

PROTOCOL FOR POST HARVEST MANAGEMENT OF MANGO

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PREAMBE

- India is the largest producer of choicest varieties of mangoes in the world.
- India's mango annual production is over 10 million tonnes.
- Post harvest losses are 25 -30 per cent of total produce due to improper handling and storage practices. Which amounts to over Rs. 250 crore.
- Remarkable improvements have been made in the post harvest handling and storage of mangoes at CISH, Lucknow.

Management steps

- Pre harvest management
- Assessment of harvest maturity
- Harvesting
- Sorting and grading
- Pest management
- Uniform ripening of fruits
- Packaging
- Storage
- Transport

Pre harvest management

- Bagging of fruits for controlling the post harvest diseases and bruises with newspaper or brown paper bags one month prior to harvest.
 - ⇒ Harvested fruits ripe uniformly without any disease and fruit fly infestation.
 - ⇒ The problem of blackening upon ripening is also over come.
 - ⇒ The shelf life of such fruits is also increased by two to three days.
 - ⇒ Checks jelly seed formation (softening of pulp near stone).
 - ⇒ This technique is eco-friendly and job oriented.

(Bags are not suited for coloured mango varieties)

Harvest maturity

- The harvest maturity takes 12 – 15 weeks after fruit set.
 - Dashehari and Langra - 12 weeks
 - Chausa and Mallika - 15 weeks
- At the time of maturity, stone becomes hard and pulp colour changes from white to cream.
- In few varieties fruits sink in water (Langra, Chausa).

Harvesting

- Harvest only mature fruits.
- Pick fruit early in the morning or late in the evening.
- Harvest fruits with 1.0 cm stalk or above the first node of the stalk.
 - ⇒ It prevents sap oozing.
- Harvest fruits with hand or harvester developed by the Institute.
- Do not harvest fruits with stick or shaking the tree / branch.

- Keep harvested fruits in plastic crates or on tarpoline / cloth / newspaper under shade. Avoid contact of fruits with soil.
- Avoid latex flow on fruits during harvesting and handling.
- Desap the fruits, particularly for export, by inverting them in a desapper for about 25 – 30 minutes.



CISH

Sorting and grading

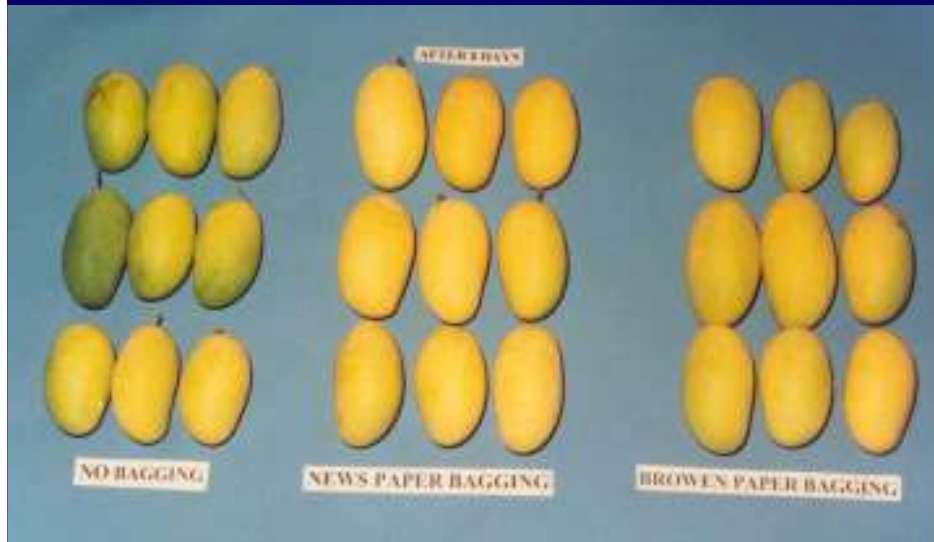
- Sort out defected, deformed, bruised and diseased fruits.
- Separate mature unripe fruits from immature and ripe fruits.
- Grade fruits according to size and weight.

- As per the Codex Alimentaris, the mangoes could be graded into 200-350 g and 351-550 g.
- The permissible difference between fruit weight is 75 and 100 g, respectively, in a package.
- The fruits may be classified into Extra Class, Class I and Class II.
- The Extra Class should be free from any defects.
- Class I and Class II may have defects from 3-4 cm² and 5-6 cm² of the surface area as per size grade, respectively.

Pest management

- Bagging of fruits check development of post harvest diseases and fruit fly infestation.
- If bagging has not been done, pre treatment of fruits is required for controlling post harvest diseases.
 - Harvested fruits should be dipped in 0.025 per cent Carbendazim in hot water ($52\pm 1^{\circ}\text{C}$) for 10 minutes.
 - Fixing of wooden block methyl eugenol traps @ 10 traps per hectare commencing from first week of May to manage fruit fly.

- Three pre harvest sprays of 2.0 per cent Calcium chloride at 10 days interval
 - Prevents the jelly seed formation (softening of pulp near the stone)
 - It also delay the ripening



Ripening

- Do not use calcium carbide, a banned chemical, for ripening of fruits.
 - Such fruits do not ripen uniformly and quality of fruits is inferior.
 - Calcium carbide is hazardous to health.
- Ripe fruits with ethylene gas (100 ppm or 0.1 %) in airtight room by exposing them for 24 – 48 hrs under controlled conditions of temperature and humidity.

- Alternatively, ripe the fruits with dip treatment of ethrel / ethephon solution (250–750 ppm) in hot water ($52\pm 2^{\circ}\text{C}$) for 5 minutes.
- The same solution could be used four times.
 - Premature fruits (fruits harvested up to 2 weeks prior to maturity) could be ripened to an acceptance quality by dipping the fruits in 750 ppm ethrel solution.
 - Less mature and mature fruits are ripened by dipping the fruits in 500 and 250 ppm ethrel solution, respectively.

- Fruits ripen uniformly with attractive colour.
- Fruits ripen within 4 - 8 days depending upon the maturity.
- This technique is also useful for processing industries.
- Sorting of ripe fruits is not required due to uniform ripening of fruits.



CONTROL



Ca-CARBIDE

DASHEHARI



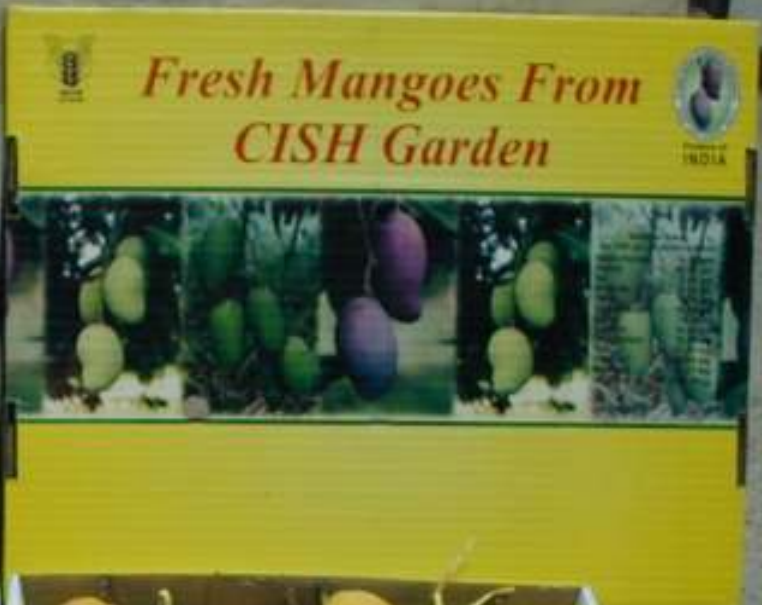
ETHREL

Packaging

- Pack only sound and uniform grade of fruits in a package / container.
- **Wrap fruits individually to avoid bruising.**
- Pack fruits in a container lined with tissue / news paper or with paper cuttings.
- **Use new, clean and good quality packaging material.**

- Package should be free from any foreign material like nails, pins, etc., and smell.
- Provide proper ventilation in the package.
- Avoid under or over filling of fruits.
- Use CFB boxes developed by Institute for packaging of fruits.

- The filled boxes / packages should be kept under shade.
- Package should meet the handling and shipping requirements of international standard.
- The pack should be labeled with name of variety, grade, class and brand, if any.



Storage

- Fruits could be stored for 6 – 12 days under ambient conditions, according to variety.
- For increasing the shelf life, fruits are stored at low temperature and high humidity.
- Pre cool the fruits to required temperature before storing at low temperature.

- Store the fruits at critical low temperature with 85-90 % R.H.

– Dashehari	12 ⁰ C		Three weeks
– Langra	15 ⁰ C		
– Chausa	10 ⁰ C		
– Mallika	12 ⁰ C		

- The shelf life of fruits at low temperature is 2 –3 weeks.
- Use rigid containers that can withstand stacking without getting deformed.

- Do not store other fruits with mango under low temperature conditions.
- Store fruits until they are marketable and profitable.
- Transfer cold store fruits gradually to room temperature to minimize sweating.

Transport

- Do not throw the packages during loading or unloading.
- Stack 4 – 8 containers, as per their strength, in pallets.
- Arrange the boxes in the truck to allow proper air circulation.

- Transport the produce during the cooler part of the day, i.e., during night.
- Cover the truck with tarpoline leaving proper ventilation.
- Avoid using large containers for packaging and transport of fruits.
- Transport cold stored fruits in a refer van.

Impact

- CISH has developed document for establishment of Mango Agri Export Zone at Lucknow (sponsored by APEDA)
- CISH is signatory to further refine protocol for post harvest handling of mango
- Participating regularly in training programme for management and handling
- Post harvest protocol developed at CISH is being appreciated by CM New Delhi, Ambassadors, and other designatory in mango festivals organised by Delhi Tourism, APEDA and NHB.
- For the last two years mango has been exported to China and other European countries by adopting CISH protocol from pack house.

NEW INITIATIVES

- Integrated Pest Management (For mango) has been standardized.
- This technology is now being demonstrated in five mango growing districts :-
 - Appropriate technology for minimizing fruit fly, anthracnose, die back and bacterial canker incidence have been devised.

- Appropriate technology for Biodynamic Production of mango has been standardized.
- Integration of organic production systems viz., Agnihotra, Panchgavya, Rishi Krishi and Biodynamic are under way.
- Few export promising hybrids are under advance stage of evaluation.
- Modernization of nursery production is being encouraged.

Thank You

