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# Introduction to Postharvest Technology



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# **EXTENT OF POST HARVEST LOSSES**

- A considerable amount of fruits and vegetables produced in India is lost due to improper post-harvest operations; as a result there is a considerable gap between the gross production and net availability.
- Post harvest losses in fruits and vegetables are very high (20-40%). About 10-15% fresh fruits and vegetables shrivel and decay, lowering their market value and consumer acceptability.
- Important sites where post-harvest losses are noticed in India are: Farmer's field (15-20%), Packaging (15-20%), Transportation (30-40%), Marketing (30-40%)



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### **Estimated loss of fruits**

<b>Crop</b>	<b>Estimated loss (%)</b>
Papaya	40-100%
Grapes	27%
Banana	20-28%
Citrus	20-95%
Avocado	43%
Apple	14%

### **Estimated loss of Vegetables**

Onion	25-40%
Garlic	08-22%
Potato	30-40%
Tomato	5-34.7%
Cabbage & cauliflower	7.08-25.0%
Chilli	4-35,0%
Radish	3-5%
Carrot	5-9%



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# POSSIBLE CAUSES OF POST HARVEST LOSSES

The different causes may be broadly grouped as primary and secondary (Bourne, 1977; Salunke and Desai, 1984):

## •Primary Causes

1. *Biological and microbiological*: Consumption or damage by insects, pests, animals and microorganisms (fungi and bacteria).

2. *Chemical and biochemical*: Undesirable reactions between chemical compounds present in the food such as browning, rancidity, enzymatic changes, etc.

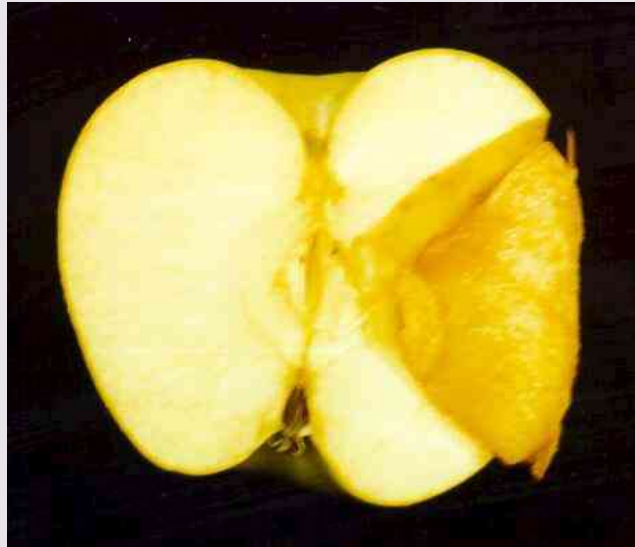


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## Biological and microbiological cause

Green mould rot: *Penicillium italicum*



Internal watery tissue



Increased watery spots



**Codling moth(*Cydia pomonella*) Larvae tunnel into the fruit to feed on the seeds**



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3. *Mechanical*: Spillages, damages caused by abrasion, bruising, crushing, puncturing, etc.

4. *Physical*: Improper environmental and storage conditions (temperature, relative humidity, air speed, etc.)

5. *Physiological*: Sprouting, senescence, other respiratory and transpiratory changes.

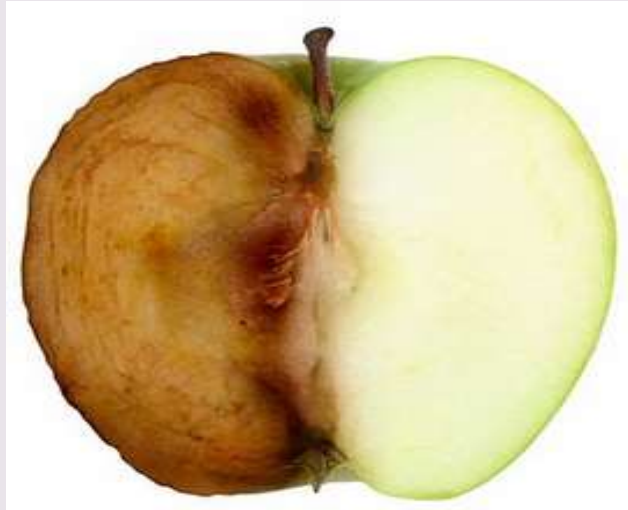
6. *Psychological*: Human aversion or refusal due to personal or religious reasons.



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## Chemical and biochemical cause



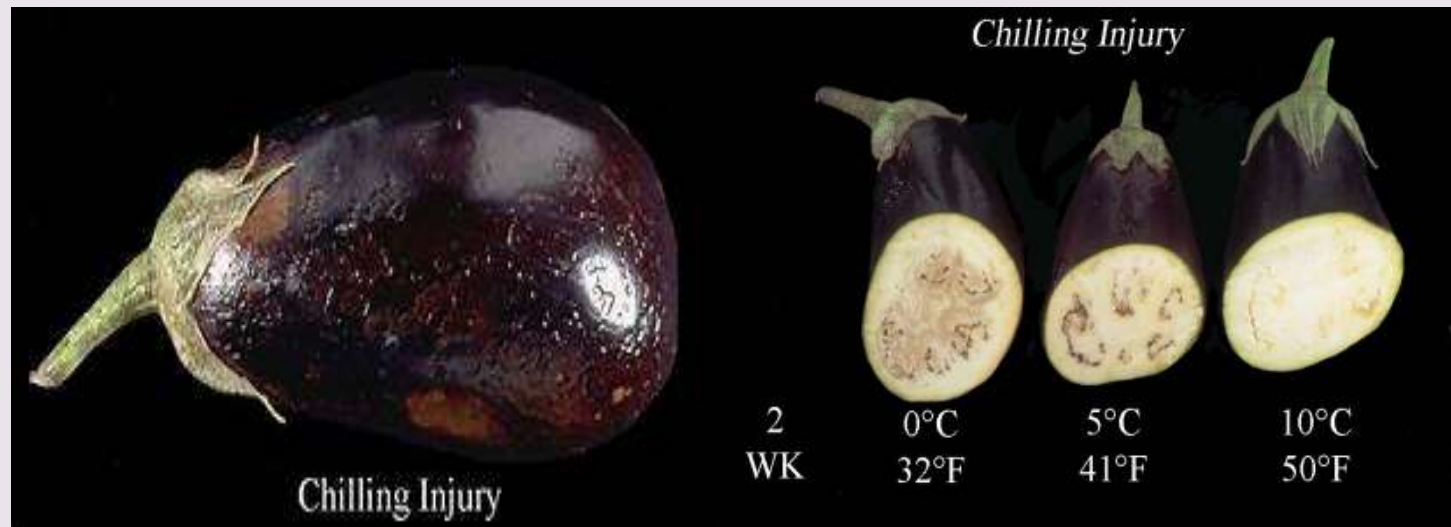
Oxidation results in browning

## Mechanical cause



Bruised Peaches

## Physical cause (Temperature related)



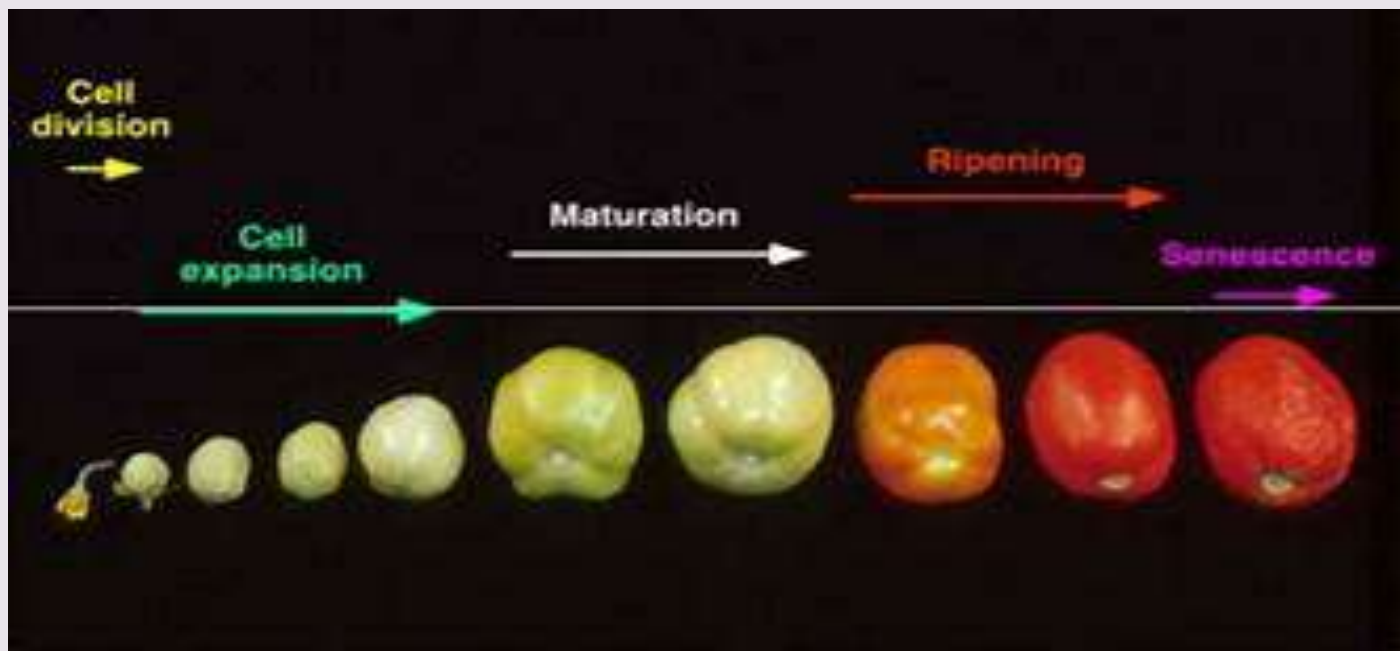


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## Physiological cause



Sprouting



Senescence





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- **Secondary Causes**

1. *Respiration*: breaks down organic matter into simple end-products with release of energy and CO<sub>2</sub>. The result is loss of organic matter, loss of food value and addition of heat load. The higher the respiration rate of produce, the shorter is its shelf-life.

2. *Ethylene production*: can trigger physiological activity even in trace amounts. Most living commodities produce ethylene as a natural product of respiration.

3. *Compositional changes*: occur during storage, some desirable and some undesirable. Development of carotenoid pigments, changes in carbohydrates, proteins and all other food components.



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4. *Growth and development*: is continued even after harvest. Characteristic activities are sprouting of potatoes, onions and garlic, elongation of asparagus, seed germination in fruits like tomatoes, lemons, etc.

5. *Transpiration*: refers to water loss resulting in shriveling and wilting due to dehydration and is undesirable due to loss of appearance, salable weight, texture and quality.

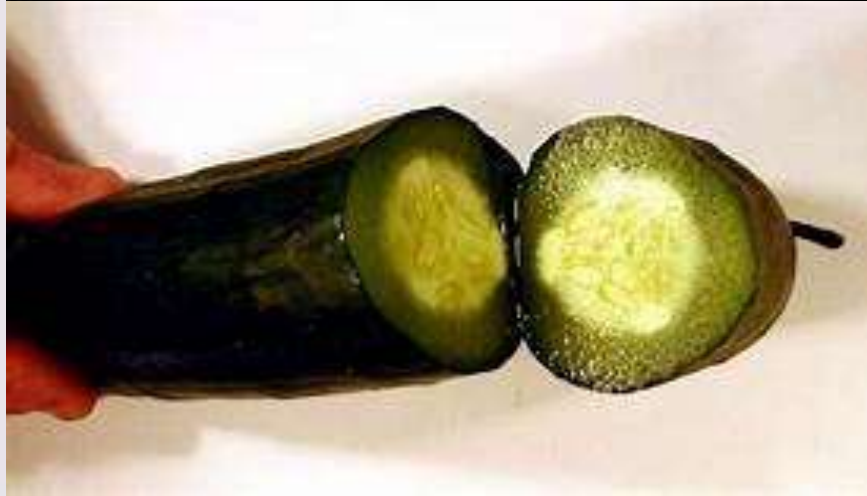
6. *Physiological breakdown*:

- *Freezing injury* or frost damage in commodities subjected to temperatures below their freezing point which can occur in the field or during transportation/storage.



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## Physiological breakdown



Freezing injury



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- *Chilling injury* is mainly associated with tropical and subtropical commodities held for prolonged periods at temperatures between 5°C and 15°C.

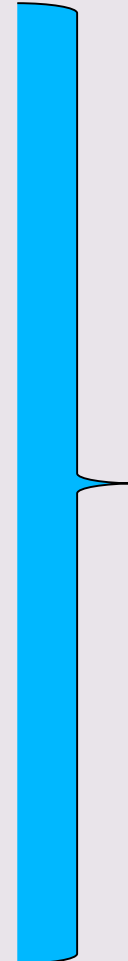
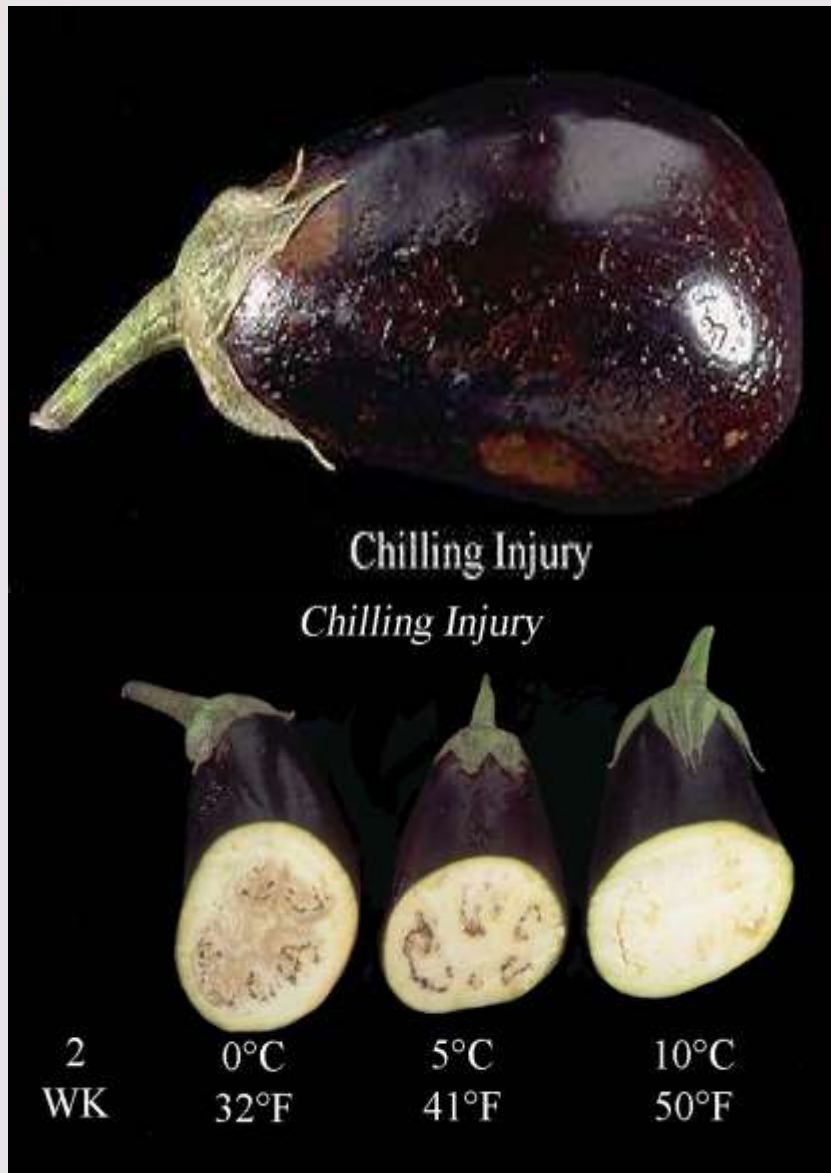
- *Heat injury* can result in commodities exposed to direct sunlight or excessively high heat for prolonged intervals.

7. *Other factors:* include physical/mechanical damage to the produce during harvesting, handling, storage and transportation, as well as spoilage due to pathological causes (attack by microorganisms such as bacteria and fungi). The environmental factors include temperature, relative humidity, atmospheric composition, light and other factors (fungicides, growth regulators, etc).



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## Physiological breakdown



Chilling injury



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## Physiological breakdown



Heat injury