



Insect Pest Management and Post Harvest for Agriculture and Horticulture Products

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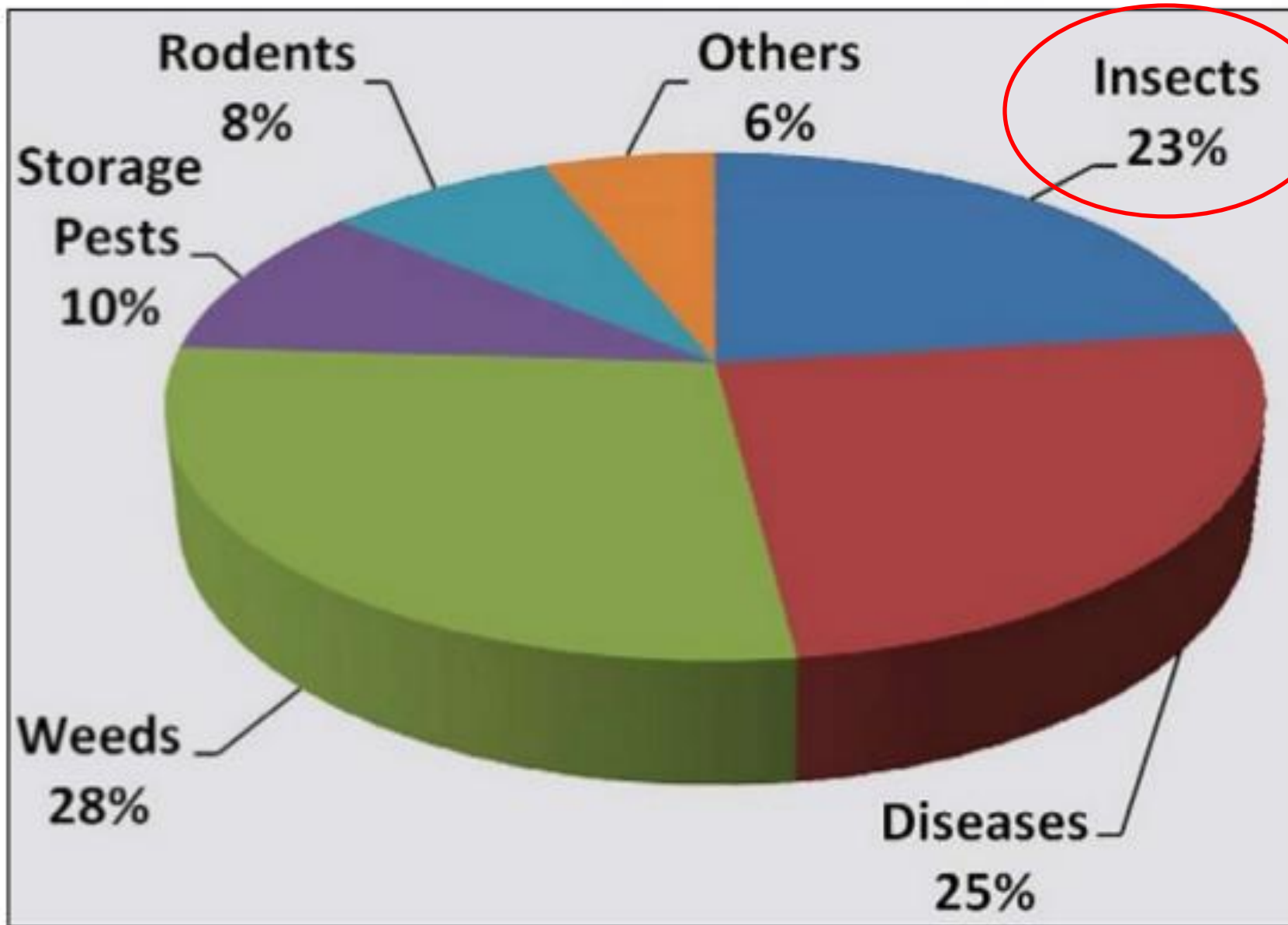
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Global mean temperature will rise by **0.3°C per decade** reaching to approximately 1° and 3°C above the present value by years 2025 and 2100, respectively.

Losses caused by different pests





World fruit production in the 21st century is faced with three Major Challenges:

- 1) To improve - Food & nutritional security, rural livelihoods and income
- 2) to satisfy - the increasing and diversified demands for safe food and other products
- 3) to conserve and protect - natural resources

These challenges have been articulated by the international community through the World Food Summit Plan of Action and the Millennium Development Goals with specific Targets .

The paradigm shift is towards the Primary producers in the context of a rapidly changing **Food Economy** and **Globalization**.





New Varieties for Different Uses

- **Fresh table purpose**
- **Processing**
- **Domestic trade**
- **Export**





Two-year-old bearing Amrapali plant



Mallika
(Neelum x Dashehari)



Pusa Arunima
(Amrapali x Sensation)



Pusa Surya (Syn. Eldon)



PKM 1



PKM 2



Improved Mango Varieties



Arka Anmol



Arka Aruna



Arka Puneet



Arka Neelkiran



Ambika



Arunika

Promising Hybrids identified for Release from IARI



Pusa Pratibha



Pusa Peetamber



Pusa Shrestha



Pusa Lalima

New Mango Hybrids



Arka Suprabath



Pusa Deepshikha



Pusa Manohari



Arka Udaya



Arka Neelanchal Kesri



Popular Banana Varieties



Co 1



Monthan



Robusta



Rasthali



Red Banana



Karpooravalli



Nendran



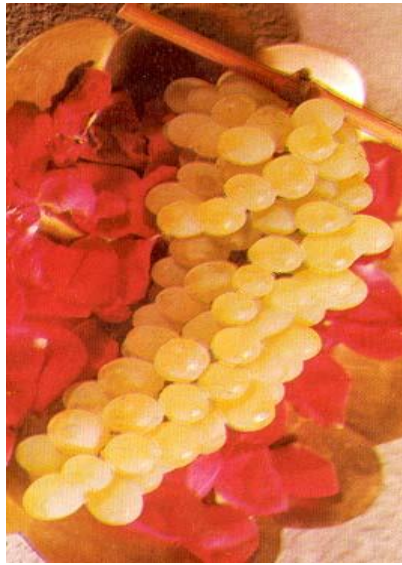
Neypoovan



Grand Naine



Improved Grape Varieties



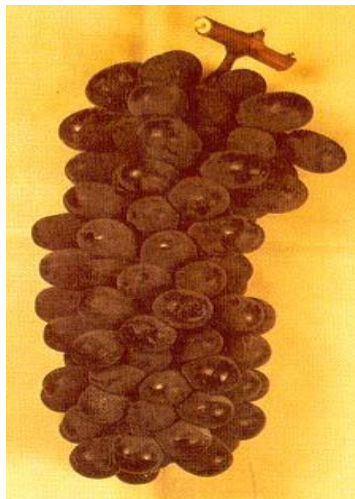
Sweta Seedless



Pusa Seedless



Pusa Urvashi

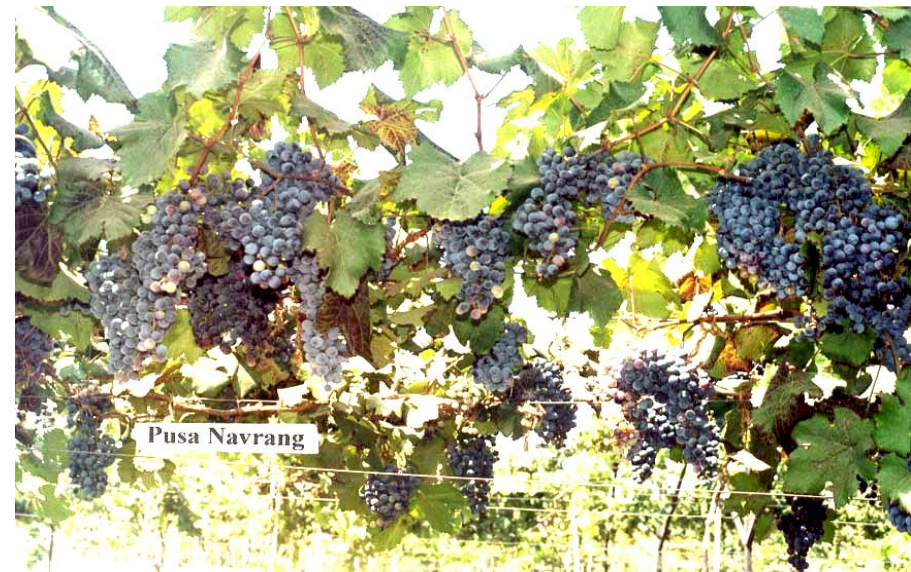


Arka Neelmani



PUSA NAVRANG

Pusa Navrang



Pusa Navrang



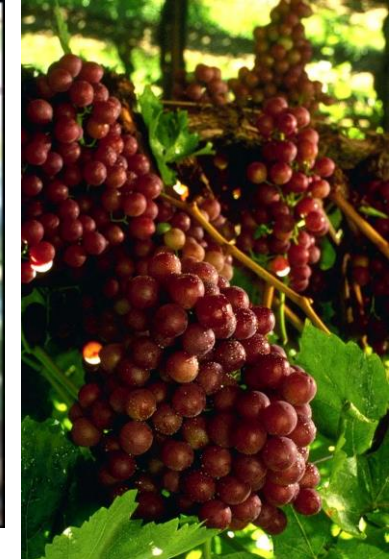
Perlette



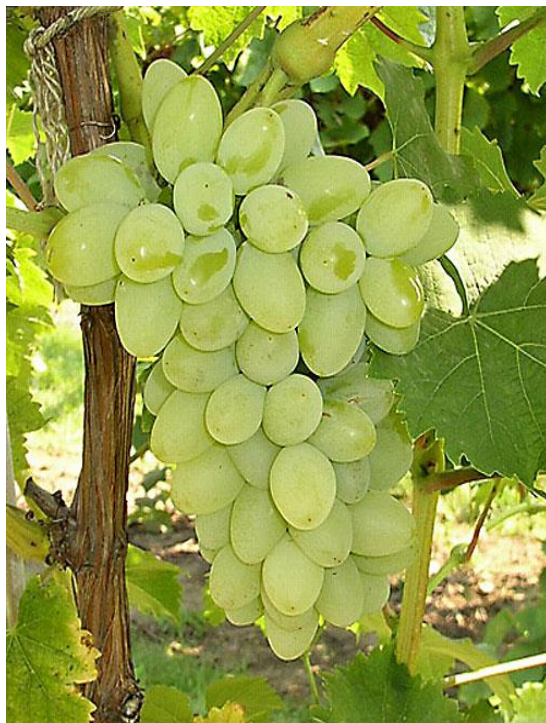
Beauty Seedless



Red Globe



Flame Seedless



Thompson Seedless



Bangalore Blue



Crimson Seedless

Improved Lime/ Lemon varieties

Jai Devi	High yield, excellent quality juice, highly acidic with pleasant aroma
Pramalini	Excellent golden coloured fruit, high yield, tolerant to canker
Sai Sarbati	High yield, tolerant to canker and triteza, tendency for summer cropping
Vikram	High yield, fruits golden coloured, borne in clusters
PKM-1	High yield, tolerant to canker and Triteza
Kagzi Kalan	High yield, excellent quality juice, pleasant aroma, High degree of seedlessness, summer bearing



PKM-1



Kagzi Kalan

Improved Acid lime Varieties



Rasraj



Balaji



Pusa Abhinav

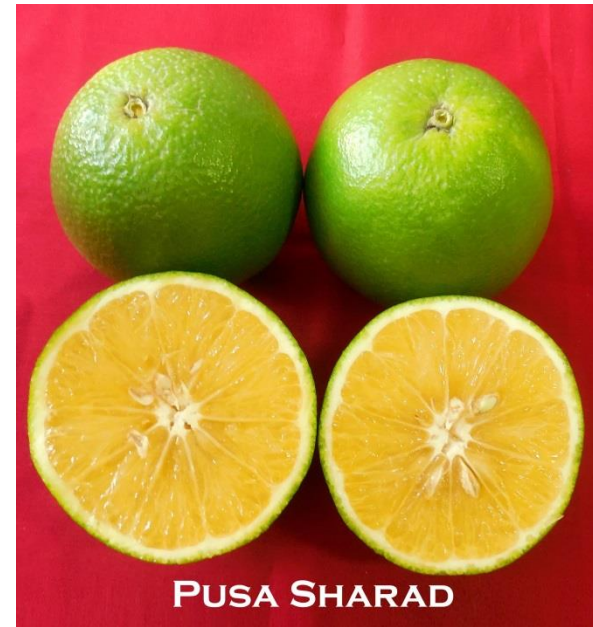
Pusa Udit



Sweet Orange varieties



Pusa Round



PUSA SHARAD



Malta



Sathgudi



Improved Sapota varieties



Co 3



PKM 2



PKM 3



PKM 1



Cricket Ball



Kali Patti



Thai sapota



PKM 4



Improved Guava Varieties



Arka Amulya



Arka Mridula



Lalit



Arka Kiran



Pant Prabhat



Sweta



VNR Bihi



Arka Rashmi (Kamsari x Purple Local)

New Guava Varieties



VNR Bihi Guava



Thai White KG 1



Thai Pink



Malaysian Pink

Improved Papaya Hybrids/ Selections



Co 1



Co 2



Co 3



Co 4



Co 5



Co 6



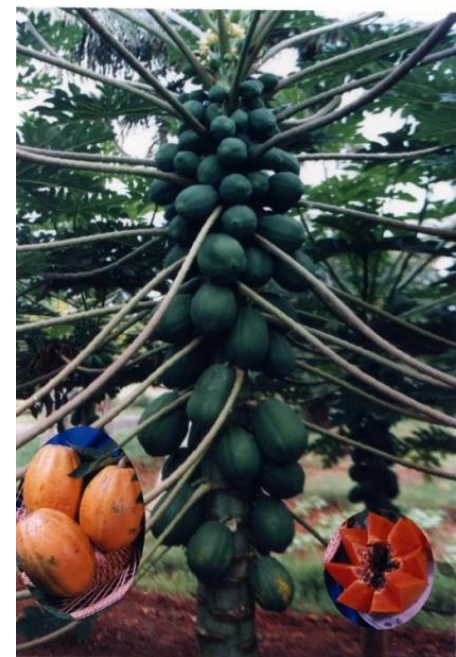
Co 7



Arka Prabath



Pusa Dwarf



Surya



Pusa Nanha



願技就是

KNOWN-YOU SEED

PAPAYA 786 F1

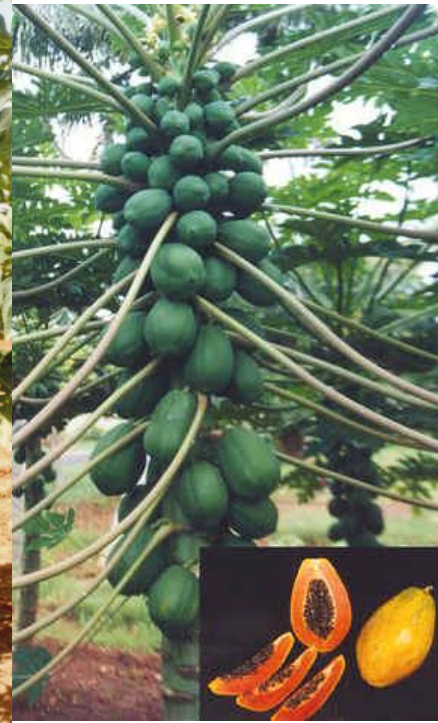
Red Lady



Red Lady



Arka Surya



Arka Prabhat



TNAU PAPAYA CO 8



Improved Pomegranate Hybrids/ Selections



Bhagwa



Mridula



Ruby



Ganesh



**Super
Bhagwa**

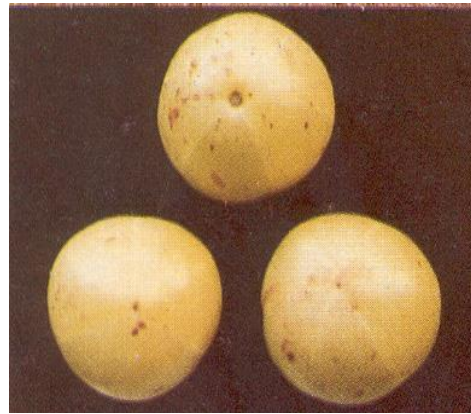


Jyoti

Improved *Aonla* varieties



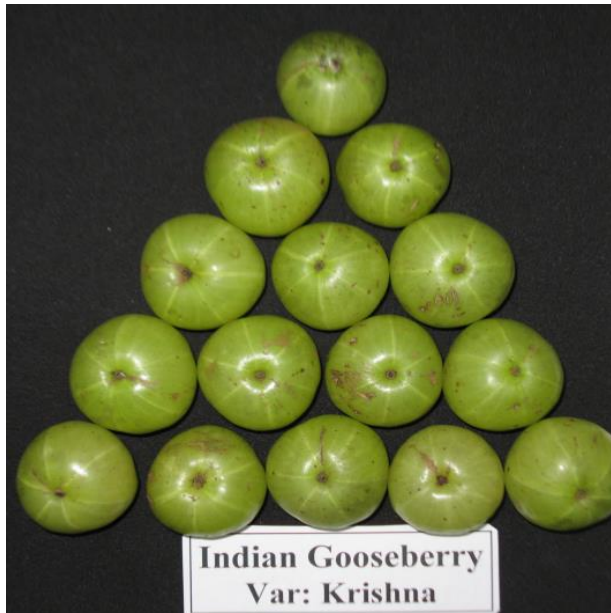
Narendra Aonla 7



Narendra Aonla 6

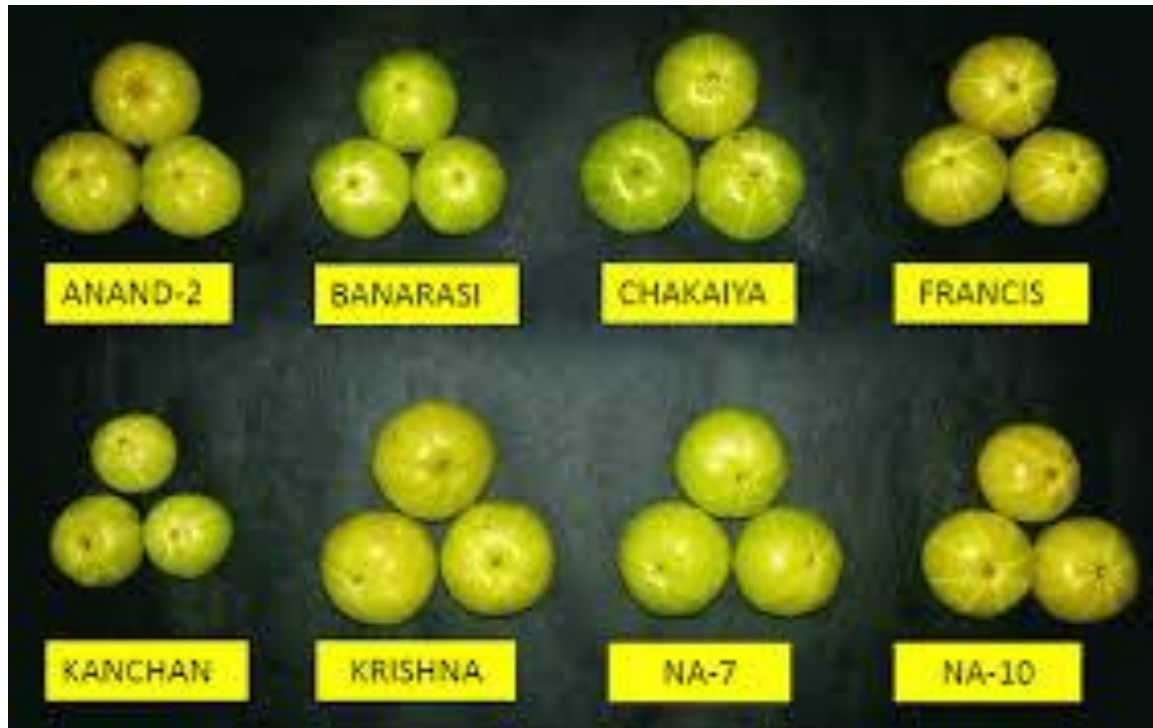


Krishna



Indian Gooseberry
Var: Krishna

Kanchan





Improved *Bael* varieties

ICAR- Indian Agricultural Research Institute, New Delhi



Bael Pant Sujata



Bael Pant Shivani



Bael NB-7



CISH Bael-1



Narendra Bael-6



CISH Bael 1



CISH Bael 2



Goma Yashi



Low Chill Temperate Fruits



Early Grande



Prabhat



Punjab Beauty



Florida Prince



Sweet Charlie

Popularization of Varieties with Specific Traits

Mango:



Amrapali : Regular bearing, high density planting, high carotenoid content

Ambika : Regular bearer, high yielding, suitable for export

Arunima : Regular bearer, high yielding, suitable for export

Banana: *Udhayam* : High yield, large bunch, uniform finger



Guava: *Lalit* : Pink pulp, suitable for processing and table purpose,

Shweta: High yielding and quality





Future Fruits suitable for growing in degraded soils

Conditions	Choice of fruit crops
Degraded pastures and grazing lands	<i>Jamun, Aonla, Custard apple, Tamarind, Phalsa, Karonda and Fig</i>
Highly drought tolerant	<i>Ker, Date palm, Ber, Aonla, Annona, Pomegranate and Fig</i>
Arid Zones	<i>Ker, Ber, Date palm</i>
Alkaline soils	<i>Custard apple, Date, Phalsa</i>
Salt-affected soil	<i>Date palm, Ber, Aonla, Bael etc.</i>
Gullied and Ravinous lands	<i>Mulberry, Jamun, Karonda, Ber, Custard apple</i>



Varieties for Abiotic Stress conditions



Gandaki



Swarnroopa litchi



Ruby



Arka Sahan

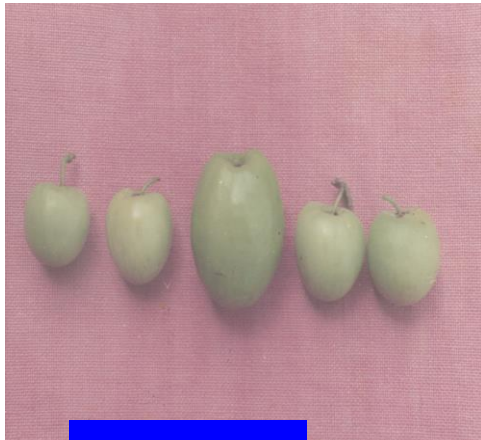


Karonda



Jyoti

Improved *Ber* varieties



Illaiichi



Mundia Mehrera



Banarasi Karaka



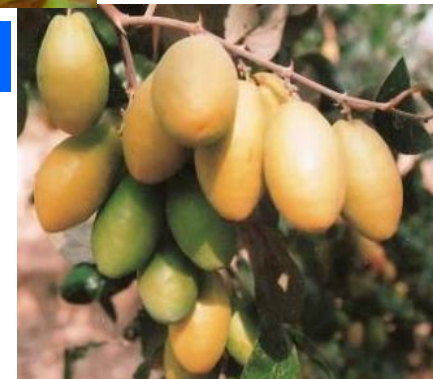
Seo



Narma



Goma Sevika



Goma Bhubraj

Important Minor fruit crops

Rich source of anti-oxidants





Future Fruits.....



Popularization of New Potential Fruit Crops

- ✚ Kiwi fruit
- ✚ Olive
- ✚ Avocado
- ✚ Cape Gooseberry
- ✚ Dragon Fruit



Popularization of New Potential Fruit Crops

- ✚ Kokum
- ✚ Mangosteen
- ✚ Passion fruit
- ✚ Tree tomato
- ✚ Cape goose berry



Management of Major Pests of Banana

Major Insect Pests of Banana

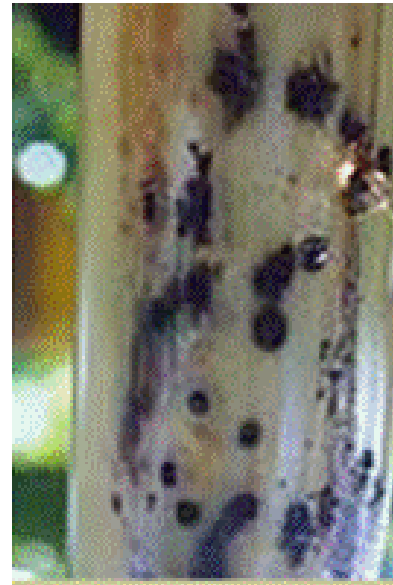
Pseudostem Borer (*Odoiporus longicollis*)

Damage:

- Adults are either reddish-brown or black.
- The pest is active during summer and monsoon months.
- The grubs bore into the stem and feed within the stem.
- An initial symptom is in the form of exudation of plant sap and blackened mass that comes out from the hole by the grub.

Control:

- Uprooting and burning of infected plants.
- Celphos (3 tablets/plant) is recommended for control of egg, larva, pupa and adult population of the insect, application of.
- After placing the tablet inside the pseudostem, the slit should be plastered with mud.
- Clean cultivation.
- Application of Carbofuran (3 g of granules/stool).
- Alternately, application of imidachlorprid (0.04%) also controls the pest population.

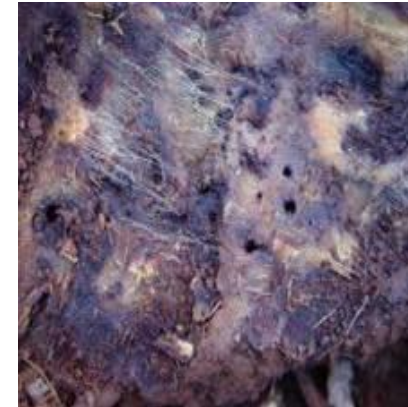


Damage:

- The larvae or grub of the weevil feeds by tunnelling in the banana plant.
- The corm decays and becomes a mass of rotten tissue. Injury to corm prevents nourishment going to the plant.
- Leaves turn yellow, wither and die maturely.
- Adults feed on dead or dying banana plants and live under newly cut or rotting pseudostems.
- The female weevil either lays its eggs in the rotting pseudostem or moves to a living plant where eggs are inserted singly into a hole.
- Spreads from plantation to plantation through planting material.

Control:

- Plantations should be clear of debris in which borers can survive.
- Use clean planting material from fields, known to be free of weevils.
- Pieces of old rhizomes or pseudostems 1-2 feet long are cut down split and placed on the plantation floor between plants.
- Adult beetles migrate into these stems and can be collected by hand and poisoned.
- Before planting dipping of suckers in imidachloprid (0.5%) for 30 minutes to protect rhizome from weevil attack.



Damage:

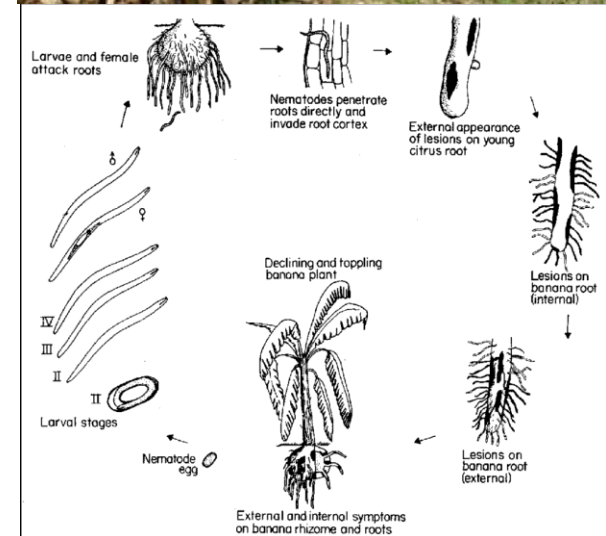
- The insect, is the vector of the virus causing bunchy top disease.
- Yellowish green nymphs and adults suck cell sap and devitalise plants.
- Affected parts become discoloured and malformed.
- High humidity favours rapid multiplication of this pest.
- The aphids are mostly observed on the lower surface of the leaves.

Control:

- Spraying of Monocrotophos (0.05%) or Malathion (0.1%) at 10-15 days interval contains aphid population effectively.
- To prevent recurrence of the pest granular insecticides like Phorate @ 1.0 kg a.i./ha should be applied to soil.



Burrowing Nematode (*Radopholus similis*)



Damage:

- The first symptom of the disease is a small dark spot on the root.
- The nematode deposit eggs in the root tissue.
- Larvae after hatching from the eggs feed on the root tissue.
- Fungi rapidly invade such damaged root tissue.
- The number of fruits in the bunch is reduced and individual fruits are small.
- Affected plants do not respond to fertilizers, irrigation or cultural practices. Nematode population is built up rapidly in ratoon crops.

Control:

- Application of Carbofuran 3G or Phorate 10G @10 g/pit at the time of planting or application of neem cake (250-400 g/pit) at the time of planting reduces the pest population.
- Control measures such as application of nematicides to the growing infected plants and planting of nematode-free corms in fallow soil are recommended.

Damage:

- The adult beetles feed on various weeds, as well as the young unfurled leaves, stems, and roots of banana trees. They also eat on the young fruit, making scars and spots on the skin that deforms it and makes it unmarketable.

Control:

- Clean cultivation.
- Application of Rogor 1ml/l or imidachlorpid (0.04%).



Post Harvest Technology of Banana

Grading:

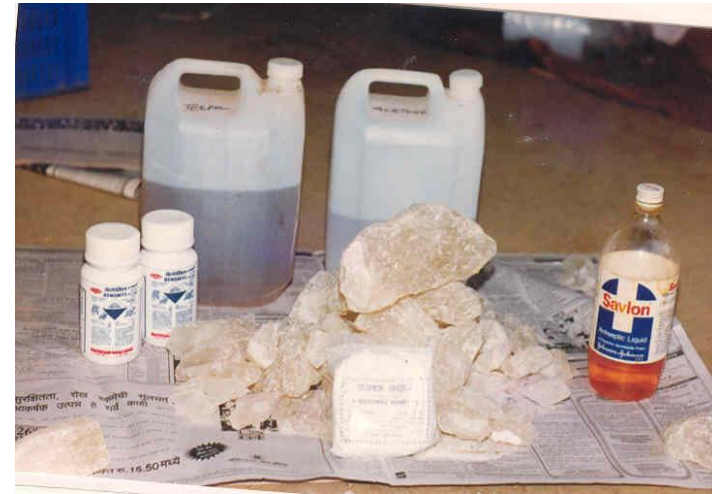
- The hands are graded based on the number and size of fingers in each hand.
- Overripe and injured fruits are discarded at this stage. Banana is sent to the local market as bunches

Packaging:

- For packing and transportation the bunch is padded with banana leaves.
- A fungicidal paste prepared by the Central Food Technological Research Institute, Mysore is applied to cut ends to prevent stem end rot. After the paste dries, the bunches are put into polythene tubes (175 gauge, 55 cm wide with 1.8 cm with holes 10 cm apart).
- The bunches should then be stacked vertically or horizontally on the ground added with wilted or dry banana leaves in case there is delay in transportation.
- For exports, bananas are removed from the stem and hands and clusters of the bananas are packed in corrugated boxes with perforated polyethylene liners. The curved side of the hands is kept facing upwards making sure that the crown of the upper hands do not damage the banana underneath.



POST HARVEST TREATMENT OF CHEMICALS TO BANANA



BANANA HANDS IN FREE FLOWING WATER TO REMOVE LATEX



BASRAI



GRAND NAINÉ



WASHING OPERATION IN PROGRESS

BANANA HANDS IN ALUM SOLUTION



BANANA HANDS IN BENOMYL SOLUTION



FAN DRYING OF BANANA HANDS



BASRAI



GRAND NAIN

Packaging Specifications for Banana Export

Corrugated Fibreboard Box				Capacity : 5 Kg
A. Minimum Specifications				
Material of Construction*	Corrugated Fibre Board	Corrugated Fibre Board	Corrugated Fibre Board	Corrugated Fibre Board
External Dimensions (mm)	333 x 300 x 200	333 x 300 x 200	333 x 300 x 200	333 x 300 x 200
Style of Box**	RSC – 0201	Telescopic - 0300	Telescopic - 0306	Telescopic - 0312
No. of Plies	3.0	Lid - 3 Tray - 3	Lid - 3 Tray - 3	Lid - 3 Tray - 3
Type of Flutes	B (Narrow)	Lid B (Narrow) Tray B (Narrow)	Lid B (Narrow) Tray B (Narrow)	Lid B (Narrow) Tray B (Narrow)
Direction of Flutes	Vertical	Vertical	Vertical	Vertical
Grammage (g/m ²) Outer to Inner (Indicative)	250 / 150 / 150	Lid : 250/150/150 Tray : 150/150/150	Lid : 250/150/150 Tray : 250/150/150	Lid : 250/150/150 Tray : 250/150/150
Burst Factor of Paper (Kraft) (Minimum)	20.0	20.0	20.0	20.0
Bursting Strength of Board (Kg/cm ²) (Minimum)	11.0	Lid : 11.0 Tray : 11.0	Lid : 11.0 Tray : 11.0	Lid : 11.0 Tray : 11.0
No. of Pieces per Box	Not more than two	Not more than two	Not more than two	Not more than two
Manufacturer's Joint	By gluing	By gluing	By gluing	By gluing
Compression Strength of Box (Kgf) (Minimum)	350	350	350	350
COBB (30 Minutes)*** (g/m ²) (Maximum)	60	60	60	60
No. of Ventilation Holes	16.0	16.0	16.0	16.0
Diameter (mm) and Position of Holes	20.0	20.0	20.0	20.0
Two Sides Each	3	3	3	3
Two Ends Each	1	1	1	1
Top & Bottom Each	4	4	4	4
B. Recommended Specifications				
Edge Crush (Kgf) (Minimum)	43.00	43.00	43.00	43.00



*Outer ply of white duplex board or bleached kraft
 **Or any other suitable style which provides equal strength and performance
 ***Outer ply to be laminated or coated for water proofing

Packing and Packaging in CFB Boxes



Storage:

- Cold storage: 13-14°C with 90-95% RH.
- Controlled atmospheric conditions: 2-5% oxygen and 2-5% carbon dioxide should be used to supplement temperature and humidity management during transport and storage.
- Maintaining ethylene concentration below 1 ppm can extend postharvest life.
- Mature-green bananas can be stored for up to 3 weeks in ethylene-free air or up to 6 weeks in a controlled atmosphere at 14°C.

Cool Chain:

The various stages of the cool chain are:

1. 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 hold.
7. Off loading direct into a cold store in the receiving country.
8. Refrigerated truck to the customer



BANANA BOXES ON RACK IN PRE-COOLING CHAMBER



TEMPERATURE MEASUREMENT ON TRANSFER OF BOXES TO COLD STORAGE



TEMPERATURE MEASUREMENT OF BANANA PULP AFTER UNLOADING OF BOXES FROM CONTAINER AT SHARJAH (U.A.E.)



JALGAON'S GRAND NAIN BANANA UPON ARRIVAL AT DUBAI (IMPORTERS PLACE)





Some Problems Observed

- Some Banana were at advanced stage of **maturity**.
- Some degree of **bruising** seen
- Crown was not cut deep enough to prevent **rotting** in some hands
- Wrong **packing** – some boxes packed with crown down instead of crown up.
- Overall Bananas **not comparable** to Chiquita or Del Monte in **quality** or **appearance**.
- But with improvements Jalgaon Banana can compete with the best.





Industry Problems

- **Cost competitiveness** needs to be improved
 - India loses 3 to 4 million tons of Banana annually due to reported post harvest losses at 30-40%. This adds to the cost of Banana.
- **Bruise, Injury and Mechanized shocks** due to
 - poor harvesting technique,
 - improper loading and unloading operations and
 - lack of proper post harvest practices.
- **Lack of pack house facilities** for washing and grading, on-farm cooling, cold storage or cold chain, lack of knowledge on harvest standards, handling and packaging techniques.



Major Insect Pests of Grape

Flea Beetles (*Scelodonta strigicollis*)

Damage:

- The adult beetles scrap the sprouting buds after each pruning.
- Damaged buds fail to sprout.
- The beetles also feed on tender shoots and leaves, and tendrils causing substantial damage.
- The tender shoots may wither and drop down.
- The losses are heavy when the sprouting buds are damaged after forward pruning.

Control:

- Removal of loose bark of the stem and applying paste of Copper Oxychloride and Carbaryl 50% WP after forward pruning to exposes and kills the beetles.
- Spraying of insecticides like Carbaryl (0.15%) or Quinalphos (0.05%) from the fourth day after pruning at an interval of 3-5 days until the emergence of the leaves is effective in protecting the sprouting bud from the attack.
- The spraying should preferably be carried out in the evening.



Thrips (*Rhipiphorothrips cruentavis*)

Damage:

- Both the nymphs and adults suck cell sap from the lower surface of the leaf.
- The injured surface is marked by a number of minute spots thereby producing a speckled silvery effect, which can be detected from a distance.
- In case of heavy incidence, the leaves may dry up and drop off the vine.
- Thrips also attack blossoms and newly set berries.
- The affected berries develop a corky layer and become brown on maturity.
- Fruit setting is poor and yield is considerably reduced.

Control:

- Alternate spraying of insecticides like Phosphamidon (0.05%) or Monocrotophos (0.1%) or Malathion (0.05%) offer a good control over the pest.
- Prophylactic sprays immediately after flowering and during fruit set is essential.



Damage:

- Most common pest found in the vineyards of Punjab.
- The adult female lays eggs in the crevices or loose bark of the vine, trunk and its arms.
- These insects suck the cell sap from the leaves, petioles, main veins and tender shoots of the grapevine.
- Weak shoot growth with appearance of golden-yellow leaves indicates the advanced stage of pest attack.
- As the arms become dry, wood-boring insects may cause further damage.
- Frequent attack in subsequent years leads to the death of the vine.

Control:

- The loose bark should be removed at the time of pruning.
- The encrustations should be scraped and the vine should be sprayed with Trithion (0.05%).
- Cuttings free from the infestation of the pest should be used for planting.
- Ants which act as carrier of the scales should be controlled to check the spread of the disease.

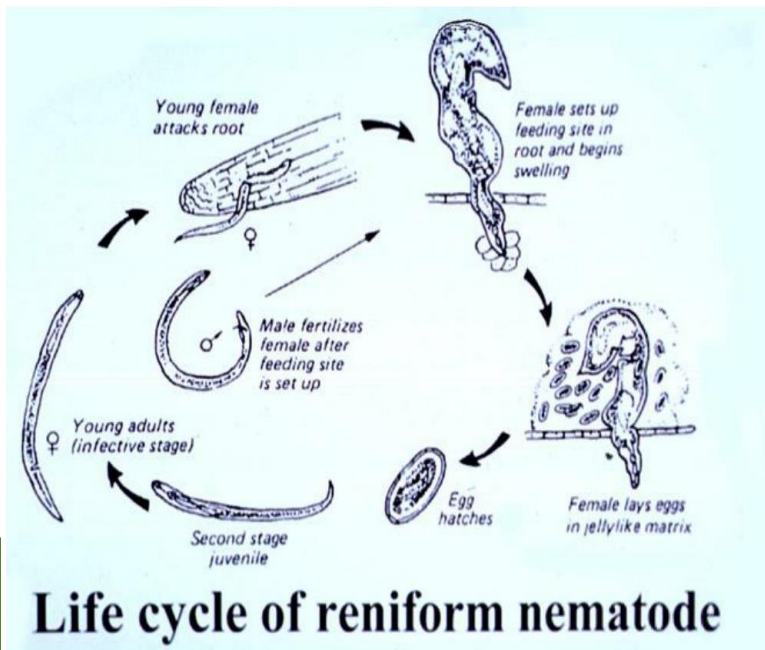


Damage:

- The nematodes mostly damage the secondary and the feeder roots.
- The affected roots show brownish discoloration.
- The affected portions rot and get sloughed off. As a result the nutrient uptake is affected and the vine appears sick.

Control:

- Soil application of Carbofuran (2.5 kg a.i. /ha) or neem cake (1 t/ha) helps to control the reniform nematode.
- Application of organic manures reduces the nematode population when applied to grapevines.



Damage:

- The affected roots exhibit severe galling.
- Galling is the result of the proliferation of cells of the affected roots.
- The vines show stunting and poor growth. Young shoots remain short and chlorotic.
- In severe attack, the vines get defoliated.

Control:

- Soil application of Carbofuran (2.5 kg a.i. /ha) or neem cake (1 t/ha) helps to control the root knot nematode.
- Application of organic manures reduces the nematode population when applied to grapevines.

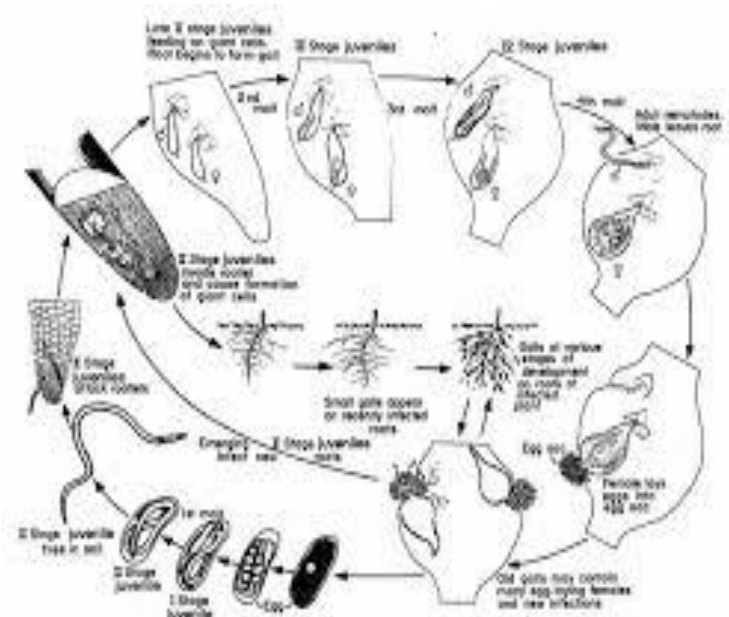


Fig. 2. Disease cycle of root knot caused by *Meloidogyne* species (G.N. Agrico)

Grading:

- The harvested bunches are graded as per their size of the berries and their colour.
- Before packing, the broken, decayed, deformed, undersized, and discoloured berries are removed by their pedicels from the selected bunches, using a long nosed scissors.
- While cleaning, harvesting or trimming bunches should be held by their stalk, preferably by wearing rubber gloves.
- This care is taken not to erase the fine waxy coating called 'bloom' from the berry surface.
- Otherwise it leads to rapid loss of water through the skin of berries and they shrivel during storage.



Post Harvest Technology of Grapes

Packaging:

- The grapes sent to the local market are packed in ventilated corrugated boxes accommodating 2-4 kg of grapes.
- 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. 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, bubble sheet is spread with its rough surface facing towards the base of the box.
- 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 SO₂ releasing pads are placed over the pouches and the polythene liner is folded in.



Packaging Specifications for Grape Export (CFB)

Corrugated Fibreboard Box

Capacity : 1 Kg

A. Minimum Specifications

Material of Construction*	Corrugated Fibre Board	Corrugated Fibre Board	Corrugated Fibre Board	Corrugated Fibre Board
External Dimensions (mm)	200 x 200 x 75	200 x 200 x 75	200 x 200 x 75	200 x 200 x 75
Style of Box**	RSC - 0201	Telescopic - 0300	Telescopic - 0306	Telescopic - 0312
No. of Plies	3.0	Lid - 3 Tray - 3	Lid - 3 Tray - 3	Lid - 3 Tray - 3
Type of Flutes	B (Narrow)	Lid B (Narrow) Tray B (Narrow)	Lid B (Narrow) Tray B (Narrow)	Lid B (Narrow) Tray B (Narrow)
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No. of Pieces per Box	Not more than two	Not more than two	Not more than two	Not more than two
Manufacturer's Joint	By gluing	By gluing	By gluing	By gluing
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Two Ends Each	1	1	1	1
Top & Bottom Each	4	4	4	4

B. Recommended Specifications

Edge Crush (Kgf) (Minimum)	33.00	33.00	33.00	33.00
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*Outer ply of white duplex board or bleached kraft

**Or any other suitable style which provides equal strength and performance

***Outer ply to be laminated or coated for water proofing

Specifications developed by IIP for APEDA

Packaging Specifications for Grape Export (EPB)

Expanded Polystyrene Box

Material of Construction	Expanded Polystyrene
External Dimensions (mm)	
• 4.5/ 5 kg	390 x 320 x 155
• 9 kg	500 x 390 x 180
Style of Box*	Lid & Tray
Density of EPS (Kg / m ³) (Minimum)	18.00
No. of Pieces per Box	Not more than two
Compression Strength (Kgf) (Minimum)	300.00
No. of Ventilation Holes	16.00
Diameter (mm) & Position of Holes	20.00
Two Sides Each	3
Two Ends Each	1
Top & Bottom Each	4
or Equivalent Ventilation	



Capacity: 4.5/5 Kg & 9 kg

Specifications developed by IIP for APEDA

Packaging Specifications for Grape Export (Consumer Packs)

Dimensions for Consumer Packs

Punnet Size	
Tray (L x W x H mm)	190 x 115 x 80
LID (L x W x H mm)	To fit the tray x To fit the tray x 15

Specifications for Consumer Packs

Type of Consumer Pack : Plastic Punnet With Lid

Capacity : 500 grams

Material: Food grade PET (Polyethylene Terephthalate)

Note: The lid should sit firmly on the tray and should be lockable type.



Capacity: 500 g

Specifications for Transport Pack for Consumer Packs

Type of Consumer Pack:	Plastic Punnet With Lid
Material of Construction*	Corrugated Fibre Board
External Dimensions (mm)	620 x 410 x 95
Style of Box**	One piece tuck-in-type
No. of Plies	3.0
Type of Flutes	B (Narrow)
Direction of Flutes	Vertical
Grammage (g/m ²) Outer to Inner (Indicative)	250 / 150 / 150
Burst Factor of Paper (Kraft) (Minimum)	20.0
Bursting Strength of Board (Kg/cm ²) (Minimum)	11.0
No. of Pieces per Box	One
Manufacture's Joint	By gluing
Edge Crush (Kgf) (Minimum)	25.00
Compression Strength of Box (Kgf) (Minimum)	350
COBB (30 Minutes)*** (g/m ²) (Maximum)	60
No. of Ventilation Holes	16.00
Diameter (mm) & Position of Holes	20.00
Two Sides Each	3
Two Ends Each	1
Top & Bottom Each	4
or	Equivalent Ventilation

*Outer ply of white duplex board or bleached kraft

**Or any other suitable style which provides equal strength and performance

***Outer ply to be laminated or coated for water proofing



Cont...

Post Harvest Technology of Grapes

Storage:

- 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 are closed and shifted to cold storage rooms where the temperature and humidity are maintained at 0-2°C and 95% respectively.
- The arrangement of boxes in the cold storage to ensure uniform cooling of all berries in a box and all boxes is very important.

Cool Chain:

The various stages of the cool chain are:

1. 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 hold.
7. Off loading direct into a cold store in the receiving country.
8. Refrigerated truck to the customer



Major Insect Pests of Mango

Hopper (*Idioscopus clypealis*, *I. nitidulus* and *Amritodus atkinson*)

Damage:

- Most serious and widespread pest of mango.
- Nymphs and adult insects puncture and suck the sap of tender parts.
- Heavy puncturing and continuous draining of the sap causes curling and drying of the infested tissue.
- Secrets sweet sticky substance which facilitate the development of the fungus *Maliola mangiferae* (sooty mould).
- Hopper population shoots up in Feb-April and June-Aug.

Control:

- Three sprays of 0.15% Carbaryl or 0.04% Monocrotophos or 0.05% Phosphamidon or 0.05% Methyl Parathion are effective .
- First spray: at the early stage of panicle formation.
- Second spray: at full-length stage of panicles but before full bloom
- Third spray: after the fruits set at pea size stage
- **Biological control agents:** *Mallada boninensis*, *Chrysopa lacciperda*, *Beauveria bassiana*.



Damage:

- Nymphs and adults suck the plant sap and reduce the vigour of the plant.
- Secretes honey dew, facilitating sooty mould development.
- The female adult crawls down the tree in the month of April-May and enter in the cracks in the soil for laying eggs.
- Just after hatching, the minute newly hatched pink to brown coloured nymphs crawl up the tree.
- After climbing up the tree, they start sucking the sap of tender plant parts.

Control:

- Flooding of orchards with water in the month of October kills the eggs.
- Ploughing the orchards in the month of November exposes the eggs to sun's heat.
- Polythene bands of 400 gauge and 25 cm width fastened around the tree trunk have been found effective barrier to stop the ascent of nymphs to the trees.
- The band should be fastened well in advance before the hatching of eggs, i.e., during November- December.
- Application of 250 g per tree of Methyl Parathion 2% dust in soil around the trunk kills the newly hatched nymphs.
- Spraying of 0.05% Monocrotophos or 0.2% Carbaryl or 0.05% Methyl Parathion is useful in controlling young nymphs of the mealy bug.
- The entomogenous fungus *Beauveria bassiana* is found to be an effective bioagent in controlling the nymphs of this pest.



Damage:

- Most serious pest in export of fresh fruits.
- The female punctures the outer wall of the mature fruits with the help of its pointed ovipositor and insert eggs in small clusters inside the mesocarp of mature fruits.
- After hatching, the larva feeds on the pulp of fruit which appears normal from outside, but drops down finally.
- The mature maggots fall down into the soil for pupation. The emergence of fruitfly starts from April onwards and the maximum population is recorded during MayJuly, which coincides with fruit maturity.
- The population declines slowly from August to September after that it is non-existent up to March.

Control:

- Bait sprays of Carbaryl (0.2%)+protein hydrolysate (0.1%) or molasses starting at first week of April and repeated once after 21 days or hanging traps containing 100 ml water emulsion of Methyl Euginol (0.1%) + Malathion (0.1%) during fruiting is effective.
- Hot water treatment at 48°C for one hour can result in total control in Alphonso and Totapuri (IIHR, Bangalore).



Damage:

- Creates hindrance in export of fresh fruits.
- It is a common pest of mango in southern India. Varieties with high TSS and sugar such as Alphonso, Bangalora, Neelum, etc. are more prone to attack by this pest.
- Female lay eggs under the rind of ripening fruits.
- Newly emerged grubs bore through the pulp, feed on seed coat and later cause damage to cotyledons. Pupation takes place inside the seed.
- Pulp is discoloured around the affected portion.

Control:

- The pest population can be kept under check by destroying the affected fruits and exposing the hibernating weevils by digging the soil.
- Spraying the trees with Fenthion (0.01%) is found effective.
- In Alphonso and Banganapalli, a single spray of Monocrotophos 36 EC 1.5ml/litre of water at marble stage gave 100% and 97.5% control of stone weevil respectively. In Totapuri, Carbaryl 50 % WDP @ 4 g/ litre of water is effective in controlling stone weevil.



Damage:

- The grub of this beetle causes damage as it feeds inside the stems, boring upward resulting in drying of branches and in severe cases attacked stem is killed.
- Eggs are laid either in the slits of tree trunk or in the cavities in main branches and stems covered with a viscous fluid.
- Pupation takes place within the stem.
- Beetle emerges in July-August

Control:

- Cleaning the tunnel with a hard wire, pouring kerosene oil, creosote, petrol, crude oil or formalin and subsequently closing entrance of the tunnel with mud or plugging it with cotton wool soaked in any of the above substances kills the grub.



Post Harvest Technology of Mango

- **Harvesting** - Fruit should be harvested with utmost care either by hand with a clipper or harvester having 8-10 mm pedicle.
- **Desapping** – Invert the fruit in a desapper for about 25 – 30 minutes for complete removal of sap.



Post harvest treatment

- Hot water treatment -
 - Hot water at $52\pm 1^{\circ}\text{C}$ supplemented with Prochloraz (0.1%) for 10 min for diseases control
 - At $48\pm 1^{\circ}\text{C}$ for 40 min for fruit fly control
- Vapour heat treatment
 - Temperature of the treatment chamber shall be raised step by step to 50°C for 20 minutes. — for export to Japan
- Irradiation
 - At 400 Grays using Cobalt-60. —



Vapour heat treatment system

Packaging

- Use of good packaging material
(Corrugated Fiber Board)

Dimensions of box

- Alphonso (320x230x90 mm)
- Banganpalli (390x260x115 mm)
- Chausa (390x280x105 mm)



Packaging Specifications for Mango Export

Corrugated Fibreboard Box

Capacity: 6 nos.

A. Minimum Specifications

Material of Construction*	Corrugated Fibre Board	Corrugated Fibre Board	Corrugated Fibre Board	Corrugated Fibre Board
External Dimensions (mm)				
Alphonso	225 x 170 x 90	225 x 170 x 90	225 x 170 x 90	225 x 170 x 90
Kesar	225 x 170 x 100	225 x 170 x 100	225 x 170 x 100	225 x 170 x 100
Dusheri	200 x 200 x 95	200 x 200 x 95	200 x 200 x 95	200 x 200 x 95
Banganpalli	230 x 180 x 100	230 x 180 x 100	230 x 180 x 100	230 x 180 x 100
Chausa	230 x 185 x 100	230 x 185 x 100	230 x 185 x 100	230 x 185x 100
Style of Box**	RSC - 0201	Telescopic - 0300	Telescopic - 0306	Telescopic - 0312
No. of Plies	3.0	Lid - 3 Tray - 3	Lid - 3 Tray - 3	Lid - 3 Tray - 3
Type of Flutes	B (Narrow)	Lid B (Narrow) Tray B (Narrow)	Lid B (Narrow) Tray B (Narrow)	Lid B (Narrow) Tray B (Narrow)
Direction of Flutes	Vertical	Vertical	Vertical	Vertical
Grammage (g/m ²) Outer to Inner (Indicative)	250 / 150 / 150	Lid : 250/150/150 Tray : 250/150/150	Lid : 250/150/150 Tray : 250/150/150	Lid : 250/150/150 Tray : 250/150/150
Burst Factor of Paper (Kraft) (Minimum)	20.0	20.0	20.0	20.0
Bursting Strength of Board (Kg / cm ²) (Minimum)	11.0	Lid : 11.0 Tray : 11.0	Lid : 11.0 Tray : 11.0	Lid : 11.0 Tray : 11.0
No. of Pieces Per Box	Not more than two	Not more than two	Not more than two	Not more than two
Manufacture's Joint	By gluing	By gluing	By gluing	By gluing
Compression Strength of Box (Kgf) (Minimum)	350	350	350	350
Cobb (30 Minutes)*** (g/m ²) (Maximum)	60	60	60	60
No. of Ventilation Holes	16.0	16.0	16.0	16.0
Diameter (mm) and Position of Holes	20.0	20.0	20.0	20.0
Two Sides Each	3	3	3	3
Two Ends Each	1	1	1	1
Top & Bottom Each	4	4	4	4

B. Recommended Specifications

Edge Crush (Kgf) (Min)				
Alphonso	43.00	43.00	43.00	43.00
Kesar	38.00	38.00	38.00	38.00
Dusheri	38.00	38.00	38.00	38.00
Banganpalli	42.00	42.00	42.00	42.00
Chausa	33.00	33.00	33.00	33.00



6 nos.



9 nos.



12 nos.

*Outer ply of white duplex board or bleached kraft

**Or any other suitable style which provides equal strength and performance

***Outer ply to be laminated or coated for water proofing

Specifications developed by IIP for APEDA

Storage



- Fruits are stored in a cold room having a temperature range of 10 – 15°C, and 85 – 90 % RH, according to variety .
- The controlled atmosphere (CA) refrigerated containers for long term storage and shipment of mangoes (up to 4 weeks).
(CO₂ and O₂ both @ 5%)



Ripening

- Ripening of fruit by ethylene gas,
 - Either direct from cylinder as liberated from catalytic generator (100 ppm).
 - Ethephon / ethrel at $52 \pm 1^\circ\text{C}$ for 5 min (250 - 750 ppm)



Ripening chamber

Process flow chart in pack house

Receipt of fruit at pack house

Desapping (25-30 min)

Washing

Hot water and fungicide treatment ($52\pm 1^{\circ}\text{C}$ for 10 min)

Drying (forced hot air at 40°C)

Sorting and grading

Packing and cooling

Pre cooling (10°C)

Palletization and storage (cold storage- $10-15^{\circ}\text{C}$)

Container loading

Transportation



Fruit Specifications for Export





FRUITS AND VEGETABLES GRADING AND MARKING RULES, 2004

(TO BE PUBLISHED IN THE GAZETTE)

EXTRACT FROM THE GAZETTE OF INDIA; PART II, SECTION 3, SUB SECTION (i)

Appearing on Page Nos.....

Dated

MINISTRY OF AGRICULTURE
DEPARTMENT OF AGRICULTURE AND CO-OPERATION

NOTIFICATION

New Delhi, dated the 2004

G.S.R Whereas the draft of the Fruits and Vegetables Grading and Marking Rules, 2003 were published as required by section 3 of the Agricultural Produce (Grading and Marking) Act, 1937 (1 of 1937) at pages 2065-2132 of the Gazette of India, Part II, Section 3, Sub section (i) dated 20-9-03 vide GSR 335, dated 3rd September, 2003 for inviting objections and suggestions from all persons likely to be affected thereby;

And whereas copies of the said Gazette were made available to the public on 21st September, 2003;

And whereas the objections and suggestions received from the public in respect of the said draft rules have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by Section 3 of the Agricultural Produce (Grading and Marking) Act, 1937 (1 of 1937), and in supersession, of (1) the Grapes grading and Marking Rules, 1937, (2) the Plums Grading and Marking Rules, 1938, (3) the Onion Grading and Marking Rules, 1964, (4) the Banana Grading and Marking Rules, 1980, (5) the Mangoes Grading and Marking Rules, 1981, (6) the Pineapple Grading and Marking Rules, 1982, (7) the Guavas Grading and Marking Rules, 1996 and (8) the Garlic Grading and Marking Rules, 02, except as respects things done or omitted to be done before such supersession the Central Government hereby makes the following rules, namely:-





Rules

1. Short title, application and commencement:-

- (i) These rules may be called the Fruits and Vegetables Grading and Marking Rules, 2004.
- (ii) They shall apply to commercial varieties of Fruits and Vegetables.
- (iii) They shall come into force on the date of their publication in the Official Gazette.

2. Definitions:-In these rules, unless the context otherwise requires,-

- (i) "Agricultural Marketing Adviser" means the Agricultural Marketing Adviser to the Government of India;
- (ii) "Authorised packer" means a person or a body of persons who has been granted a certificate of authorisation to grade and mark Fruits and Vegetables in accordance with the grade standards and procedure prescribed under these rules;
- (iii) "Certificate of Authorisation" means a certificate issued under the provisions of the General Grading and Marking Rules, 1988 authorising a person or a body of persons to grade and mark Fruits and Vegetables with the grade designation mark;
- (iv) "General Grading and Marking Rules" means the General Grading and Marking Rules, 1988 made under section 3 of the Agricultural Produce (Grading and Marking) Act, 1937 (1 of 1937);
- (v) "Grade designation" means a designation prescribed as indicative of the quality of Fruits and Vegetables;
- (vi) "Grade designation mark" means the "Agmark Insignia" referred to in rule 3;
- (vii) "Schedule" means a Schedule appended to these rules.

3. **Grade designation mark.**- The grade designation mark shall consist of "AGMARK insignia" consisting of a design incorporating the certificate of authorisation number, the word "AGMARK", name of commodity and grade designation resembling the design as set out in Schedule- I.

4. **Grade designation and Quality.**- The grade designation and quality of Fruits and vegetables shall be as set out in Schedules II to XIX.





Cont...

Method of Packing

5. Method of packing:-
- (i) Fruits and Vegetables shall be packed in such a way as to protect the produce properly.
 - (ii) The materials used inside the package must be new, clean and of such a quality as to avoid causing any external or internal damage to the produce.
 - (iii) The use of materials particularly of paper or stamps bearing trade specifications is permitted provided the printing or labelling has been done with non toxic ink or glue.
 - (iv) Fruits and Vegetables shall be packed in each container in compliance with the recommended international code of practice for Packaging and Transport of Tropical Fresh Fruit and Vegetables (CAC/RCP 44-1995) of practice for export and as per the Instructions issued by the Agricultural Marketing adviser from time to time for domestic market.
 - (v) The containers shall meet the quality, hygiene, ventilation and resistance characteristics to ensure suitable handling, shipping and preserving of the Fruits and Vegetables. Packages must be free of harmful foreign matter and obnoxious smell.
 - (vi) Contents of each package or lot must be uniform and contain only Fruits and Vegetables of same origin, variety and grade designation.
 - (vii) The visible part of the contents of the package (if present) must be representative of the entire content.
 - (viii) Contents of package may have different fruits and vegetables of different grades as per buyer's requirements with proper labelling





Cont...

Method of Marking and Labeling

(i) The grade designation mark shall be securely affixed to or printed on each package in a manner approved by the Agricultural Marketing Adviser or an officer authorised by him in this behalf.

(ii) The following particulars shall be clearly and indelibly marked on each package, namely:-

(a) Name of the commodity;

(b) Variety;

(c) Grade designation;

(d) Size code (if prescribed);

(e) Lot/batch/code number;

(f) Country of origin;

(g) Net weight/No. of units;

(h) Name and address of the packer/exporter;

(i) Best before date (where applicable);

(j) Storage condition, if any;

(k) Date of packing;

(l) Such other particulars as may be specified by the Agricultural Marketing Adviser.

(iii) The ink used for marking on packages shall be of such quality which may not contaminate the product.

(iv) The authorised packer may, after obtaining the prior approval of the Agricultural Marketing Adviser, mark his private trade mark or trade brand on the graded packages provided that the same do not indicate quality other than that indicated by the grade designation mark affixed to the graded packages in accordance with these rules.





Cont...

Method of Marking and Labeling

7. Fruits and Vegetables may be graded and marked as per buyer's requirements for exports provided the minimum requirements specified in the relevant schedule are met.
8. For domestic trade, Fruits and Vegetables shall comply with the residue levels of heavy metals, pesticides, aflatoxin and other food safety parameters as specified in Prevention of Food Adulteration Rules, 1955.
9. Special conditions of certificate of authorisation:-In addition to the conditions specified under sub-rule (8) of the rule 3 of the General Grading and Marking Rules, 1988, every authorised packer shall follow all instructions prescribed by Agricultural Marketing Adviser from time to time.



SCHEDULE-I (See rule 3)



SCHEDULE - II

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 or 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.**

Foot Note : Pigmentation due to sun is not a defect.



3. Criteria for Grade Designation

Grade designation	Grade Requirements	Provision concerning sizing	Grade tolerances
Extra class	Grapes must be of superior quality. The bunches must be typical of variety in shape, development and colouring 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 for 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 colouring. 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. 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 colouring	do	10% by weight of bunches not satisfying the requirements for the grade, but meeting those of Class II grade or exceptionally coming within the tolerances of that grade.
Class II	The bunches may show defects in shape, development and colouring provided these do not impair the essential characteristics of the variety. The berries must be sufficiently 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 colouring, - slight sun scorch affecting the skin only, - slight bruising, - slight skin defects.	do	



4. Other Requirements

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'-----

PROVISIONS CONCERNING SIZING

Size is determined by the weight of bunches (in g) The following minimum (in g) 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.



Export Specifications for Grapes



Sharad Seedless



Flame Seedless



Thompson Seedless

Variety	Countries		
	Middle East	Holland/ Germany	U.K.
Thompson Seedless	Berry Size: 15mm Colour: amber	Berry Size: 16mm Colour: white/amber	Berry Size: 18mm white
Sharad Seedless	Berry Size: 15mm black	Berry Size: 16mm black	Berry Size: 18mm black
Flame Seedless	---	Berry Size: 16mm pink	Berry Size: 18mm pink
Packing	1 Kg	4.5 Kg /9 kg	4.5 Kg /9kg
Storage Temp.	0-1 °C	0-1 °C	0-1 °C



Grape Export Suffered a Loss of Rs. 250 crores during July 26, 2006

- ◆ Export of grapes, mainly from the Maharashtra, suffered a loss of Rs **250 crores** after the EU Countries refused to accept the consignments due to chemical residue.
- ◆ The rejected grapes were alleged to have residue of **chlormequat chloride (CCC)**, a growth hormone being used for many years by the grape growers in India.
- ◆ As per the new norms, **0.05 milligram per kilogram** is the new permissible residue level for farmers exporting to EU countries as against the **earlier limit of 1.6 mg per kg.**





GRADE DESIGNATION AND QUALITY OF MANGOES

1. Mangoes shall be fruits obtained from Varieties (cultivars) of plant *Mangifera indica* L. of Anacardiaceae family.

2. MINIMUM REQUIREMENTS

(i) Mangoes shall be:-

- (a) whole, firm, sound and fresh in appearance. Produce affected by rotting or deterioration such as to make it unfit for consumption is excluded;
- (b) clean, practically free of any visible foreign matter;
- (c) free of black necrotic stains or trails;
- (d) free of marked bruising;
- (e) free of abnormal external moisture, excluding condensation following removal from cold storage;
- (f) free from damage caused by low/or high temperature;
- (g) free of any foreign smell and/or taste;
- (h) free of damage caused by pests;
- (i) sufficiently developed and display satisfactory ripeness;
- (ii) When a peduncle is present, it shall not be no longer than 1.0 cm.
- (iii) Mangoes 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.



Grading

Grade designation	Grade Requirements	Grade tolerances
Extra class	Mangoes must be of superior quality. They must be characteristic of the variety. They must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearances of the produce, the quality, the keeping quality and presentation in the package.	5% by number or weight of mangoes not satisfying the requirements for the grade, but meeting those of Class I or exceptionally, coming within the tolerances of that grade.
Class I	Mangoes must be of good quality. They must be characteristic of the variety. Mangoes may have following slight defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package. <ul style="list-style-type: none"> - slight defects in shape; - slight skin defects due to rubbing or sunburn, suberized stains due to resin exudation (elongated trails included) and healed bruises not exceeding 2,3,4,5 sq. cm. for size groups A, B, C, D respectively 	10% by number or weight of mangoes not satisfying the requirements for the grade, but meeting those of Class II grade or, exceptionally coming within the tolerances of that grade.
Class II	This grade includes mangoes which do not qualify for inclusion in the higher grades, but satisfy the minimum requirements. Mangoes may have following defects, provided they retain their essential characteristics as regards the quality, keeping quality and presentation. <ul style="list-style-type: none"> - defects in shape, - slight skin defects due to rubbing or sunburn, suberized stains due to resin exudation (elongated trails included) and healed bruises not exceeding 4,5,6,7 sq. cm. for size groups A, B, C, D respectively 	10% by number or weight of mangoes not satisfying the requirements of the grade, but meeting the minimum requirements.

Foot note : In Class I and Class II, scattered suberized rusty lenticels, as well as yellowing of green varieties due to exposure to direct sunlight, not exceeding 40% of the surface and not showing any signs of necrosis are allowed



4. Other Requirements

- ❑ The development and condition of the mangoes must be such as to enable them:
 - To ensure a continuation of the maturation process until they reach the appropriate degree of maturity corresponding to the varietal characteristics,
 - To withstand transport and handling, and
 - To arrive in satisfactory condition at the place of destination.

5. Provisions Concerning Sizing

- ❑ Size is determined by the weight of the fruit, in accordance with the following table:

Size Code	Weight (in grams)	Maximum permissible difference within the package (in grams)	between fruits
A	100-200	50	
B	201-350	75	
C	351-550	100	
D	551-800	125	



Size Tolerances

For all grades, 10% by number or weight of mangoes in each package are permitted to be outside (above or below) the group size range by 50% of the maximum permissible difference for the group. In the smallest size range, mangoes must not be less than 90 gms. and for those in the largest size range a maximum of 925 grams applies, as follows:

Size Code	Normal size range	Permissible size range. ($<10\%$ of fruit/ fruit in each package exceeding the normal size range).	Max. permissible difference between fruit in each package
A	100-200	90-220	50.0
B	201-350	180-425	112.5
C	351-550	251-650	150
D	551-800	426-925	187.5

Export Specifications for Mangoes



Alphonso



Kesar

Variety	Countries				
	Middle East	Netherlands / Germany	U.K.	Japan	USA
Alphonso	Wt: 200-250gm	Wt: 250-300gm	Wt: 250-300gm	Wt : 250-300gm	Wt : 250-300gm
Kesar	Wt: 200-250 gm	Wt: 225-250 gm	Wt: 225-250 gm	Wt : 250-300 gm	Wt : 250-300 gm
Packing	1 Doz/2.5 kg	1 Doz/2.5 kg	1Doz/2.5 kg	1 doz/ 3.5 kg	1 Doz/3.5 kg
Storage Temperature	13°C	13°C	13°C	13°C	13°C
Export	By Sea	By Air	By Air	By Air	By Air

Source: Maharashtra State Agriculture Marketing Board. Website (Jan, 2009)

Export Specifications for Banana



Grand Naine

Variety	Countries
	Middle East
Grand Naine Cavendish	Colour : Green, Weight of Bunch : 2.5 Kg Fruits preferably straight
Packing	13 Kg
Storage	13-14 °C
Transport	By Sea

Source: Maharashtra State Agriculture Marketing Board. Website (Jan, 2009)

Export Specifications for Pomegranate



Arakta



Ganesh

Variety	Countries		
	Middle East	Netherlands / Germany	U.K.
Ganesh, Bhagwa	300-450 gm Red	250-300 gm Red	250-300 gm Red
Arakata, Mrudula	200-250 gm Deep red	200-250 gm Deep red	200-250 gm Deep red
Packing	5 kg	3 kg	3 kg
Storage	5 °C	5 °C	5 °C
Export	By Sea	By Sea	By Sea

Source: Maharashtra State Agriculture Marketing Board. Website (Jan, 2009)

Export Specifications for Vegetables

- ❑ Major export mode: air
- ❑ Major export target area: Middle east and Gulf countries

Commodity	Parameters for Export
Commodity	Parameters for export
Okra	3-5 inch length, green tender, packing 5 kg
Tondali	1-2 inch length, green tender, packing 5 Kg
Bottle Gourd	12 inch length, greenish tender, straight, packing 5 Kg
Peas	5-6 inch length, green tender, straight, packing 5 Kg
Gawar	4-5 inch length, not over matured, packing 5 Kg
Suran	Cleaned, weighing around 5-10 Kg
Green Chilli	3-4 Inch length, green, packing 5 Kg
Drum Sticks	24 Inch length, straight, thick, packing 5 Kg
Lime	20-25 mm, green, packing 5 Kg gunny bags, 20 kg wooden boxes.
Mode of Transport	By Air or By Sea

Source: Maharashtra State Agriculture Marketing Board. Website (Jan, 2009)



Good Agricultural Practices

How is GAP related to the Concept of Best Practices?:

Among a wide range of Good Practice Options, the **“Best”** practices are related to the identification of practices **“more suitable”** to the characteristics (environmental, social, economical *etc.*) of the farm and the crop growing regions.





GAP Definition by FAO definition

Good Agricultural Practices are a **Collection of principles to apply for on-farm production and post-production processes, resulting in safe and healthy food and non-food agricultural products, while taking into account **economical, social and environmental sustainability**.**

“FAO Committee on Agriculture (COAG) 2003 GAP paper”

Good Agricultural Practices were first presented to the FAO Committee on Agriculture (COAG) in 2003





Four Pillars of GAP

Economic Viability

Environmental Sustainability

Social Acceptability

Food Safety and Quality



GLOBALGAP

- **Formerly** known as **EUREPGAP** – more than 100 countries are members.
- **EurepGAP** initiated in **1997**.
- **1st** version was released in Europe in **2001**.
- **EurepGAP** changed to **GlobalGAP** in **2007**
- The **GlobalGAP** for **Fruits & Vegetables** in under implementation since **1997**.
- **GLOBALGAP** is the **fresh produce food standards set by Europe's leading Food Retailers to give their Customers more assurance of Food safety.**
- **Only Certified Growers can supply Produce to the retailers.**





What is GLOBALGAP ?

- Is a **Private Body** that set out **Voluntary Standards**.
- These **Standards are Reference** for GAP, which is **managed by the GLOBALGAP Secretariat**.
- **Food PLUS GmbH**: a non-profit industry owned and governed organization, **legally represents the GLOBALGAP Secretariat**. (private company called in Germany, GmbH = *Gesellschaft mit beschränkter Haftung* means a 'company with limited liability')
- **Provides standards and framework** based on EN45011 or **ISO/IEC Guide 65**. (Certification of the production process cropping, growing, rearing, or producing- of products)
- **Membership of GLOBALGAP**: **Retailer, Supplier and Associate**





Indian National Programme for Good Agricultural Practices

IndiaGAP





Quality Council of India
Working for "National Well Being"

Good Agricultural Practices (GAP) Voluntary Certification Scheme

Draft

1.	VOLUNTARY CERTIFICATION SCHEME FOR IndGAP : CERTIFICATION PROCESS FOR BASIC REQUIRMENT	
2.	VOLUNTARY CERTIFICATION SCHEME FOR IndGAP : CERTIFICATION PROCESS	
3.	VOLUNTARY CERTIFICATION SCHEME FOR GAP REQUIREMENTS FOR CERTIFICATION BODIES	
4.	VOLUNTARY CERTIFICATION SCHEME FOR IndGAP : GROUP CERTIFICATION PROCESS	
5.	GOOD AGRICULTURAL PRACTICES - BASIC REQUIREMENTS	
6.	IndGAP (Good Agricultural Practices)	



IndiaGAP

- Draft is prepared by APEDA/ BIS- and released in 2012 .
- ISO is the reference for draft.



भारतीय मानक ब्यूरो ने 'उत्तम कृषि व्यवहार रीतियों की अपेक्षाएँ - भारतगैप - फसल आधारित' विषय पर एक भारतीय मानक (आईएस 15930 (भाग 1) : 2010) प्रकाशित किया है... यह भारतीय मानक 29 जून 2011 को भारतीय मानक ब्यूरो, मुख्यालय, नई दिल्ली में डॉ. एस. अय्यप्पन, सचिव (कृषि अनुसंधान एवं शिक्षा विभाग) एवं महानिदेशक (भारतीय कृषि अनुसंधान परिषद) द्वारा औपचारिक रूप से जारी किया गया



Need for IndiaGAP

- ❖ **Demand for safe food**
- ❖ **Uniform farming practices**
- ❖ **Improve soil fertility and environment**
- ❖ **Increasing competition**
- ❖ **Recognition of farmers**





Products Covered

- **Fresh fruits and vegetables**
- **Plantation crops**
- **Food grains**
- **Spices**
- **Nuts**
- **Oil seeds**
- **Medicinal Plants**





Major Benefits of IndiaGAP

- ❖ Uniform approach to good practices
- ❖ Group certification helps small / marginal farmers
- ❖ Development of farm infrastructure
- ❖ Improvement in environment and soil fertility
- ❖ Availability of safe and healthy food
- ❖ Employment generation
- ❖ Increased competitiveness (value addition, credibility)
- ❖ Better returns to farmers





Essential Components

- ❖ **Title, Effective Date and Scope**
- ❖ **Verification System**
 - **19 Broad Parameters** (115 compliance requirements)
 - **40 major criteria**
 -
 - **53 minor criteria** **ions**
- ❖ **Graded pattern of IndiaGAP certification**

<u>Category</u>	<u>Major</u>	<u>Minor</u>
IndiaGAP – A	100%	90%
IndiaGAP – B	100%	80%
IndiaGAP – C	100%	75%





EurepGAP Components absent in IndiaGAP

- ❖ **10 components - 1 major, 3 minor and 6 reco (reconciliation).**
- ❖ **Chapter on substrates – soilless culture and substrate recycling is not practiced widely in India**
- ❖ **Risk assessment to promote safe and healthy working conditions**
- ❖ **Evidence of accident procedure within 10 m of crop protection store.**
- ❖ **Consideration to conversion of unproductive sites into conservation areas**





IndiaGAP Components absent in EurepGAP

- ❖ 29 components – 2 major, 17 minor and 10 reco.
- ❖ **Major** – provision for micro nutrients addressed and check for metallic toxicity
 - check for maturity standards before harvest
- ❖ **Minor** – grower awareness, use of weedicides, prevention of soil erosion, application of micro nutrients, maintenance of irrigation equipments, permeability of rain water, drainage facilities, implementation of SAU / NRC recommendations, procedures for harvesting & post-harvest procedures, loading and transportation
- ❖ **Reco** – Stock-scion compatibility, plant density, inter-cultural operations, water harvesting, drain water analysis.





Control Points and Compliance Criteria

1. **Site Record**
2. **Land**
3. **Grower's Record**
4. **Seeds and Plants**
5. **Nursery**
6. **Cultural Practices**
7. **Transplanting**
8. **Manures and Manuring**
9. **Irrigation**

10. **Drainage System**
11. **Crop Protection**
12. **Crop Maturity**
13. **Harvesting**
14. **Post Harvest Handling**
15. **Packaging**
16. **Loading & transport**
17. **General**
18. **Environmental Issues**
19. **Complaint Procedure**





Steps proposed for implementation

- ❖ Common objectives of the 3 Ministries: **MoA & FW, MoFPI & MoC**
- ❖ Roles of the Ministries
 - **MoA -- Group farming, infrastructure, model farms, POP, accreditation Training of KVKs / NGOs / Agric-graduates.**
 - **MoFPI**
 - **Assist Manufacturers / Retailers for Backward linkages, integrated supply chain, Consumer awareness**
 - **MoC-- Assist exporters of Fresh / Processed foods, promote IndiaGAP abroad, traceability, provide Tech. Asst. to LDCs / SAARC / CIS / other countries**





Key areas of concern when implementing a GAP programme

- ✓ **Prior land use**
- ✓ **Adjacent land use**
- ✓ **Water quality and use practices**
- ✓ **Soil fertility management**
- ✓ **Wildlife, pest, and vermin control**
- ✓ **Worker hygiene and sanitary facilities**
- ✓ **Harvesting and cooling practices**



Prerequisite Programmes



are the basis for implementing Quality and Safety Assurance programmes



GAP

Good Agricultural Practices GAP

GAP includes **practices that have to be followed at the primary production**, in order to ensure a **Safe and wholesome product** whilst also minimizing the negative impact of those practices on the **Environment** and on **Workers' Health**.





GMP

Good Manufacturing Practices

GMP includes practices oriented to the prevention and control of hazards associated to the fresh fruits and post-harvest chain, ensuring a safe and wholesome product, whilst also minimizing the negative impact of those practices on the environment and on workers' health.



GHP

Good Hygiene Practices

Practices oriented to ensure the safety and aptitude throughout the food chain, with emphasis in prevention and control of microbiological hazards.



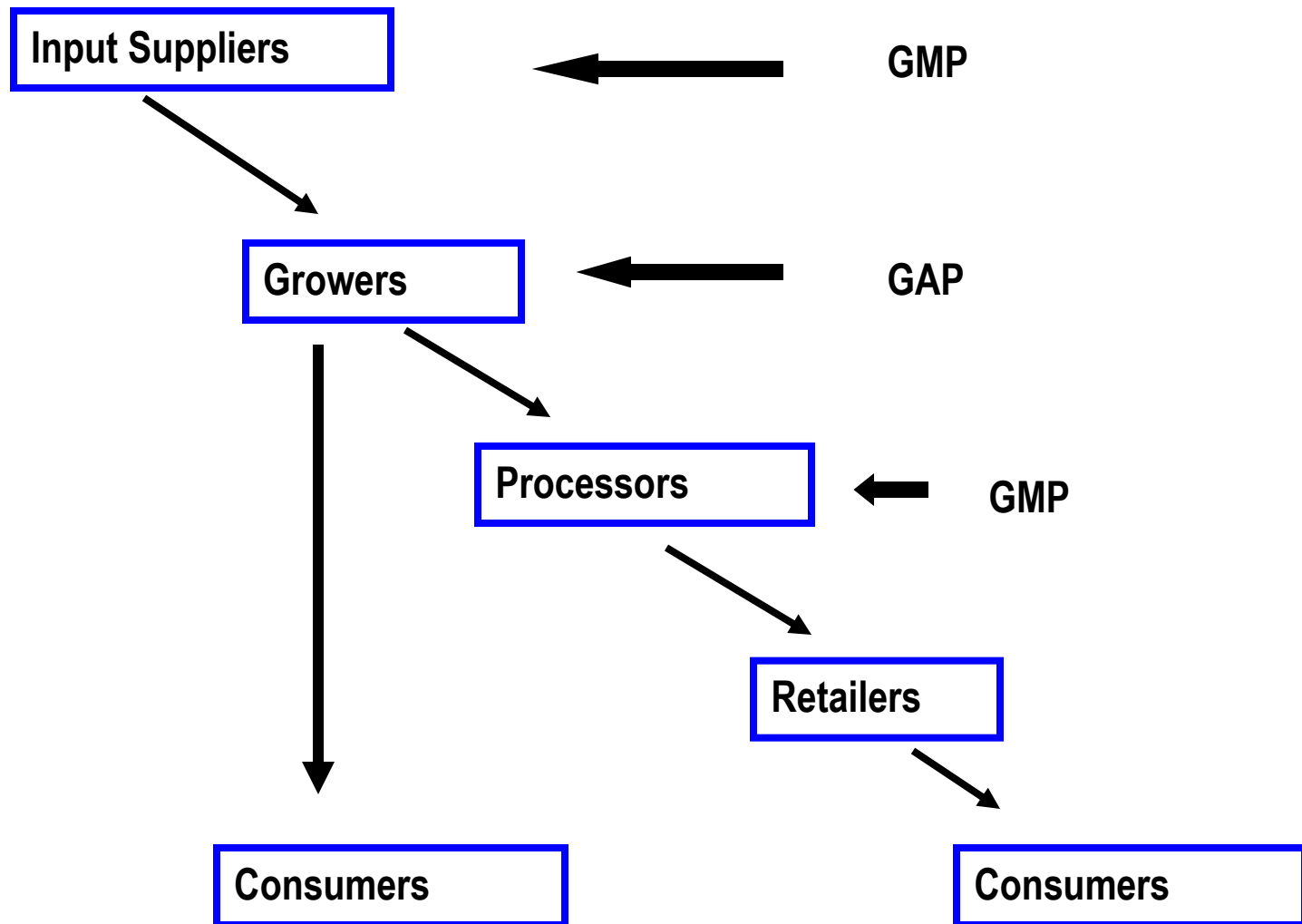
In practical terms.....

..... GAP, GMP and GHP have been incorporated into the code of practices and protocols for certification under a generic concept of **Good Agricultural Practices.**





Food chain





Under EurepGap/ GlobalGap, there are about fifteen selected agricultural components to be adhered to which are listed below:

1. Traceability
2. Record keeping
3. Varieties and Rootstocks
4. Site history and Management
5. Soil and substrate management
6. Fertilizer use
7. Irrigation and Fertigation
8. Crop Protection
9. Harvesting
10. Produce handling
11. Waste and pollution
12. Worker Health and safety
13. Environmental Issues
14. Complaint form
15. National Legislation

GAP Certification Agencies in India

- **Eurocert India,**
- **Foodcert India (p) Ltd,**
- **IMO Control Private Ltd,**
- **Control Union Inspections India Pvt Ltd,**
- **Skal International India and**
- **SGS**



Experience on Mango

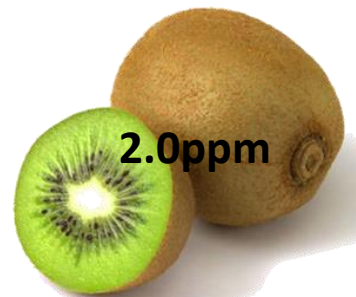
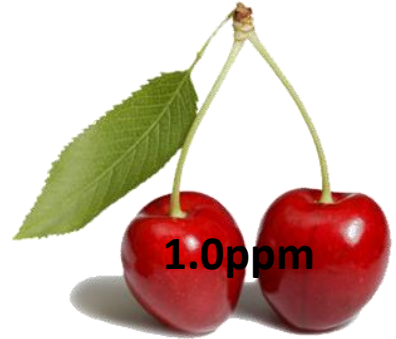




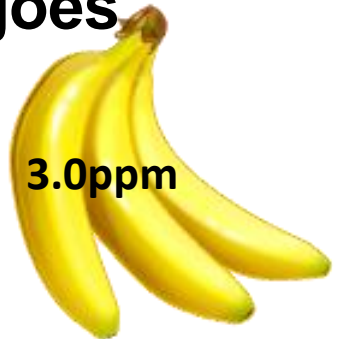
- **September, 2004, Japan one of the major Philippine mango export market, lowered the maximum residue level of chlorpyrifos (toxic substance found in some pesticides) for Philippines fresh mangoes from 0.5 ppm to 0.05 ppm.**
- **Perceived to be arbitrary as seen in the different MRLs on other fruits being imported by Japan.**



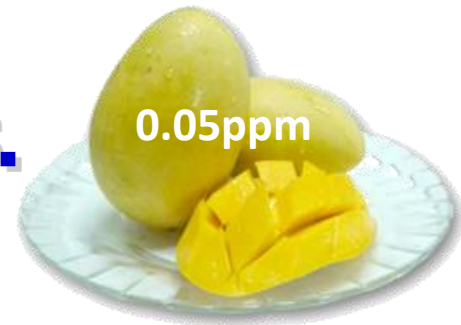
MRL of fruits that are directly consumed without peeling



MRL of fruits that are peeled and scooped before eating like mangoes



VS.



Source: Japan Ministry of Health, Welfare and Labor



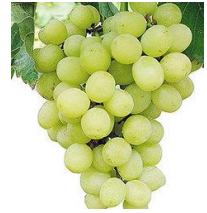
Setback in Export of Fresh Grapes

THE HINDU
BusinessLine

Agri Business

Grape exports to EU may turn sour this year

Chitra Narayanan Updated on March 12, 2018



- ◆ March to May are the peak months for export of Indian grapes to the EU (70% of total). And, India is the only country capable of feeding the EU market in those months. Hence, both parties want to avoid a repeat of last year.
- ◆ In 2010, Indian grape exports faced a setback, with EU reluctant to accept Indian table grape consignments as **Chloromequat chloride** — a plant growth regulator — was detected in excess of the prescribed maximum residue level (MRL).
- ◆ In 2009, EU had come up with new regulations on pesticides, raising the chemicals to be monitored from 98 to 167. Unaware of the changed rules, Indian exporters who did not meet the new standards, faced rejection.



Food Research International

44(1):397–403

- **New Generation Fungicides that have been recently introduced in Viticulture:**
 - benalaxyl,
 - benalaxyl-M,
 - boscalid,
 - cyazofamid,
 - famoxadone,
 - fenamidone,
 - fluquinconazole,
 - iprovalicarb,
 - pyraclostrobin,
 - trifloxystrobin and
 - zoxamide)
- fungicides does not cause problems of public concern in health and environmental





✓ **Mandatory accreditation of the farms and packaging stations of all exporters and growers.**

✓ **Department of Agriculture / Bureau of Plant Industry Quarantine Service also assigned code for each farmer which is reflected in the final cartons for export, this is now the traceability code.**



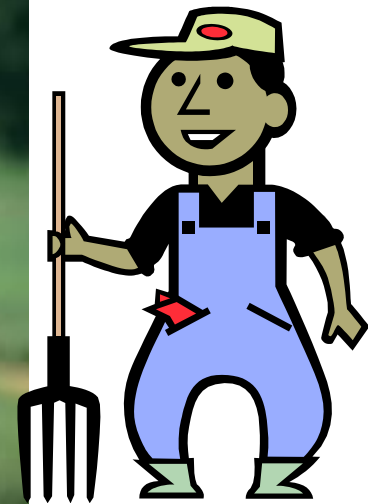


✓ **BPI Plant Quarantine Inspectors are assigned to Monitor the Proper use of Accredited Chemicals.**

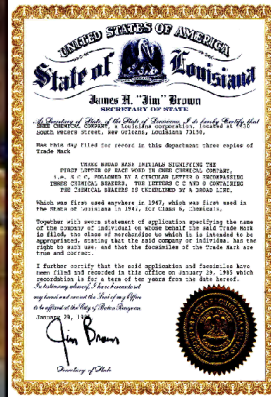
✓ **Phytosanitary Certificate is issued to the Exporter after Inspection in the Respective Packing Houses.**



Only authorized skilled, trained and properly equipped spraying teams will be allowed to undertake spraying. During spraying farmers/ Growers presence is be ensured at all times.



Resellers of chemicals will be accredited and screened to ensure that chemicals are not adulterated or tainted.





Waiting Period of some Plant Protection Chemicals

Crop	Pesticide/ Fungicide	Use to control	Waiting period (days)
Apple	Fenazaquin 10EC	Mites	30
	Propsgite 57EC	Mites	9
	Spiromesfin 0.03%	Mites	30
	Quinalphos 25EC	Wolly aphid	-
	Aureofungin (46.15% W/V)	Powdery mildew	-
	Bitertanol 25%WP	Scab	30
	Captan 75%WP	Scab and Fly speck	8
	Chlorothalonil 75% WP	Scab	45
	Difenoconazol 25%EC	Scab	14
	Dodine 65%WP	Scab	21
Walnut	Dinocap 48%EC	Powdery mildew	21
	Carbendazim 50%WP	Downy leaf spot	-
Grape	Chlorothalonil 75% WP	Anthracnose and Downy mildew	60
	Dinocap 48%EC	Powdery mildew	21
	Hexaconazol 2% SC	Powdery mildew	14
Peach	Dinocap 48%EC	Powdery mildew	45
Apricot	Dimethoate 30% EC	Aphid	-





Maximum pesticide residue limits

Pesticide	MRL (ppm)	Year of adoption
Abamectin	0.02	2001
Dimethomorph	0.05	2008
Chlorpyrifos-Methyl	0.06	2010
Cypermethrins (including alpha- and zeta- cypermethrin)	0.07	2009
Deltamethrin	0.2	2004
Meptyldinocap *	0.3	2011
Chlorpyrifos	0.3	2003
Glufosinate-Ammonium	0.3	2013
Fluopyram	0.4	2013
Dinocap	0.5	2003
Imidacloprid	0.5	2009
Acetamiprid	0.5	2012
Sulfoxaflor	0.5	2013
Malathion	1	
Trifloxystrobin	1	2013
Pyraclostrobin	1.5	2012
Spirodiclofen	2	2010
Cyprodinil**	2	2005
Penthiopyrad	3	2013
Boscalid	3	2010
Cycloxydim	3	2013
Buprofezin	3	2010
Pyrimethanil **	3	2008
Chlorothalonil	5	2011
Hexythiazox	6	2013
Azoxystrobin	10	2009
Fenhexamid	10	2006
Captan	15	2008



Grape Growing Regions in India

• Temperate Region

- Consists of the areas of sub-Himalayan Region (Himachal Pradesh, Jammu & Kashmir)

• Sub-tropical Region

- Covers states of Punjab, Haryana, Rajasthan, Delhi, Western U.P., Mizoram, Manipur

• Tropical region

- Hot Tropical areas: Mid Maharashtra, North Karnataka and Telangana region of Hyderabad
- Mild Topical areas: South Karnataka and Tamil Nadu

GRAPE-GROWING STATES

Figures for 2013-14	Area '000 hectares	Production '000 tonnes
Maharashtra	90	2,050
Karnataka	20	321
Tamil Nadu	3	43
Andhra Pradesh	2	32
Mizoram	2	21
Others	1	17
Total	118	2,483

Source: National Horticulture Board



Period of Availability of Fresh Grapes

State(s)	Period of availability of grapes	Peak season
Maharashtra, Karnataka and Andhra Pradesh	Mid-December to May	February to March
Tamil Nadu	Mid -December to Mid- April	February to March
Punjab and Haryana	First to third week of June	Mid June





Constraints in Grape Production

- High incidence of disease like downy mildew and anthracnose, especially under tropical conditions where most of grape cultivation in India takes place
- High frequency of application of pesticides *etc.* and their residues in berries
- Existence of heavy clay, saline and alkaline soils especially in Maharashtra and in North Karnataka
- Formation of pink berries in white grape cultivars
- Non-availability of enough planting material grafted on rootstocks tolerant to salinity/ alkalinity and drought
- Interference of monsoon rains in ripening of grapes under north Indian conditions
- Disease & pest forecasting and advisory services
- Water scarcity in grape growing areas
- Heavy initial investment on establishment of vineyards



Major Problems in Sub-Tropics

- Pre-monsoon showers causing berry raking and rotting
- Non availability of early maturing varieties
- Faulty pruning practices
- Imbalanced fertilizer application
- Micro-nutrient deficiencies
- Rootstocks not in use in NI

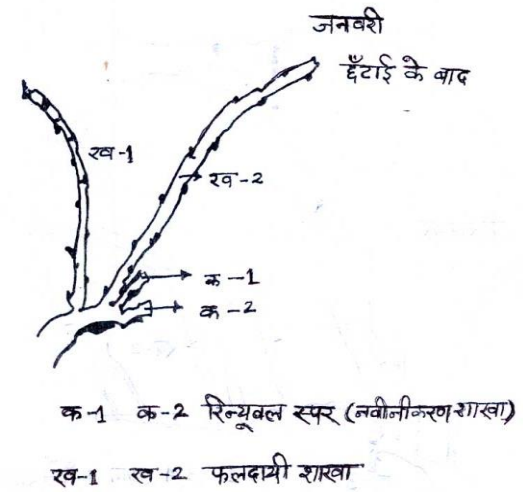
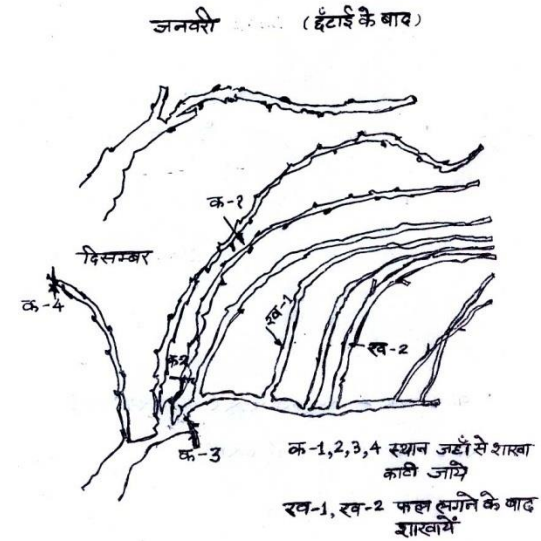


Popular Varieties

State	Earlier	Current
Andhra Pradesh	Anab-e- Shahi	Anab-e- Shahi, Thompson Seedless
Karnataka	Bangalore Blue, Bhokri, Gulabi	Thompson Seedless, Bangalore Blue
Maharashtra	Bhokri, Gulabi, Kali Sahebi and Sel-7	Thompson Seedless, and its clones (Tas-A- Ganesh, Sonaka and Manik Chaman) Sharad Seedless, Red Globe, Crimson Seedless, Flame Seedless
Punjab & Haryana	Anab-e-Shahi, Beauty Seedless, Perlette, Flame Seedless	Perlette, Beauty Seedless, Flame Seedless, Punjab Purple
Tamil Nadu	Anab-e-Shahi, Gulabi	Anab-e-Shahi, Gulabi, red Globe, Crimson Seedless

Pruning

Variety	No. of Nodes
Perlette	4
Beauty Seedless	5-8
Pusa Seedless	8-12
Pusa Urvashi	4-6
Pusa Navrang	4-6
Flame Seedless	4-6
Punjab Purple	6-8



Dormex (49% aqueous solution of hydrogen cyanamide) @ 1.5% a.i. on dormant buds in the beginning of January just after pruning



Thiourea (4.0%) mixed with 1 per cent Bordeaux mixture after pruning





Fertilizer Application in north Indian conditions

Nutrient	February	March	April	May
N	250	350	-	100
P₂O₅	800	400	-	-
K₂O	-	400	400	200

* Micronutrients spray in April last week -0.2% Zn + 0.2 % B+ 0.1% Cu + 0.1% Fe





Irrigation

- **Regular irrigation after berry set at week interval**
- **1.5 -2.0 litre in young and 4.5-6.0 l water per day for bearing plants**
- **Reduced irrigation during ripening, i.e. (one month prior to harvesting)**

Weed management

Application of post-emergent weedicides : Paraquat (7.5 kg/ha) or Glyphosate (2.0 kg/ha)



Treatments for Berry Quality enhancement

GA₃ (45 ppm) at full bloom for Pusa Seedless

GA₃ (45 ppm) at full bloom for Beauty Seedless

GA₃ (30 ppm) at 50% bloom for Perlette

GA₃ (60 ppm) at 50% bloom) for Pusa Urvashi

- **Shoot and cluster thinning**
- **Girdling at 15 cm height on trunk about one month before ripening**





Inter-veinal chlorosis: 0.5% solution of neutralized magnesium sulphate during the fruit development stage

Flower-bud and flower drop: Gibberellic acid (20 and 50 ppm) and parachlorophenoxy acetic acid (20 ppm) applied at 18 days before flower opening

Uneven ripening: Ethephon (250 ppm) at colour break stage

Coulure water berries, hen & chicken disorder: 20-30 kg of borax per hectares should be applied or foliar application of boric acid (0.3-0.5%)

Pink berries: 0.2% ascorbic acid and 0.25% sodium diethyl dithiocarbamate at fortnightly intervals commencing berry softening

Blossom end rot: 0.2% calcium solution or application of lime to the soil

Vine barrenness: Proper pruning

Post-harvest berry drop : Spraying of NAA (50 ppm), a week prior to harvesting



Diseases

Antracnose: Bordeaux mixture at 0.8 percent, copper oxychloride at 0.25% or carbendazim at 0.1%

Downy mildew : Bordeaux mixture at 1%, copper oxychloride at 0.2%, Mancozeb at 0.2 %, metalaxyl (Ridomil Mz at 0.2%) .

Powdery mildew :Wettable sulphur formulations., namely, Calaxin at 0.07%, Karathane EC at 0.04%, Myclobutanil (Systhane at 0.05%), Triademifon (Bayleton at 0.1%)

Bacterial leaf spot : Streptomycin at 500 ppm is used as a prophylactic spray, while Bordeaux mixture at 0.8% or copper oxychloride at 0.15%

Pests

Thrips: Phosphamidon at 0.05% or carbaryl at 0.125%

Mealy bugs: Dichlorvas at 0.1% mixed with neem oil 0.2%

Leaf hopper: Carbaryl at 0.15% or fenitrothion at 0.04%

Chaffer beetle: Monocrotophos or Quinolphos at 0.05%



Pest Management

Flea beetle: This pest will appear immediately after pruning and the newly sprouted buds are damaged.

- Leaves are defoliated with a characteristic slit cuts.

Control measures

Spraying of Quinolphos 0.06% or Carbaryl WP 0.2% four days after pruning is done to control the pest. Spraying of neem cake extract (4%) is also useful. Imidacloprid 17.8 SL @ 0.3-0.4 ml / l or Lambda cyhalothrin 5 CS @ 0.5 ml/l or Fipronil 80 WG @ 0.06 g/l.





Good Agricultural Practices (GAP) in grapes - APEDA

- **Selection of improved varieties for cultivation**
- **Identification of exact nature of problems in difficult soils and providing solutions.**
- **Adoption of suitable training system and high planting density and canopy management**
- **Integrated nutrient and water management of vineyards**
- **Treatment with chemical growth regulators for quality improvement**
- **Weed management**
- **Integrated pest and disease management practices**





Standards for Export: Grapes

Parameter	Standard
Berry diameter (mm)	18
Acidity (%)	0.67
Sugar: acid ratio	35-40
Bunch wt. (g)	400-700
No. of berries/ bunch/ cm	3-3.5
Av. berry wt. (g)	4
Berry adherence	Strong
Skin thickness and Bloom	Thin with Intact bloom

**India had exported grapes worth Rs 1551 crores during the 2015-16
Farmers received rate of Rs 65 to Rs 85/kg; Premium = Rs 93/kg**





Export Scenario of Indian Grape

Export of Fresh Grape from India

Year	Qty. (MT)	Value (Rs in Lakhs)
2005-06	54050	21461
2006-07	85898	30192
2007-08	96964	31783
2008-09	124628	40861
2009-10	131154	54534
2010-11	99312	41206
2011-12	108585	60288
2016-17	1,12,000	

Source: APEDA Database (2011-12)

Trade specification for export to European Union are;

Berry size : >17 mm

Bunch size : 250 to 500 g

Brix : 16-18^oBrix

Berry colour : Yellowish-green , pink, red

Others : Bunches should be free from bruises, water berries, pink berries and loose berries

■ Major destinations of India's table grapes were the Netherlands, Bangladesh, UAE, UK, Russia and Saudi Arabia

Expert Services for Liasoning with APEDA with Farmers/ Cooperatives of Maharashtra, Andhra Pradesh & Karnataka regarding safe use of chemicals and application of GAP for minimizing pesticidal residue levels and to increase exports to European Union markets .



Mango

GAP recommendations

When planning a new orchard, select and prepare an appropriate site at least one to three years in advance.

- Frost pockets
- Soil testing (pH, EC, soil depth, slope, stoniness, hard pan etc.)
- Organic matter levels & nutrients availability
- Past levels of nematodes (Root Lesion nematode)
- Perennial weeds
- Irrigation & Drainage
- Soil and water testing for heavy metals & chemicals

Ideal conditions for mango

pH = 5.5- 7.5

EC ≤ 1.0 dS/m

Organic C = 0.5%

No micronutrient deficiency

Well drained





Selection of planting/propagation material

Selection of varieties: Traditional Vs New Improved Varieties

Source : Reliable nursery preferably Govt. / University / Reputed

Method of Propagation : Veneer, Soft wood or Epicotyl grafting

Rootstocks : Non-descript Vs Polymebrionic

Condition : Select healthy vigorous and 1-1 ½ year old seedling. It should be straight, erect and should have at least 3-4 leaves

GAP recommendation

- A record of the source of the planting materials, the number and date of purchase must be kept in the farm
- The suggested minimum age of the planting material should preferably be one year old.



Plant density: Traditional Vs HDP

How to dig pits

How to Plant Seedlings

Aftercare of seedlings

- Staking
- Irrigation
- plant protection measures
- Manuring at an interval of 2 to 3 months.
- Weeding of basins
- Plough inter spaces
- Grow green manure crops
- Mulch the basin
- Allow the graft to grow 1meter height without side shoots
- Deblossom the plant till 3-4 years

GAP recommendation

- ***Records of all these activities should be should be maintained at farm.***





Mango MRL status report

[EU Pesticides database - European Commission](http://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/)

ec.europa.eu/food/plant/pesticides/eu-pesticides-database/ ▼

7 Apr 2016 ... Download **MRLs** data - Sustainable use of pesticides ... PESTICIDES EU-MRLs. Regulation (EC) No 396/2005. Latest **MRL** updates ...

[Search active substances](#) - [Download MRLs data](#) - [Search pesticide residues](#)

[CODEX Alimentarius: Pesticide MRLs](http://www.fao.org/fao-who-codexalimentarius/standards/...mrls/en/)

www.fao.org/fao-who-codexalimentarius/standards/...mrls/en/ ▼

This database contains Codex **Maximum Residue Limits** for Pesticides and Extraneous **Maximum Residue Limits** adopted by the Codex Alimentarius ...

[\[PDF\] codex alimentarius commission - FAO.org - Food and Agriculture ...](http://ftp://ftp.fao.org/codex/meetings/ccpr/ccpr32/pr00_14e.pdf)

ftp://ftp.fao.org/codex/meetings/ccpr/ccpr32/pr00_14e.pdf ▼

86/363/EEC and 09/642/EEC deal with **MRLs** in **fruit**, vegetables, cereals, products of ... such as **mango**. avocado and litchi is illustrated in Appendix 1 to 3.

[g\) Maximum residue limits of pesticides \(Codex\) for fruit ... - Agmarknet](http://agmarknet.nic.in/amrscheme/goodpracfruitvege.htm)

agmarknet.nic.in/amrscheme/goodpracfruitvege.htm ▼

Pesticide Name of Fruit/Vegetable **MRL** (Mg/kg.) 1. CHLORPYRIFOS 1. **Banana** 2.0. 2. Broccoli 2.0. 3. Cabbages,Head 1.0. 4. Carrot 0.1. 5. Cauliflower 0.05. 6.

[\[DOC\] Residue Monitoring Plan for Mangoes for Export to Japan - India ...](http://www.indiaenvironmentportal.org.in/.../Residue_Monitoring_Plan-Japan-FINAL_APRIL_2008.doc)

www.indiaenvironmentportal.org.in/.../Residue_Monitoring_Plan-Japan-FINAL_APRIL_2008.doc

to closely monitor the residue levels of pesticide and other agriculture chemicals in fresh **fruits** of **mango** to ensure that they are within **maximum residue limits** ...

[\[PDF\] EU requirements for fresh Fruit and Vegetables](http://aic.ucdavis.edu/research1/de-Froidmont.pdf)

aic.ucdavis.edu/research1/de-Froidmont.pdf ▼

uncut and unprocessed vegetables and **fruits**, excluding ... Patulin in **fruit** juice, **apple** product. – Lead in **fruit** ... Lists of EU **MRL** sorted by pesticide, crop group or ...

[\[PDF\] mango](http://www.centallabthai.com/.../MRLs/.../Fruits/CODEX_MRLs_Mango.pdf)

www.centallabthai.com/.../MRLs/.../Fruits/CODEX_MRLs_Mango.pdf ▼

Assorted Tropical and Sub-Tropical **Fruits** - Inedible Peel. Commodity ... **Mango**. 11 FENITROTHION. There are currently no. **MRLs**. 24 PROTHIOFOS. Not in the.

[\[DOC\] Standard Operating Procedure for Mango Orchards - Department of ...](http://plantprotection.gov.pk/Notification-of%20SOP's-for-export-of-Mango-to-EU-and-)

plantprotection.gov.pk/Notification-of%20SOP's-for-export-of-Mango-to-EU-and-



**Table 1: Per capita consumption of pesticide in major countries**

S. No.	Name of country	Pesticide consumed (Kg/ha)
1.	Taiwan	17.0
2.	China	13.0
3.	Japan	12.0
4.	USA	7.0
5.	Korea	7.0
6.	France	5.0
7.	UK	5.0
8.	India	0.6

Source: Industry reports, Analysis by Tata Strategic (FY 12)

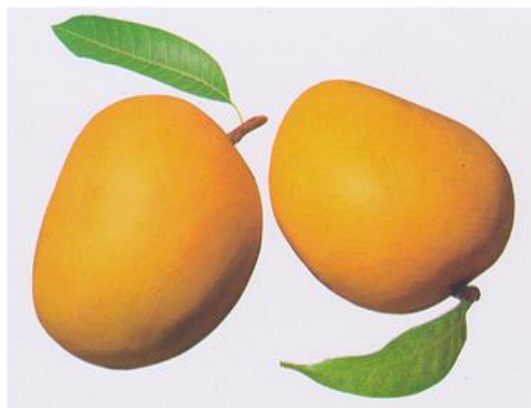
Table 5: Pesticides banned for manufacture, import and use in India

S. No.	Name of Pesticides	S. No.	Name of Pesticides
1.	Aldicarb	19.	Heptachlor
2.	Aldrin	20.	Maleic hydrazide
3.	Benzene hexachloride (BHC)	21.	Menzona
4.	Calcium cyanide	22.	Methomyl 12.5% L formulation
5.	Captafol 80% powder (for export only)	23.	Methomyl 24% formulation
6.	Carbofuran 50% SP formulation	24.	Metoxuron
7.	Chlorbenzilate	25.	Nicotine sulphate (for export only)
8.	Chlordane	26.	Nitrofen
9.	Chlorfenvinphos	27.	Paraquat dimethyl sulphate
10.	Copper acetoarsenite	28.	Pentachloro nitrobenzene (PCNB)
11.	Dibromochloropropane	29.	Pentachlorophenol (PCP)
12.	Dieldrin	30.	Phenyl mercury acetate (PMA)
13.	Endrin	31.	Phosphamidon 85% SL formulation
14.	Endosulfan	32.	Sodium methane arsonate (MSMA)
15.	Ethylene dibromide (EDB)	33.	Tetradifon
16.	Ethyl mercury chloride	34.	Toxaphene
17.	Ethyl parathion	35.	Trichloro acetic acid (TCA)
18.	Lindane (Gamma-HCH)		

Source: www.cibrc.nic.in



Residue Monitoring Plan for Mangoes for Export to Japan.



Agricultural & Processed Food Products Export Development Authority
(Ministry of Commerce, Govt. of India),
3rd Floor, NCUI Building
3, Siri Institutional Area, August Kranti Marg, New Delhi - 110 016

February 2008

Table-1: List of Accredited Laboratories recognised by APEDA for testing for pesticide residues in fresh fruits of mango for export to Japan.

S. No	Name of the Laboratory	Status
1.	Geo-Chem Lab Pvt. Ltd., 36, Raja Industrial Estate, 1 st Floor, Purushottam Kheraj Marg, Mulund (West), Mumbai – 400 080. Phone: 022-67974999 Fax: 022-67974616 E-mail: neel@geochemgroup.com laboratory@geochemgroup.com radlab@geochemgroup.com , sureshababu@geochemgroup.com	Accredited to NABL/ISO-17025, recognised by APEDA
2.	Insecticide Residue Testing Laboratory Krishibhayan, Shivajinagar, Pune – 411 005 Phone: 020-25534348, 25281186 Fax: 020-25537695, 26131064 Phone/fax: 020-25510300 Cell: 094224 95497 E-mail: irtipune@yahoo.com irtipune@rediffmail.com vijayskolekar@gmail.com	Government laboratory recognised by APEDA
3.	Reliable Analytical Laboratory A-1, 5 Acres, Kothari Compound Tiku - ji - ni Wadi Road Manpada, Thane (W) – 400 607 Phone: 022-25899490, 25899491 Fax: 022-25899492 E-mail: reliablelabs@hotmail.com info@reliablelabs.org , renu@reliablelabs.org	Accredited to NABL/ISO-17025, recognised by APEDA
4.	Vimta Labs Ltd. 142, IDA, Cherlapally, Hyderabad – 500 051 Phone: 040-2726 4141, 2726 4444 Fax: 040-27263657 E-mail: crm@vimta.com sudhakar@vimta.com	Accredited to NABL/ISO-17025, recognised by APEDA
5.	SGS India limited, 1/509 A, Old Mahabalipuram Road, Opp. Govt. High School,	Accredited to NABL/ISO-17025, recognised by APEDA



Maximum Residue Limits for commonly used pesticides in mango fruits prescribed under Food Sanitation Law of Japan

Pesticides and other Agricultural chemicals	MRLs (mg/kg) prescribed by Japan (FSA) ^{a/}
Aldrin	0.05
Atrazine	0.02
Benalaxyl	0.05
Benomyl	2.0
BHC (α, β, γ, isomers)	0.01
Bitertanol	0.05
Carbendazim	2.0
Carbaryl	3.0
Carbofuran	0.3
Captan	5.0
Cartap hydrochloride	3.0
Chlordane	0.02
Chlorothalonil	0.5
Chlorpyrifos	0.05
Chlorpyrifos-Methyl	0.05
Cypermethrin	0.03
DDT	0.5
Deltamethrin	0.5
Diazinon	0.1
Dichlorvos	0.1
Dicofol	3.0
Dieldrin	0.05
Dimeton-S-Methyl	0.04
Dimethoate	1.0
Dinocap	NS
Endosulfan	0.5

Endrin	0.01
Ethephon	2.0
Ethion	0.3
Fenitrothion	0.8
Fenthion	5.0
Fenvalerate	1.0
Heptachlor	0.01
Hexaconazole	0.5
Imidacloprid	1.0
Iprodione	10.0
Lindane (γ BHC)	1.0
Malathion	8.0
Metalaxyl (isomer: Mefenoxam)	1.0
Myclobutanil	1.0
Oxydemeton-Methyl	0.02
Parathion	0.05
Parathion-Methyl	0.2
Permethrin	5.0
Phosalone	1.0
Phosphamidon	0.2
Propiconazole	0.05
Quinalphos	0.02
Thiophanate-Methyl	2.0
Triazophos	0.02
Triadimefon	0.05
Tridemorph	0.05





Agri Export Zones

- Under chapter 16 of Exim Policy 2001, a new concept of Agri Export Zone (AEZ) has been introduced by Govt. of India.
- APEDA has been nominated as the Nodal Agency to coordinate the efforts on the part of Central Govt.
- Total 60 AEZ (APEDA)
(Fruits=23, Vegetables=11 (+3), Spices=7, Medicinal plant= 2, Darjeeling Tea=1, Wheat=1, Lentil=1, Horticultural products=1, Flowers=6, Basmati Rice=2)





AGRI EXPORT ZONES FOR FRUIT CROPS

No	Product	State	District/Area	
5	Mangoes and Vegetables	UP	Lucknow, Unnao, Hardoi, Sitapur & Barabanki	Investment =Rs. 44.71 crore. Export = Rs. 170 crore in the next five years.
6	Mangoes	UP	Sahranpur, Muzaffarnagar, Bijnaur, Meerut, Baghpat, Bulandshar and Jyotifule Nagar	
7	Mango Pulp & Fresh Vegetables	AP	Chittor District	Investment= Rs. 53 crores Export= Rs. 250 crores in the next 5 years.





8	Mangoes Alphanso	Maharashtra	Districts of Ratnagiri, Sindhudurg, Raigarh and Thane	Investment= Rs. 35 crores. Export= Rs. 68 crores per annum in 7 years. However, the incremental export of around Rs. 18 crores will start from the first year itself.
9	Mango Kesar	Maharashtra	Districts of Aurangabad, Jalna, Beed, Latur, Ahmednagar and Nasik	Investment= Rs. 18.56 crores Export of Rs. 44 Crores in the next five years.
10	Mangoes & Vegetables Kesar	Gujarat	Districts of Ahmedabad, Khaida, Anand, Vadodra, Surat, Navsari, Valsad, Bharuch and Narmada	Investment= Rs. 33.72 crores Export= Rs. 90 crores in the next five years.





11	Mango & Grapes Banganpalli	Andhra Pradesh	Districts of Ranga Reddy, Medak & Parts of Mahaboobnagar Districts	Investment= Rs. 57 crores Export= Rs. 60 Crores in the next five years.
12	Mangoes Banganpalli	Andhra Pradesh	Krishna District	Investment= Rs. 17.90 crores Export = Rs. 48 crores in the next 5 years.
13	Mangoes Fazli, Langra, Lakhanbhog, Amrapali, Mallika and Himsagar	West Bengal	Malda and Murshidabad	Investment= Rs. 31.17 crores Export= Rs. 93.15 crores in the next 5 years.
14	Mangoes	Tamil Nadu	Districts of Madurai, Theni, Dindigul, Virudhunagar and Tirunelveli	Investment= Rs. 24.60 crores Export= Rs. 85.00 crores in the next 5 years.





Thank
you!

