schemes etc. ➢ This loan is offered in the form of direct finance to farmers with a repayment span not less than 3 years and not exceeding 15 years.

8.3 ORGANISATIONS / AGENCIES PROVIDING MARKETING SERVICES:

Name of the organisation and address	Services provided
1.Directorate of Marketing and Inspection (DMI) NH-IV, CGO Complex Faridabad Website: www.agmarknet.nic.in	➢ To integrate development of marketing of agricultural and allied produce in the country. ➢ Promotion of standardization and grading of agricultural and allied produce. ➢ Market development through regulation, planning and designing of physical markets. ➢ Promotion of cold storage. ➢ Promotion of rural godowns and market infrastructure. ➢ Training of personnel in agricultural marketing. ➢ Undertakes extension and publicity activities to educate producers, traders and consumers. ➢ Providing agricultural marketing information. ➢ Liaison between the Central and State Governments through its regional offices (11) and sub-offices (26) spread all over the country.
2.Agricultural and Processed Food Products Export Development Authority (APEDA)	➢ Development of scheduled agriculture products related industries for export. ➢ Provides financial assistance to these industries for conducting surveys, sensibility studies, relief and subsidy schemes.

NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016 Website: www.apeda.com	➤ Registration of exporters for scheduled products. ➤ Adapting standards and specifications for the purpose of export of scheduled products. ➤ Carrying out inspection of meat and meat products for ensuring the quality of such products. ➤ Improving the packaging of the scheduled products. ➤ Promotion of export oriented production and development of scheduled products. ➤ Collection and publication of statistics for improving marketing of scheduled products. ➤ Training in the various aspects of industries related to the scheduled products.
3.National Horticultural Board Ministry of Agriculture, Govt of India 85, Institutional Area, Sector – 18 Gurgoan - 122015 (Haryana) Website : www.nhb.gov.in	• Develop high quality horticultural farms in identified belts and make such areas vibrant with horticultural activity which in turn will act as hubs for developing commercial horticulture. • Develop post-harvest management infrastructure, • Strengthen Market Information System and horticulture database, • Assist R&D programmes to develop products suited for specific varieties with improved methods and horticulture technology, • Provide training and education to farmers and processing industry personnel for improving agronomic practices and new technologies, • Promote consumption of fruits/vegetables in fresh and processed form, etc.
4.National Co-operative Development Corporation (NCDC), 4, Siri Institutional Area, New Delhi-110016 Website: www.ncdc.nic.in	➤ Planning, promoting and financing programmes for production, processing, marketing, storage, export and import of agricultural produce. ➤ Financial support to Primary, Regional, State and National level marketing societies is provided towards; i) Margin money and working capital finance to augment business operations of agricultural produce. ii) Strengthening the share capital base, and iii) Purchase of transport vehicles.
5.Director General of Foreign Trade	➤ Provides guidelines / procedure of export and import of different commodities.

(DGFT), Udyog Bhavan, New Delhi. Website: www.nic.in/eximpol	➤ Allot import-export code number (IEC No) to the exporter of agricultural commodities.
6.State Agricultural Marketing Board (SAMBs),	➤ Implementation of the regulation of marketing of agricultural and allied commodities in the state. ➤ Provide infrastructural facilities for the marketing of notified agricultural produce. ➤ Grading of agricultural produce in the markets. ➤ To co-ordinate all the market committees for information services. ➤ To eliminate malpractices in the marketing system.

9.0 UTILIZATION

9.1 PROCESSING:

Grapes are utilized as raw material mainly for preparation of raisins, wine making, ready to serve beverage, squash and juice concentrates. In the developed countries more than 90% grapes are utilized for manufacture of wine. In India, grapes are mainly utilized for table purpose followed by preparation of raisins and wine making.

a) Raisins Production

The seedless grape varieties such as seedless Thompson and Arkavati with T.S.S. content 20% and above have been found to be ideally suitable for raisin marking. The grape raisin ratio has normally been found to be 5:1 with maximum moisture content of 15%.

The grape berry has continuous cutin membranes, covering the epidermis as a noncellular support, which carries fine film of cuticular wax. The wax provides an effective cover against excessive loss of water from the berry. It involves evaporation of this inherent moisture gradually and systematically in raisin making.

After grading of grapes, dipping the bunches in dilute solution (NaOH, KOH, Na_2CO_3) for a few seconds and washing with cold water, gives rise to formation of cracks on the surface of the berry; which increases evaporation rate of moisture and

accelerates the drying process. Subsequently grape bunches are exposed to the SO_2 fumes (at the rate of about 2kg.of grapes) to produce quality raisins.

The final stage of raisin making involves drying. The sun drying for 3-4 weeks results in dark brown raisins. The shade drying of sulphur treated bunches for 3-4 weeks in well-ventilated shade for 4-5 weeks yield golden coloured raisins. The sulphur treated bunches kept inside air drier at 60^0 C at the initial stage till half drying and thereafter drying at 50^0 C till completion of drying for about 24-36 hours produces greenish raisins.

In India, innovative processing techniques for raisin making have already been developed at CFTRI, Mysore, IIHR, Bangalore; IARI, New Delhi and Haryana Agricultural University, Hissar.

b) Grape processing for wine production

One of the most well known and ancient fruit processing activities is the wine production. All over the world wine is produced and consumed. France and Italy represents the most important exporters covering 56% of the market in term of value of the produce other than alcohol, wine contains many healthy compounds such as the flavonoids which give the protection from cardiovascular diseases. Moreover, tannin is an antibacterial compound and have astringent effect.

Different kinds of wine are produced all over the world but it can be summarized in three main vinification process: red, white, and dessert. The main steps for preparing the wine are as under:

Harvesting of grapes:

Grapes must be picked at the right stage of ripening.

Unloading and destemming:

Picking of grapes should be done carefully and avoid crushing of the berries. Not squeeze the bunches in the buckets. Unload the buckets in the crusher where the berries will be pressed and the peel broken.

Destem:

Usually the stems are removed to avoid the excessive load of salts and avoiding herbaceous taste to the wine

Crushing:

Crushing is very important step. The operation serves to break the berries for extracting the must.

Maceration and fermentation:

From the crusher, the must with the peels is pumped or moved to the container (fermentor) where fermentation and maceration take place. At the beginning of fermentation adding sulphur doxide is also in practice.

Stabilisation:

When the liquid is removed from fermentor, it is not completely clear. The aim of stablisation is to convert malic acid into lactic acid thereby reducing the acidity and giving a smoother taste.

Filtration and bottling:

Before bottling, filtration is a common practice. After filtration, the wine is bottled in well washed bottle and then capped with the cork or silicon cap. The wine can be kept in the bottle before selling for several months.

For all the steps the cleanliness of the equipment and the containers is very important. Use good detergents for machinery and metabisulfite solution or sulphur burning to clean the containers.

White wine:

The white wine production differs from the red wine due to the removal of the peel from the flesh after the crushing. The reason of this procedure is to avoid the transfer of pigments from the peel which are very oxidable, as they produce unpleasant colour and odour to wine.

9.2 USES:

Grapes are eaten raw and also used for making raisins, wine, jam, jelly, squash, grape juice and grape seed oil.

Raisins: Raisins are the dried grapes. They are produced in many regions of the world, such as the India, United States, Australia, Chile, Argentina, Mexico, Greece, Turkey, Eastern European and other countries. Raisins are eaten raw or used in cooking and baking. Raisins are rich source of sugar most of which is fructose and antioxidants. Raisin varieties depend on the type of grape used. Mostly seedless varieties such as Thompson Seedless (Sultana) is used for making raisins.

Wine: Wine is an alcoholic beverage obtained from the fermentation of grape juice. The natural chemical balance of grapes is such that they ferment without the addition of sugars, acids, enzymes or other nutrients.

Grape seed oil: Grapeseed oil is also called grape oil. It is a vegetable oil pressed from the seeds of various varieties of grapes. Grape seed oil is used for salad dressings, marinades, deep frying, flavored oils, baking, massage oil, sunburn repair lotion, hair products, body hygiene creams, lip balm and hand creams. Grape seed oil

used as cosmetics. Grape seed oil is a preferred cosmetic ingredient for damaged and stressed tissues, possessing regenerative and restructuring qualities which allow a better control of skin moisturization.

Jam: Jam contains both fruit juice and pieces of the fruit's flesh. Properly, the term *jam* refers to a product made with whole fruit, cut into pieces or crushed. The fruit is heated with water and sugar to activate the pectin in the fruit. The mixture is then put into containers.

Jelly:
Jelly is also made from grapes. Jelly refers to a type of clear fruit spread consisting of firmed fruit juice made with pectin. Jelly can be made from sweet, savory or hot ingredients. Jelly is made by a similar process to jam, with the additional step of filtering out the fruit pulp after the initial heating. A cloth "jelly bag" is traditionally used as a filter.

Grape juice: Grape juice is a fruit juice obtained from crushing grapes berries. The juice is often fermented and made into wine, brandy, or vinegar. In the wine industry grape juice which contains 7-23 percent of pulp, skins, stems and seeds, is often referred to as “must”. Grape juice can also be sweetened and preserved as a non-alcoholic drink beverage

Commercial grape juice and drinks contain preservatives and colouring, and sometimes added vitamins. Like wine, grape juice also contains antioxidants such as flavonoids, providing some health benefits. These antioxidants are beneficial to the skin.

10.0 DO’S AND DON’TS

DO’S	DON’TS

√ Harvest the grapes at right maturity stage.	X Delay in harvesting causes shattering of berries.
√ Grapes should be harvested at low temperature (early in the morning or evening).	X Harvest during noon (high temperature).
√ Grapes are harvested by cutting selected bunches with long nose sharp scissors.	X Damage the bunches and individual berries.
√ While harvesting, care should be taken to avoid erasing the waxy coating by holding the stem of the bunch by hand.	X Erase waxy coating on grapes.
√ Market the grapes after AGMARK grading to get remunerative prices in the market.	X Market grapes without grading.
√ Before marketing the produce, get the market information regularly from www.agmarknet.nic.in website, newspapers, T.V., radio, MAHAGRAPES, concerned APMC offices etc.	X Market produce without collecting / verifying marketing information.
√ Grapes should be pre cooled before transportation or storage.	X Transport or store grapes without pre cooing.
√ Store grapes in cold storage.	X Store in godown at high temperature.
√ Package properly to protect the quality and quantity of grapes during transit.	X Use conventional method of package, which causes higher transit losses.
√ Grapeguard should be used in package during transport.	X Package without grapeguard during export.
√ Grapes should be transported in refrigerated (reefer) van.	X Store transport in open trucks.
√ Adopt the procedure of Sanitary and Phyto-Sanitary measures during export.	X Export without any Sanitary and Phyto-Sanitary measures.

√ To assure better marketing of the produce, avail benefit of contract farming. √ Get MRLs certificate to control pesticide residues in excess before exporting grapes.	X Produce grapes without assessing and assuring its market demand for that year. X Export without getting MRLs certificate.

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