



# Banana

## Quality Care During Handling

During ripening, proper banana packaging is essential, either in corrugated boxes or crates with polythene or paper cover to protect the fruit from direct exposure to gases or temperature (inside the chamber also, the unit environment is required for ripening of fruit). No Sharp temperature treatment during pre-cooling; else, it will harm the produce – a gradual decrease in temperature is recommended.

**Pulp temperature must also be checked during pre-cooling as the field temperature used to be 30- 40 degrees Celsius. Usually, there is a drop in half a degree of pulp temperature every hour.**

**There may be a difference in room temperature and pulp temperature. Usually, there is a gap of 1-2 degrees.**

**Proper use of leaf/foam inside crate or box to protect the fruit from bruising. Full use of leaf and foam in direct loading to protect from direct jerk on the road.**

**Banana is to be packed in the field after proper drying; otherwise, it will start transit ripening.**

**When subjected to a very high reefer mode, the flesh of the banana goes mushy, they bruise readily, spoil more rapidly, develop an insipid taste and split open at the skin ends.**

## Freshness Facts



**OPTIMUM CARRYING TEMPERATURE**  
**13 - 14°C** is the optimum temperatures for storage in reefer containers for holding of green bananas



**HIGHEST FREEZING POINT**  
**-0,8°C** chilling may occur at **<13°C** if kept for more than **6 hours**.



**ACCEPTABLE PRODUCT TEMP. AT LOADING INTO CONTAINERS**

Pre-cooling is required for maintaining shelf life. Pulp temperature not to exceed **13°C** upon loading



**OPTIMUM HUMIDITY**  
**85% to 95%** (Recommended **95%** for **28 days**)

Ventilation setting for containers	<b>30 CBM</b>
Storage life	<b>4-6 weeks</b>
Climacteric / non-climacteric	<b>Climacteric</b>
Ethylene production	<b>Medium</b>
Ethylene sensitivity	<b>High</b>
Modified / controlled atmosphere	<b>Not widely used</b>
Potential benefits	<b>Excellent</b>

## Chilling Injury

Chilling Injury is an important disorder of bananas. Both green and ripe fruit are susceptible, with green fruit being slightly more sensitive than ripe fruit. Chilling injury results from exposing fruit to temperatures below 13°C for a few hours to a few days, depending on cultivar, maturity, condition of the fruit, temperature and duration of exposure.

Chilling injury is mainly a peel disorder. Symptoms include sub-epidermal discoloration visible as brown to black streaks in a longitudinal cut, a dull or greyish (smoky) cast on ripe fruit, failure to ripen, and in severe cases the peel turns dark brown or black, and even the flesh can turn brown and develop an off taste.

Chilled fruits are usually more sensitive to mechanical injury. Ripe fruit, if chilled, turn dull brown when later exposed to higher temperatures and are very susceptible to handling marks; the slightest pressure causes discoloration. Inflicted chill in green or ripe fruit may not become apparent until 18 to 24 hours after actual damage has occurred .

## Cooling and Storage

During long distance transport, bananas must be kept in pre climacteric stage, so that ripening can later be induced artificially in the 'ripening rooms'.

If premature ripening is to be avoided, then besides cutting the fruit at the appropriate maturity, three other requirements must be fulfilled. First, there must be no delay between cutting and loading the (sound) fruit into the refrigerated space. Secondly, the precooling (within 4 hrs) and cooling process itself must be as rapid as possible (preferably within 24 hrs. after harvesting/cutting). The third requirement is the prevention of ethylene accumulation in the atmosphere surrounding the bananas

**Skin abrasions result from skin scuffing against other fruits or surfaces of handling equipment or shipping boxes.**

**When exposed to low relative humidity conditions (<80%), water loss from scuffed areas is accelerated and their colour turns brown to black. Finger dropping or shedding may induce browning of the flesh without damage to the skin.**

**Sometimes, cracking/splitting of skin takes place when RH level goes below 85% during storage and below 90% during ripening depending upon the cultivars.**

**O<sub>2</sub> levels below 2% may cause dull yellow or brown skin discoloration, failure to ripen properly, and off-flavours.**

**Greater than 5% CO<sub>2</sub> levels may cause the fruit to soften while still green and confer undesirable texture and flavour. Presence of ethylene can cause premature and rapid ripening during transit.**

**For storage purposes (Cavendish) bananas can be kept at +13.2°C up to approx. 30-45 days under active packaging.**

**This consists of 0.4 mm thick polyethylene bag, in which the carbon dioxide content is raised to 5% and the oxygen content is reduced to 2% ("modified atmosphere").**

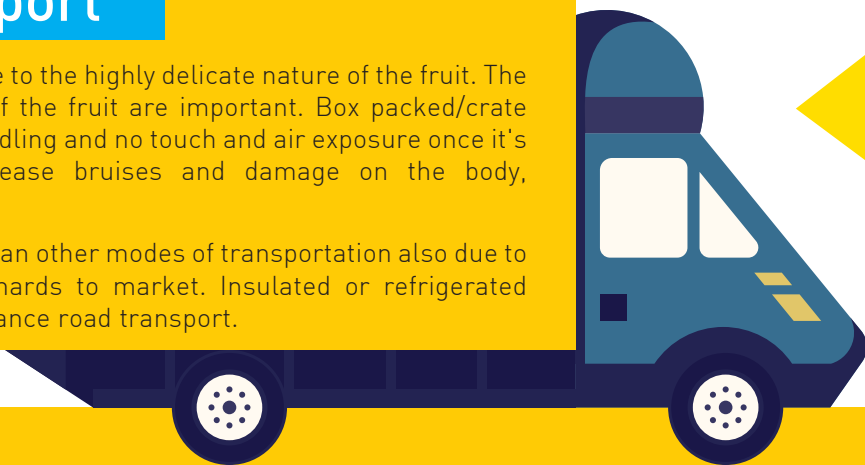
**The ethylene which arises is absorbed by adding potassium permanganate sachet.**

**This makes the fruit dormant, i.e. its respiration processes are interrupted, so extending storage life. Bananas are packed in corrugated fibre board boxes as whole hands or clusters of 5-6 fingers holding an average weight, between 13 and 18 kg., depending on market preferences.**

## Surface Transport

Surface transport is preferred due to the highly delicate nature of the fruit. The looks and physical appearance of the fruit are important. Box packed/crate pack banana needs minimum handling and no touch and air exposure once it's packed. Otherwise, it will increase bruises and damage on the body, highlighted after ripening.

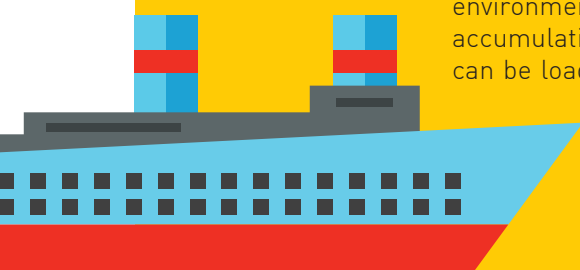
Surface transport is convenient than other modes of transportation also due to its easy approach from the orchards to market. Insulated or refrigerated trucks are also used for long distance road transport.



## Water Transport

Sea transport is the cheapest mode of transport for intercontinental transportation and is most preferred. It is time consuming in comparison to other means of transportation to cover long distance.

To survive long distance transportation in waterways, most of the produce requires low temperature environment with enough ventilation to minimize carbon dioxide and ethylene accumulation. Refrigerated modular containers should be used for purposes, which can be loaded at the packing house/center and transported on trucks to the port, for onward transportation. Further, upon reaching to the port, this refrigerated container having fitted with sensors for maintaining optimum temperature and RH is to be properly plugged in onto to exclusive vessels having UPS facility throughout its sailing period to the destination port.



## Rail Transport

Rail transport has certain advantages over road transport and is mostly used in long distance. The damage to the produce is less as compared to road transport due to rough roads. Costing of rail transport is also lesser than road transport. Rail transport however requires extra man handling because of multiple transfer of stock till it reaches the end user and hence may not be preferred. Although during COVID in 2020, some private players tried the Kisan rail for banana shipment to Delhi. Export-oriented train vegans are also being started in south India for export loading.



## Air Freight

Air transportation is the fastest and most expensive mode of transport for long distance. However, this means of transportation is ideal in international trade of high value exotic crops for a specific variety. Generally, refrigeration facilities are not available and, on the contrary, low-pressure environment with low RH is encountered at high altitudes. This increases the rate of water loss of the produce. For air transportation, providing polyethylene Film liner with perforation within the box or over-wrapping of unit load is necessary. The packed produce, coming in for air transportation must be pre-cooled sufficiently to counterpoise the lack of refrigeration facility. As there are no cold storage facilities at most of the airports in India, it is necessary to transport the pre-cooled produce in insulated or refrigerated trucks or vans to the airport to obviate possible delays in loading due to late arrivals or non-availability of required space on a particular flight. Perishable cargo handling center at airports are required for transportation of perishable horticultural produce.