



# Contamination



- During harvesting and containers unless these have been adequately sanitized.
- Mechanical damage during transportation
- Soaking, washing, handling
- Sweating of products during handling
- Wooden surfaces
- Hot water blanching - add thermophilic bacteria
- Inclusion of decayed
- Added ingredients - add thermophilic bacteria

# Preservation

## Vegetables

1. Asepsis
2. Removal of micro organisms
3. Use of heat
4. Use of Low temperatures
5. Chilling
6. Hydrocooling
7. Freezing
8. Drying
9. Use of preservatives
10. Added preservative
11. Preservation by irradiation

## Fruits

1. Asepsis
2. Removal of micro organisms
3. Use of heat
4. Use of Low temperatures
5. Chilling
6. CA Storage
7. Freezing
8. Drying
9. Use of preservatives

## Spoilage



Deterioration of raw vegetables and fruits due to

- Physical factors
- Action of their own enzymes
- Microbial action
- Mechanical damage
- Action of animals, birds, insects.
- Wounding
- Bursting
- Freezing
- Dessication
- Other mishandling

# Microbial spoilage of fruit & vegetable

## 1. Bacterial soft rot

- Caused by *Erwinia caratovora*, these are fermenters of pectins.
- *Pseudomonas*, *Clostridium*, *Bacillus sps* have also been isolated from these rots.
- It results in a water soaked appearance, a soft mushy consistency and often a bad odor.



*Erwinia Caratovora*



*Erwinia caratovora*



## 2. Gray mold rot

- *Caused by Botrytis.*
- It is favored by high humidity and a warm temperature





### 3. Rhizopus soft rot

- It is caused by sps of *Rhizopus* Ex: *Rhizopus stolonifer*.
- *This rot is often soft and mushy.*
- The cottony growth of the mold with small, black dots of sporangia often covers masses of the foods.



R. Stolonifer

#### 4. Anthrachose

- Usually caused by *Collectotrichum lindemuthianum*, *Collectotrichum coccodes*, defect is spotting of leaves and fruits or seed pods.





## 5. Alternaria Rot

- Caused by *Alternaria tenuis*.
- Areas become greenish brown early in the growth of the mold and later turn to brown or black spots.



## 6. Blue mold rot

- Caused by *Penicillium digitatum*.
- Bluish green color spores are produced.



7. **Downey mildew-** Caused by *Phytophthora blight*



8. **Watery soft rot-** Caused chiefly by *Sclerotinia sclerotiorum*. Found in mostly vegetables



**9. Stem end rots-** Caused by *Diplodia*, *Alternaria*, *Phomopsis*, *Fusarium*.



**10. Black mold rot-**

- Caused by *Aspergillus niger*.
- Dark brown to black masses of spores of the mold termed “Smut”.



**11. Black rot:** Caused by *Alternaria*, *Ceratostomella*,  
*Physalospora*.



**12. Pink mold rot:** Caused by pink spored  
*Trichothecium roseum*.



**13. Fusarium rots:** Caused by *Fusarium* sps.



**14. Green mold rot:** Caused by *Cladosporium*,  
*Trichoderma*.





**15. Brown rot:** Caused chiefly by *Sclerotinia*  
(*Monilinia fructicola*) sps.



**16. Sliminess or souring:** Caused by Saprophytic bacteria in piled, wet, heating vegetables.

Sr. No.	Type of spoilage	Spoilage Microorganism
1.	Bacterial soft rot	<i>Erwinia caratovora, Pseudomonas sps</i>
2.	Gray mold rot	<i>Botrytis cinerea</i>
3.	Rhizopus soft rot	<i>Rhizopus nigricans</i>
4.	Anthrachose	<i>Collectotrichum lindemuthianum</i>
5.	Alternaria Rot	<i>Alternaria tenuis</i>
6.	Blue mold rot	<i>Penicillium digitatum</i>
7.	Downey mildew	<i>Phytophthora brexia</i>
8.	Watery soft rot	<i>Sclerotinia sclerotiorum</i>
9.	Stem end rots	<i>Alternaria, Phomopsis, Fusarium</i>
10.	Black mold rot	<i>Aspergillus niger</i>
11.	Black rot	<i>Alternaria, Ceratostomella, Physalospora</i>
12.	Pink mold rot	<i>Trichothecium roseum</i>
13.	Fusarium rots	<i>Fusarium sps</i>
14.	Green mold rot	<i>Cladosporium, Trichoderma</i>
15.	Brown rot	<i>Sclerotinia</i>
16.	Sliminess	<i>Saprophytic bacteria</i>

## Spoilage of fruit and vegetable juices

- Molds can grow on the surface of acidic fruit juices if juices are exposed to air.
- The lactic acid fermentation of sugars, mostly by heterofermentative lactic acid bacteria such as *Lactobacillus pastorianus*, *Lactobacillus brevis* and *Leuconostoc mesenteroides*.
- Acetic acid fermentation- by lactic acid bacteria. E.x. *Lactobacillus psatorianus*.
- Slime production- by *Leuconostoc mesenteroides*, *Lactobacillus brevis*, and *Lactobacillus plantarum* in apple juice and by *L. plantarum* and *Streptococci* in grape juice.