

**MANUAL ON
GOOD AGRICULTURAL MARKETING
PRACTICES FOR MANDARIN**



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GOVERNMENT OF INDIA

**MINISTRY OF AGRICULTURE
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PREFACE

The Inter-Ministerial Task Force on Agricultural Marketing Reforms in their Report in May 2002, suggested several measures for undertaking various reforms in the Agricultural Marketing system in the country. In view of the keen competition in the domestic, as well as export markets, it has become imperative to launch awareness programme vigorously to up-date and up-grade the technical know-how of various stakeholders involved in the marketing of farm produce in multidimensional aspects of agricultural marketing system. Accordingly, the present “**Manual on Good Agricultural Marketing Practices for Mandarin**” was drafted by **Shri M.P. Parashar, Senior Marketing Officer** under the supervision and guidance of **Shri Rakesh Saxena, Deputy Agricultural Marketing Adviser**, Directorate of Marketing & Inspection, Branch Head Office, Nagpur.

The Government of India should not be regarded as assuming the responsibility for any of the statements contained in this manual. However, any creative suggestion to bring about further improvement in the manual would be most welcome.

-Sd-

Faridabad.
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GOOD AGRICULTURAL MARKETING PRACTICES OF MANDARIN

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MANDARIN

Family: Rutaceae

Genus: *Citrus*

Species: *reticulata*

1.0 INTRODUCTION

Mandarin is a very important fruit crop, next only to banana. It is usually consumed in raw form or in fruit salads as well as juice. The fruit consists of three layers.

1) The outer yellow/orange peel containing oil glands which exude the essential oils, producing the typical orange odour.

2) The whitish thread like mesocarp and

3) The endocarp consisting of 8 - 10 segments filled with juice sacs (vesicles).

Mandarin is grown in the tropical/sub tropical region 35° N to 35° S of equator.

Brazil, China, Egypt, Japan, India, Iran, Italy, Mexico, Spain, Thailand, Turkey, and USA are the main Mandarin producing countries.

In India Assam, Karnataka, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Rajasthan and Tamil Nadu are the main Mandarin producing states.

2.0 IMPORTANT VARIETIES GROWN IN INDIA:

<u>States</u>	<u>Actual Locations</u>	<u>Varieties</u>
Assam	Tinsukia and Dibrugarh districts: Nagajanka in Jorhat district, Majbat in Darrang district, Jatinga valley in north Cachar hill district; and in Kamrup district	Khasi orange, Assam orange
Haryana	Sirsa, Hissar, Jind. Ambala and Kurukshetra	Kinnow orange (hybrid Mandarin)

Karnataka	Coorg, Hassan and Chickmangalur districts	Coorg Mandarin and Kodagu Kittale
Maharashtra	Nagpur, Amraoti and Wardha districts	Nagpur Santra
Orissa	Hilly areas of Koraput, Ganjam, Phulbani and Dhenkanal and Sambalpur	Mandarin
Tamil Nadu	Nilgiri, Palni, Shevroy and Yerkaud falls.	Nagpur Graft, Kodai / Kamala and Coorg
West Bengal	Three hill-sub divisions of Darjeeling district	Khasi orange, Mandarin orange or Darjeeling orange
Punjab	Kinnow orange successfully grown throughout the state.	Kinnow orange (hybrid Mandarin).

Mandarins are rich in Ascorbic acid (13 – 54 mg per 100 g of edible portion) and Calcium (25 – 46 mg per 100 g of edible portion). They are a great source of Vitamin C. One orange actually has all the Vitamin C that one needs for the day. The water content in the fruit is nearly 80 per cent to 90 per cent of edible portion.

3.0 PRE- HARVEST, HARVESTING AND POST HARVEST CARE MANAGEMENT

A) PRE HARVEST CARE

Pre-harvest management:

Once the fruits are harvested, the overall quality of fresh fruits can hardly be improved. The final market value of the produce depends upon the grower's ability to apply best available pre-harvest, harvesting and then post-harvest technology.

Selection of site:

Orchard:

Soil of the orchard should be

- i) Well drained.
- ii) Shallow
- iii) Medium depth
- iv) Soil should not have more than 60 % clay contents.

Nursery:

- i) Nursery should be located at least 500 meters away from the orchards to minimize the incidence of insects and diseases.
- ii) Potting mixture of soil, sand and FYM or compost should be in proper ratio.
- iii) Only certified seed should be used.
- iv) Stagnation of water in beds should be avoided.
- v) Seedling of uniform height should be selected for planting.
- vi) Hooked or bench rooted plants should be discarded.
- vii) Plant protection measures should be followed.
- viii) Pits for planting should be 75*75*75 cm size and spaced at 6*6 m distance.
- ix) Soil of the roots should be removed on transplanting in order to avoid the soil borne diseases.
- x) Pre-planting treatment of budding should be done.
- xi) Proper doses of manures and Nitrogen and Potassium containing fertilizers at proper interval of time should be used.
- xii) Proper pest controls should be used.

Orchard care:

- i) Spray (10 ppm) of Gibberellic acid should be done at colour break stage to delay colour development, maintain firmness, extend harvesting period.
- ii) Drip irrigation system should be preferred to provide proper water at the feeder root system.
- iii) Weed should be controlled.
- iv) Fruit drops, which occur at least twice in each crop, should be controlled with the recommended doses of GA₃, urea, benomyl and carbendazim at right time.
- v) Insect pests like Blackfly (Kolshi), Citrus Psylla, Leaf miner, Bark eating caterpillar, Fruit sucking Moth, Mites, Twing Blight, Gummosis, Root rot and Collar rot should be controlled.

- vi) Recommended fungicide (Carbendazium) and proper doses (0.1% or 1000 ppm) should be sprayed at proper time (One month and 15 days before harvest i.e. two sprays).

B) HARVEST CARE

Harvesting:

Suitable application of harvesting technique is very important to prevent the losses during post-harvest handling.

Precautions during harvesting:

Following precautions should be to be taken during harvesting

- i) Harvesting should not be delayed because fruit becomes puffy. Losses are high while harvesting and handling puffy fruits.
- ii) Harvesting should be done by using appropriate instruments like clippers or by carefully twisting and pulling the fruit from the tree.
- iii) The harvesting under wet conditions should be avoided, since wet fruits are more susceptible to microbial growth and soil particles may cling to wet crops, exposing them to soil-borne rotting organisms.
- iv) Harvesting of fruits is best done in the late morning, because in the early morning the oil glands of the fruits are full and cause immediate discolouration.
- v) Care should be taken at the time of plucking the fruit that the button remains attached to the fruit.
- vi) Stalk left on the fruit should be cut off close to fruit because they can puncture other fruit, causing injury and fruit spoilage.
- vii) The tree should never be shaken to harvest the fruits. Do not allow the fruit to fall on the soil, as the impact leads to mechanical injury, that makes fruit more prone to decay.
- viii) After harvesting, fruits should never be left in direct sunlight and must be kept in the shade
- ix) To avoid contact with the soil, the harvested fruits should be carefully put into padded field crates, well-ventilated plastic containers, or picking bags.
- x) Picking bags made with a quick-opening bottom, should be either strapped around the waist or put over the shoulder of the picker.

- xi) Picking bags should be so designed to empty from the bottom so that fruits can roll out of the sack onto the bottom of a larger field container or atop fruits already present.

C) POST-HARVEST OPERATIONS:

Washing and cleaning:

After harvesting, sorting, washing and cleaning bring down the microbial load of the fruits.

Method of sorting, washing and cleaning:

- i) Do not handle fruit on the ground or on rice straw.
- ii) Rotten, diseased, insect damaged, discoloured and deformed fruits should be sorted out carefully on roller conveyer.
- iii) Fruits should be cleaned mechanically on roller brushes and water sprays.
- iv) Water used for washing should be sanitized with 1000 p.p.m active chlorine by adding sodium hypochlorite.
- v) Benomyl (1000 p.p.m) plus imazalil (1000 p.p.m), or thiabendazole (1000 p.p.m) are the most effective post harvest fungicides and can be applied on fruit. Guazatine (1000 ppm) should also be used to control sour rot..

Benefits of washing and cleaning:

- i) Improve the appearance of the fruits and avoid wilting.
- ii) Enhance the shelf life.
- iii) Increase the marketability.
- iv) Reduce the post harvest losses

Peel De-Greening:

Peel De-greening is solely cosmetic in effect and

does not alter the flavor of the fruit. Ethylene, which

is a naturally produced plant growth hormone, is effective as a de-greening agent.



Benefits of Peel De-greening:

It breaks down the green chlorophyll pigment. This treatment also improves the external skin color and export market acceptance.

Process of Peel De-greening:

- i) Green-skinned Mandarin fruit of uniform grade is exposed to low level of ethylene (usually between 1 ppm to 10 ppm) at 20°C to 25°C (68°F to 78°F) 90% Relative Humidity.
- ii) It is always advisable that the ethylene treatment is given immediately after harvest if fruits are to be sold immediately.
- iii) Ethylene must be applied prior to waxing.
- iv) Sufficient air is circulated every 2 to 3 minutes.
- v) The carbon dioxide level inside the treatment chamber should not rise above 2000 ppm.
- vi) Fruits should not be washed before de-greening.
- vii) Ethephon (500 ppm for 1 minutes), ethylene-releasing liquid compound, can also be applied by dipping the fruit in a tank of sanitized water at room temperature.
- viii) Higher concentration of ethylene is injurious to fruits.
- ix) Care should also be taken that the fruits do not dry before treatment.

Temperature control:

The temperature control (Pre-cooling) is very necessary to remove field heat and to slow down the ripening process of the fruit after harvesting, particularly when harvesting is undertaken in hot weather.

Benefits of temperature control:

- i) It minimizes storage losses considerably.
- ii) It extends storage life by reducing the rate of physiological change.
- iii) It retards the microbial growth.
- iv) If the temperature is maintained between 5°C to 6°C, market period may be extended up to 2 months.
- v) For short-term storage and during transit period, 10°C (50°F) is adequate to minimize losses due to decay of the fruits.

4.0 GRADING:

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 fruit.

For large volume of the produce, semi- automatic grading machines can be used which is very efficient with respect to time, space and quantity.

N.R.C.C., Nagpur has developed a machine for mechanical sorting, washing, waxing and sizing operations. Hand-held rings called “Fruit Sizer” of different diameters are also used to check the different size categories and help in packing of same size fruits in the one container.

Advantages of Grading and standardization:

- i) Grading is beneficial to the farmers, traders as well as to the consumers, as it provides common standard to all.
- ii) Grading of the produce before sale enables farmers to get better price for their produce.
- iii) Grading assists the producers and other intermediaries in preparing fresh produce for market with appropriate labeling.
- iv) Grading helps the consumers to get standard quality produce at fair price.
- v) It facilitates the consumer to compare the prices of different qualities of a produce in the market.
- vi) It assures the quality of the produce and also reduces the cost of the marketing and transportation.
- vii) Produce of similar grade can be stored in bulk.
- viii) Market values are better understood.
- ix) Commodities can be bought and sold without inspection, through e-trading.
- x) Grading provides an authentic and scientific basis in promoting and managing the marketing system.
- xi) It serves as a realistic and common basis for market intelligence and reporting.
- xii) It facilitates the settlement of quality disputes between buyers and sellers.

Grading at producers’ level:

Though there is no grading of Mandarin at producers level, but there is an increasing recognition to the fact that producers need to be assisted in grading their produce before sale so that they may get better price. For securing adequate returns to the producer/seller, the scheme of “Grading at Producers’ Level” was introduced in 1962-63 by Directorate of Marketing and Inspection. The main objective of this scheme is to subject the produce to simple test and assign a grade before it is offered for sale. After grading, the producers get prices commensurate with the quality of the produce. The programme is being implemented by the States/Union Territories. At present, some fruits are graded at producer’s level, mainly in the regulated markets of Andhra Pradesh, Gujarat, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal etc. Up to 31-03-2006, 2051 grading units have been set up in the country.

The total number of producers’ level grading units, as on 31-03-07 are 2143.

Benefits of Grading at producers' level:

1. Grading of the produce at producers' level enable farmers to get higher price for their produce as well as it helps the consumers to get standard quality produce at fair price.
2. Grading not only facilitates the dissemination of prices and market information but also assist the machinery of distribution at all stages.
3. Grading at producers level helps them to develop suitable marketing strategy.

5.0 PACKAGING:

Packaging is an important function in marketing of Mandarins. The different types of packaging material that can be used for packing fresh produce comprises of

- i) Natural materials (traditional containers made of cane and bamboo),
- ii) Wooden boxes,
- iii) Corrugated fiber board boxes,
- iv) Paper or plastic films.



Type of packaging:

There are two types of packaging i.e. i) Conventional packages and ii) Modern packages.

In conventional packages, wooden boxes, bamboo boxes and jute gunny bags are used.

In modern packaging card board boxes, plastic crates, poly bags, wire bags, M.A.P. (Modified Atmospheric Packaging) is generally used. M.A.P. allows certain gaseous components from atmosphere to replace the ones released by the produce or checks the gaseous exchange around fruit pack and thus enhances the shelf life.

Qualities of packaging material:

Since, a package as a container offers accommodation to the contents for storage and transportation, therefore the packages must have the following basic qualities.

- i) It must protect quality and quantity.
- ii) It must prevent spoilage during transit and storage.
- iii) Labeling of package must indicate about quality, variety, date of packing, traceability, weight and price etc.
- iv) It must be convenient in handling operations.
- v) It must be convenient to stack.
- vi) It must be cheap, clean, hygienic and attractive.
- vii) It must be biodegradable
- viii) It must be free from adverse chemicals and should be food grade.
- ix) It should be reusable.
- x) It should immobilize the fruits placed inside.
- xi) Quality and hygienic cushioning material must be used to protect fruits from impact, injury and compression.
- xii) It should offer good ambient conditions to the fruits congenial for storage and transportation.
- xiii) It should meet optimum requirements of ventilation vis-à-vis temperature and relative humidity management.

Packaging material suggested by Market Planning and Design Center:

Market Planning & Design Centre of Directorate and Inspection has suggested corrugated paper boxes for the packaging of Mandarins. It has the following advantages.

- 1) These packages can be arranged in the truck with minimal residual space.
- 2) The unit capacity is comfortable, compared with conventional wooden box.
- 3) The counts of each package can very well be presented in terms of unit dozen or multiple thereof, which will facilitate price negotiations and auction. .
- 4) The weight of each package in terms of gross weight and net weight will be less than that of the conventional wooden box and hence the package is likely to be safe from various surges in the transit.
- 5) The handling cost at loading point will be comparable with the conventional wooden boxes.
- 6) The unit cost of transportation will be reduced, because of more space generated for the cargo in the load.

Precautions to be taken before packaging:

- i) Mandarins should be plucked at appropriate maturity, keeping in view the time span of the market.
- ii) Mandarins should be sorted and graded as per accepted quality standards, before packing. Only sound fruits should be packed.
- iii) Before packing, post-harvest treatment with wax and fungicides should be resorted to as a prophylactic measure against pathogenic invasion in transit.
- iv) For prevention of bruising/abrasion injuries, paper liners, pads, trays or tissue wraps may be used. Corrugated Board pieces can be used which are hygienic and neat and clean. Rice straw is messy, unhygienic and adds to rotting.
- v) Careful placement of Mandarins in the cartons is necessary to avoid bruising. The use of telescopic boxes can overcome this problem very well.
- vi) For securing packages, use of adhesive tape (3 to 4 cm) may be used. The packages can also be secured with thin rope of coconut fiber, or polythene sutli, as an alternative.

Precautions to be taken during packing:

- i) In order to avoid shaking of packed fruits which leads to friction between fruits surface and thereby causing damage, loose packing should be strictly avoided.
- ii) In wooden boxes or cartons, filling should be done with little pressure so that during transit period when the volume of the fruits gets reduce due to dehydration and adjustment of space due to jerks in transit, the pack structure does not lose its shape.
- iii) Care should be taken so that sharp edges of the packing material do not come out of the containers, resulting in bruising, puncturing and damaging the fruits.
- iv) Too much ventilation should be avoided as this can affect the quality of fruits due to shrinkage, loss in weight, colour, etc.

Shrink-wrapping:

This is a relatively new technique in which heat shrinkable poly film is used to wrap the individual fruit and over wrapping of trays. Polyethylene is the best for using it as wrapping, as it is least expensive and extend the shelf life by three weeks.

6.0 TRANSPORTATION:

Transportation is considered as backbone and lifeline of the agricultural marketing. Transport starts right from the field till produce reaches the consumer. It is a vital requirement for bulk movement, distribution and marketing of fresh and processed products.

Selection of Mode of Transportation:

Since, the body of the vehicle is also a container, therefore following points should be considered for the selection of mode of transportation:

- a. The mode of transportation should be cheaper among available alternatives.
- b. It should immobilize the packages placed inside.
- c. It should not cause damage to packages, because of uneven surface or protrusions in the body due to nuts and bolts.

- d. It should work as a safe carrier of the packages placed inside.
- e. It should be convenient during loading and unloading.
- f. It must protect the Mandarins during transportation from adverse weather conditions.
- g. It should be safe from pilferage, etc.
- h. It should deliver the fruits to consignee in stipulated period.
- i. It should be easily available, particularly during post harvest period.
- j. Distance of the market should be considered for selecting the mode of transportation.

Precautions to be taken while loading:

The following precautions should be taken while loading in the trucks.

1. The workers, engaged in loading of Mandarins, should be sensitized through informal training to handle the packages carefully so that the mechanical injury at the time of loading/ unloading is minimum.
2. The stacking should be done in such a manner that the packages get locked with each other in a stack. This will help to immobilize the packages within the truck.
3. Provide cushioning with clean paddy straw on all sides to the extent possible, so that there is no damage to the packages because of the protrusions of nuts/bolts, angles, etc., in the body of the trucks at various places.
4. Instead of dark coloured tarpaulin used for securing packages, white tarpaulin should be used. This will help to keep the packages cool to some extent because of heat reflection.

Cool Chain:

Cool chain is essential during the transport of quality Mandarins 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. Pre- cooling and cold store at the farm.
2. Refrigerated truck from farm to the airport
3. Cold store at the airport.
4. Building up of the pallet in a cold store at the airport.
5. Loading the aircrafts directly from the cold store in a short time.
6. Cargo aircraft maintains cold store temperature in transit.
7. Off loading direct into a cold store in the receiving country.
8. Refrigerated truck to the air cooled departmental stores.

7.0 STORAGE:

Production of the fruit is seasonal, but its demand remains for a longer period. Therefore, storage is very essential for extending the consumption period of fruits, as well as for regulating their supply to the markets. The principal aim of storage is to ensure better returns to the growers.

Requirements for safe storage:

The following are the requirements for safe storage of Mandarins:

1) Selection of site (location):

- ii) The storage structure should be located on a raised well-drained place.
- iii) It should be easily accessible.
- iv) The structure should be protected from excessive humidity, excessive heat, direct sunrays, and pests.

- v) It should be constructed on a well-built platform at a height of not less than 1 foot from ground level to prevent dampness.

2) Cleaning of storage structures:

- i) The storage structures should be properly cleaned before storing fruits.
- ii) There should be no left over, cracks, holes and crevices in structure, which may harbour insects and pests.
- iii) Before storage, the storage structure should be cleaned and fumigated.

3) Cleaning and Drying of fruits:

- i) Before storage, the Mandarins should be properly cleaned and dried.
- ii) Damaged fruits should be discarded to avoid quality deterioration and pest attack.

4) Separate storage of new and old stock:

To check infestation and to maintain hygienic condition of godown, the new and old stock should be stored separately.

5) Cleaning of vehicles:

The vehicles used for transporting the fruits should be properly cleaned and disinfected with pesticides.

7) Proper aeration:

There should be proper ventilation and circulation of air to avoid accumulation of gases such as CO₂, Ethylene etc.

8) Regular inspection:

Regular inspection of stored fruits should be carried out to check any infestation or declination of quality. This is necessary to maintain proper quality and hygiene of the stock.

Ways to reduce storage temperature:

- a) Protect the fruits from direct sun rays.
- b) Cool promptly after harvest.
- c) Use of natural cooling, e.g., harvesting during the cool early morning hours, open stores for ventilation during the night,
- d) Evaporative cooling, obtained by drawing dry air over a moist surface.

Precaution during storing in cold storage:

There are four basic principles which must be correctly followed for successful refrigeration of perishable crops like Mandarins:

- i. **Select only healthy Mandarins:** Refrigeration does not destroy pathogens responsible for deterioration, but only slows down their activity. It also does not improve produce quality, only maintains it. A damaged fruit will deteriorate more quickly than a healthy one even in refrigerated storage. Hence, store only sound produce in refrigeration.
- ii. **Timely cooling:** Since, refrigeration slows the development of micro-organisms and physiological changes, responsible for deterioration of the fruits. Allow the produce to cool, soon after harvesting.
- iii. Adhere closely to optimal conditions for temperature and relative humidity.
- iv. **Uninterrupted cooling:** Refrigeration should be applied from the point of harvest to the point of consumption.

Controlled atmosphere storage:

Storing at high temperature causes rapid moisture loss, flavour deterioration, resulting in decay of the fruits.

It is preferable to store fruits at optimum relative humidity (RH) of 90% to 95%. At a low RH, the peel becomes thin, dry, and shriveled.

- i) In the Controlled atmosphere storage, the fruit is placed in the gas-tight refrigerated chamber allowing the natural respiration of the fruit.
- ii) Controlled atmosphere storage decreases the oxygen content and increase the percentage of carbon dioxide in the chamber.
- iii) This controlled atmospheric storage extends the storage life of the fruit.

Shortening the time between harvest and consumption:

The losses of the fruits can also be reduced to a large extent by reducing the marketing channel. Shorter is the marketing channel, lesser will be losses during the process of marketing.

Sanitation:

- i) Proper sanitary conditions must be maintained during the operation like handling, storage, cleaning and washing equipment, used for the fruits to minimize the risk of spreading microbial growth.
- ii) Diseased or damaged fruits should be sorted out and properly disposed off to prevent the likely the growth of fungi and bacteria on sound fruits.
- iii) Insects infesting culled fruits may migrate to good fruits and introduce pathogenic organisms and increase losses.
- iv) Water used for washing should also be changed at regular intervals before it becomes contaminated with fungi and bacteria, which spreads infection.
- v) The chlorinated water or chemically treated water reduces the count of viable organisms.

Evaporative cool chamber:

For short duration storage at small scale, evaporative cool chamber (7.5' X 6' X 7'), having drip system for watering and fan for air movement has been developed at NRCC, Nagpur. This chamber has maximum fruit storage capacity of 1.5 ton. The storage cost is very less and small farmers can hold the fruit up to 25 days.

Post Harvest Losses:

Nature and Causes of Post-Harvest Losses:

Post-harvest losses of horticultural produce may occur due to a variety of reasons. Some of the common reasons for post-harvest losses are as under.

- (i) Mechanical injury:
- (ii) Injuries due to thermal shock;
- (iii) Disease and pest attack;
- (iv) Microbial attack; and
- (v) Physio-biochemical reasons.

Main Causes of Post Harvest Losses:

The post harvest losses at different stages and their reasons are as under.

A) During Harvesting:

- i) Harvesting of fruits at improper maturity.
- ii) Harvesting not done properly.
- iii) Harvesting equipments are not clean.
- iv) Harvesting during warmest part of the day.
- v) Exposures to unnecessary high temperature.

B) Transportation:

- i) Careless Driving.
- ii) Too high loading/stacking.
- iii) Poor roads.
- iv) Unsuitable transport containers.
- v) Overloading with other fruits and vegetables (in some cases people even sit on top of the load)

- vi) Lack of link roads, leading to highways or collection centers.
- Viii) Heat accumulation or very poor ventilation within the transport vehicles.
- ix) Virtual absence of refrigerated and insulated trucks.

C) Grading / Packing:

- i) Lack of quality standards or minimum requirement.
- ii) Rough handling.
- iii) Unsuitable packaging material.
- iv) Overfilling of containers.

D) Assembling:

Assembly points are not properly/ adequately prepared.

E) Loading / Unloading:

- i) Rough handling.
- ii) Loading too high.
- iii) Bad stacking.
- iv) Improper cushioning of carrier.

F) Storage:

- i) Inadequate ventilation in packages and carrier used.
- ii) Storage temperature is too high.
- iii) Rough handling.
- iv) Too high heaps or stacks.

G) Ripening:

- i) Lack of uniformity and homogeneity of the produce.
- ii) Inadequate equipment and ripening method.
- iii) Rough handling.

8.0 POST-HARVEST DISEASES AND DISORDERS:

Principal Post harvest Diseases and Disorders:

Sl. No.	Diseases	Season and places	Characteristics of affected fruits	Control measures
1	Sour Rot (<i>Geotrichum candidum</i>)	Maharashtra (Oct.-Jan.) (Feb.-May)	Fruits show water soaked skin, soft texture with oozing liquid and fermented odour.	Treatment with Guazatine (1000 ppm) on packing line and avoiding handling of fruit on ground.
2	Fruit Rot (<i>Phytophthora nicotianae</i>)	Coorg Wynaad (Rainy weather, June-Sep.)	Affected fruits soft, covered with whitish fungus growth	Spraying with Bordeaux mixture (2-3 sprays) (1 %) or Difolaton (0.3 %): defoliated leaves and fruits burnt; water logging to be avoided
3	Powdery Mildew (<i>Acrosporium tingitanium</i>)	Coorg and Malnad in Karnataka, Nilguries (Sep-Oct. and Mar.-Aprl.)	Premature fruit drop	Fortnightly spray (during flush period) with any of the following fungicides. a) Cosan (0.2 %) b) Thiovit (0.2 %) c) Sulfex (0.2 %) d) Karathane (0.2 %) e) Morestan (0.05 %) f) Bavistan (0.1 %) g) Callxin (0.1 %)
4	Stem End Rot (<i>Alternaria citri</i>)		Seen in stored fruits; discolouration of stem and rotten area in	Use of imazalil or 2,4-D (or both) on harvested fruit. Use of the growth regulator 2,4-D delays the

			the core; part of segment shows black sporulate)	onset of senescence of the fruit button, thereby delaying or restricting the movement of the pathogen into the fruit.
5	Brown Rot <i>(Phytophthora citrophthro)</i>		Brown colour spot on infected fruits; infected fruit does not become soft and pulpy	Copper fungicide sprays applied to the soil and the lower part of the tree canopy prior to anticipated wet weather help to prevent brown rot. Brown rot can be controlled by submerging fruit in hot water (50°C) for 2-4 min. Storage of fruit at about 5°C significantly delays the development of brown rot.
6	Wither Top / Anthroacnose <i>(Collectotrichum gloeosporioides)</i>	Coorg, (Aug-Sep)	Serious on orange tree-Die back of twings; or shedding of leaves, flowers and fruitdrop; brown spot on rind; pink colour in infected portion of segment	Pruning of affected portion and spraying with Bordeaux mixture. Proper irrigation and timely fertilization essential.
7	Pink Disease <i>(Pellicularia salmonicolor)</i>	Coorg,	Affected Mandarin tree show gumminess of bark; appearance of pink coloured mycillial growth on diseased	Pruning and burning of affected portion. Scraping of diseased tissue and application of Bordeaux mixture in dry season.

portion; and drying of whole bark.

8	Other storage Rots <i>(Phytophthora nicotianae, Geotrichum sp, Penicillium sp, Rhizopus sp, Phomopsis citri, Diplodia natalensis and Sclerotium)</i>	Coorg Mosoon and summer crops)	—	Post harvest dip treatment of mosoon fruits with TBZ, Bavistan and Benlate check losses upto 26 days. Likewise, dipping of summer season fruits in Benlate, Callxin, and Bavistan or TBZ restricted the rot to less than 10 %.
9	Leaf Fall <i>(Phytophthora nicotianae)</i>	Mrig Bahar	Young fruits develop water soaked chocolate brown lesion	Spraying Bordeaux mixture (0.1 %) before the onset of rains and spraying the remaining mixture during rainy season during dry spell.
10	Kolsi or Sooty Mold <i>(Capnodiumsp)</i>	Karnataka (June-Sep.) (Early winter)	Fruits show reduced size and discolouration	1. Spraying monocrotophos or dimethoate combined with Copper oxy chloride or mancozeb helps in prevention of the disease. Spraying of diluted glue or a detergent can wash off the black coating.
11	Blue and Green Mold <i>(Penicillium italicum and P. digitatum)</i>	Pune	Soft, water soaked skin covered by blue, green mouldy growth)	Harvesting the fruit after the rain and fog; careful handling; Pre and post harvest treatment with benlate or carbendazim..

Source: Mandarin Orange in India. Central Food Technological Research Institute, Mysore.

9.0 MARKETING CHANNELS:

The main channels followed for marketing of Mandarins are as under:

1. Growers – Pre-harvest contractors – Commission Agents – Retailers – Consumers
2. Growers – Wholesalers – Commission Agents – Retailers – Consumers
3. Growers- Commission Agent- Processing Industries - Retailers – Consumers.
4. Growers-Retailers-Consumers
5. Growers-Exporters.

10.0 MARKETING INFORMATION AND EXTENSION

Marketing information:

Marketing Information is essential for producers in planning production and market led production. It is equally important for other market participants for trading.

Government of India has launched 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 markets in the States and Union Territories. The data received from markets is being displayed on the website www.agmarknet.nic.in

All India Level Price Range (Rs./Quintal) on 24/7/2002
Markets Reported : 32

Commodity	Max	Min	MSP
Cereals			
Bajra	610	251	485
Barley	611	500	500
Jowar	900	405	485
Maize	670	200	485
Paddy	891	360	Comm. Fine:34
Rice	3890	750	
Wheat	1120	560	620
Fibre Crops			
Cotton	2310	1875	F414/4 H4:187
Jute	800	700	TD5:81
Forest Products			
Bay leaf (Tejpatta)	900	750	
Broomstick	3800	2800	
Fruits			
Apple	8375	500	
Banana	910	400	
Chikoo	1250	125	

AGMARKNET Portal

Search for in AgriSurf

Navigation Links:

- Agmarknet
- Guidelines
- Commodities
- Market Profile
- Prices & Arrivals
- Coordinators
- DMI

Diagram: The AGMARKNET Portal is the central hub, connected to the Directorate of Marketing & Inspection, Agricultural Produce Markets, Tradenic online, Department of Animal Husbandry, Dairying & Fisheries, Department of Agriculture & Cooperation, and State Agricultural Departments. It is also connected to the NICNET network.

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.
 - Harvesting care
 - Techniques to minimize losses during post-harvest period.
 - 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.

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. Dial toll free No. 1551 to contact Kisan Call Centre.

11.0 ALTERNATIVE SYSTEM OF MARKETING:

1.) Direct marketing:

Direct marketing is an innovative concept, which involves marketing of produce i.e. mandarin 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.

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.

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). Contract farming is beneficial to both the parties i.e. farmers and the contracting agencies.

Benefits	To Producer	To Contracting agency
Risk	It minimises the price risk.	It minimises risk of raw material supply.
Price	Price stability, ensuring fair price.	Price stability as per pre-agreed contract.
Quality	Use of quality seed and inputs.	Get good quality produce and control on quality.
Payment	Assured and regular payments through bank tie up.	Easy handling and better control on payment.
Post-harvest handling	Minimises risk and cost of handling.	Control and efficient handling.
New technology	Facilitates in farm management and practices.	For better and desired produce to meet consumer needs.
Fair trade practices	Minimises malpractices and no involvement of middle man.	Better control on trade practices.
Crop insurance	Reduces risk.	Reduces risk.
Mutual	Strengthens.	Strengthens.

relationship
Profit

Increases.

Increases.

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. Co-operative societies market the member’s produce collectively and secure advantages of economy of scale to its members.

The cooperative marketing structure in the different states consists of;

1. **PMS** (Primary Marketing Society) at the Mandi level
2. **SCMF** (State Cooperative Marketing Federation) at the State level
3. **NAFED** (National Agricultural Cooperative Marketing Federation of India Ltd.) at the National Level.

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.

12.0 INSTITUTIONAL CREDIT FACILITIES:

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:

1. **Crop Loan**
2. **Produce Marketing Loan (PML)**
3. **Kisan Credit Card Scheme**

4. Modified National Agricultural Insurance Scheme

Long term loans:

1. Agricultural Term Loan

13.0 ORGANISATIONS PROVIDING MARKETING SERVICES:

Name and address of the organisation
1. Directorate of Marketing and Inspection (DMI) NH-IV, CGO Complex Faridabad Website: www.agmarknet.nic.in
2. Agricultural and Processed Food Products Export Development Authority (APEDA) NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016 Website: www.apeda.com
3. National Horticultural Board (NHB) Ministry of Agriculture, Govt of India, 85, Institutional Area, Sector – 18 Gurgaon - 122015 (Haryana) Website : www.nhb.gov.in
4. National Co-operative Development Corporation (NCDC), 4, Siri Institutional Area, New Delhi-110016 Website: www.ncdc.nic.in
5. Director General of Foreign Trade (DGFT), Udyog Bhavan, New Delhi. Website: www.nic.in/eximpol
6. State Agricultural Marketing Board (SAMBs),

14.0 DO'S AND DON'TS

DO'S

- ✓ Harvesting should be done by using appropriate instruments like clippers
- ✓ Harvesting should be done in the late morning
- ✓ During harvesting the button should remain attached to the fruit.
- ✓ Rotten, diseased, insect damaged, discoloured fruits should be sorted out
- ✓ After harvesting, the fruits should be washed and cleaned properly.
- ✓ Before marketing, the fruits should be graded.
- ✓ After grading the fruits should be stored in cool and airy place
- ✓ Fruits should be stored in hygienic conditions.
- ✓ New and old stock should be stored separately.
- ✓ Regular inspection of stored fruits should be carried out.
- ✓ Store fruits at optimum relative humidity of 90% to 95%.
- ✓ Properly packaging to protect the

DON'TS

- ✗ Harvest the fruit Manually
- ✗ Harvesting under wet condition
- ✗ Remove the button from the fruit.
- ✗ Place Unhealthy fruits with the healthy fruits.
- ✗ Keep unclean and dirty fruits for a long time.
- ✗ Market ungraded fruits.
- ✗ Keep the fruits under direct sun and windy conditions.
- ✗ Keep the fruits in unhygienic conditions.
- ✗ Store new and old stock together.
- ✗ Delay to remove unhealthy and rotten fruits from the store.
- ✗ Store at lower than optimum temperature

fruits

- ✓ Use packaging material which is convenient to handle, convenient to stack, cheap, clean and hygienic.
 - ✓ Fruits should be transported in refrigerated van
 - ✓ Adopt sanitary and phyto-sanitary measures during transport
 - ✓ Use mode of transportation which is suitable and convenient.
 - ✓ Proper measures should be taken to control the post harvest diseases and disorders.
 - ✓ Choose the marketing channel which Shorten the time between harvest and consumption.
 - ✓ Before marketing get the market information regularly from websites, T.V., radio and other APMC
- X Store the fruit in loose.
 - X Use unhygienic and conventional method of package which causes higher transit losses
 - X Transport in open trucks
 - X Export without sanitary and phyto-sanitary measures.
 - X Use mode of transportation which is unsuitable and inconvenient.
 - X Delay in applying the control measures.
 - X Choose the longer marketing channel
 - X Market without collecting marketing information.