

Fruit cracking

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Introduction

Fruit cracking can be defined as the cracks or fractures in the cuticle or peel or fruit surface. It is a major problem in cherry (up to 75%), litchi, pomegranate, apple, citrus, mango, etc.



Fig. 1: Fruit cracking in citrus and litchi

Types of Fruit Cracking

Generally, there are three types of fruit cracking

Peel Cracking

It is also known as “checking”, “lenticels cracking” or “cuticle cracking”. Peel cracking may be characterized by the presence of numerous minute superficial cracks on fruit surface followed by gradual “peeling off” of the peel in patches as in apple. It may also occur in the form of short to large cracks as in litchi.

Star cracking

Star-shaped cracks near the calyx or on the sides of the peel of the fruit are seen. The affected fruits may also appear russeted and irregular in shape. e.g. apple, pear.

Splitting

It is also known as “flesh or pulp cracking”. It is an extreme form of cracking in which both the peel and the pulp ruptures/ cracks and there is gross exposure of the internal tissues of the fruit to the atmosphere. e.g. lemon, mango, etc.

Nature of Fruit Cracking

Generally, four types of cracking are observed in fruits.

Radial cracking



It is also known as longitudinal cracking. In this the cracks occur lengthwise on the fruit extending from the proximal end to the distal end of the fruit. It is the most common type of cracking causing severe damage to the crops. e.g. in litchi, mango, citrus, cherry, pomegranate, *etc.*

Transverse cracking

In this type of cracking, the cracks occurs along the circumference of the fruit. e.g. in lemon, mango, pomegranate, litchi, *etc.*

Oblique

In this type of cracking slant cracks appear on the fruit skin. e.g. in pomegranate, litchi, *etc.*

Mixed

When two or more types of the above cracking's appear simultaneously on the fruit, then is called as mixed type of cracking. E.g. in cherry, lemon, mango, *etc.*

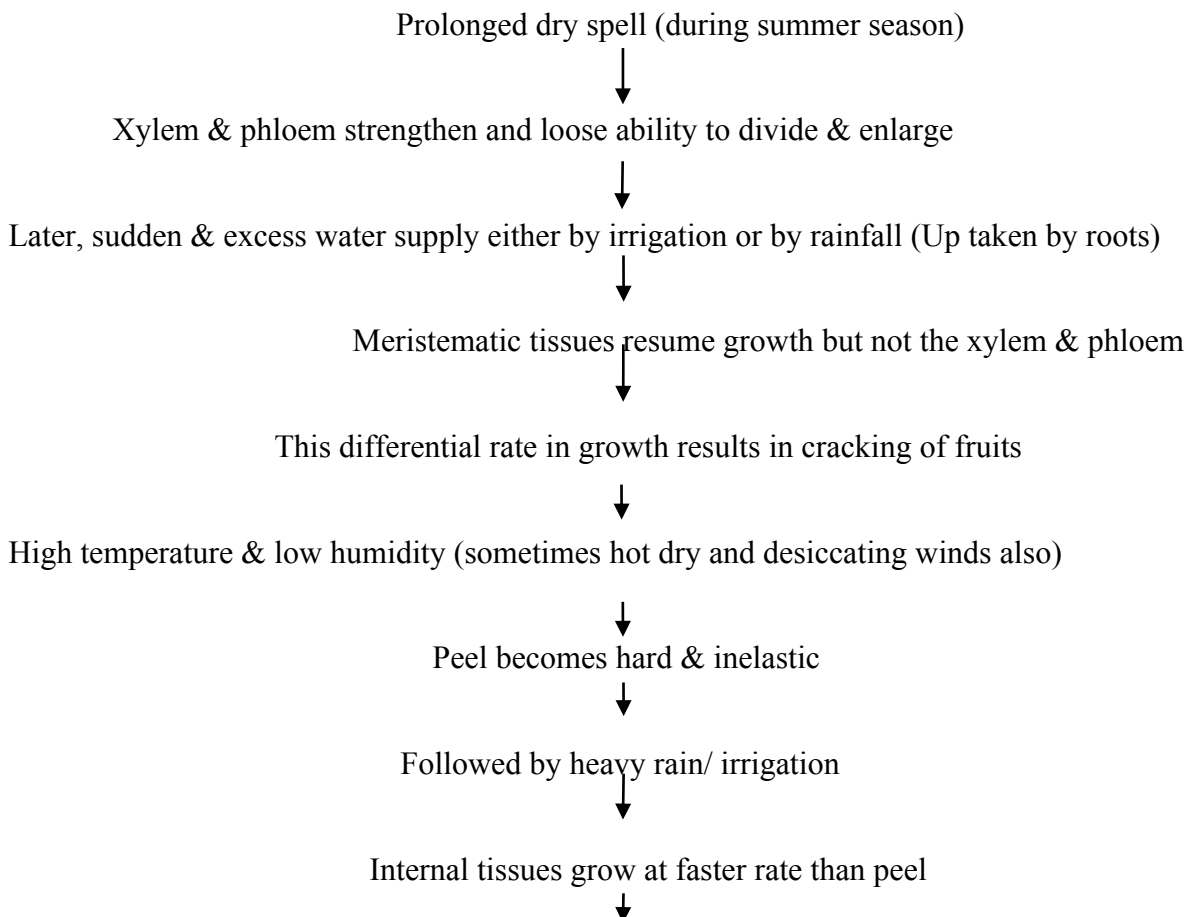
Effects of cracking on fruits

Cracking of fruit mostly alters the structural integrity of the fruits and thus results in the following changes:

- Cracking of the fruits lower down the mechanical strength of the fruits.
- It facilitates rapid moisture loss and excessive shrivelling of fruits.
- Fruits become more prone to chemical injury.
- It permits the infection by microbes- *Aspergillus, Penicillium, etc.* and insects.

Therefore, we can say that cracking of fruits results into unmarketability of the fruits as such fruits are not acceptable in the market and are not purchased by the consumers. Thus, fruit cracking leads to huge economic loss to the growers.

Mechanism of fruit cracking





Cracking of inelastic peel takes place

Causes

1. Biotic factors

Living organisms are sometimes found associated with fruit cracking. E.g. In apple - false sting (viral) & star cracking (viral). In citrus, cracking is associated with diseased tissues, such as lesions. These diseased tissues absorb water exceptionally when water supply is plentiful and causes ruptures through abnormal swelling.

2. Varietal factors

Different varieties show differential response. So, susceptibility to fruit cracking is considered to be under genetic control. Lemon varieties showed different levels of cracking - Kagzi Kalan (48.2%), Pant lemon-1 (43.97%), Nepali Oblong (12.5%)

1. Rootstock

Various types of rootstocks effects are seen on commercial varieties grafted on them. E.g. In cherry, more fruit cracking was observed when Mahaleb was used as a rootstock than Mazzard.

4. Environmental factors

A) *Soil moisture*- It is one of the major factors responsible for fruit cracking. Moisture stress followed by sudden upsurge of soil moisture content (from irrigation or rainfall) leads to cracking of the fruits. e.g. litchi, pomegranate, cherries, lemon, apple, etc.

B) *Relative humidity*- Low humidity accentuates cracking as it causes more evaporation from the fruit surface. e.g. In Litchi (<60% RH causes cracking), Pomegranate, etc.

C) *Rainfall*- More cracking is seen when peel comes in contact with rain water or mist as peel absorbs the water from the micropores on the surface leading into increased turgor pressure from inside, thus, resulting into macro cracks on the fruit surface. e.g. Cherry, apple, peach, etc.

D) *Temperature* - Fluctuation in day and night temperature. e.g. in Litchi (>38°C causes cracking), Cherry, apple, etc.

5. Hormonal factors

Auxins, cytokinins and ABA play important role in regulating fruit cracking. Skin and seeds of cracked fruits of Litchi had lower level of auxins.

6. Nutritional status

Nutritional status of the tree and fruit has been suggested to account for the differences in the susceptibility to cracking of fruits on different trees, or even on the same tree. Deficiency of Zn, Ca, B & excess of N is found associated with cracking in many fruits.

7. Chemical sprays

Lead arsenate, phosdrin spray are reported to cause distortion and cracking in developing fruits. Surfactants like Tween-20 along with pesticides cause cracking by increasing uptake of water.

Management

1. Moisture management- Irrigation (for dryer season) as well as drainage (for rainy season) facilities in the orchard should be present to prevent imbalance of water in the plant system.



Sprinkler irrigation during fruiting time minimized the fruit cracking in litchi. Drip irrigation facilities have also shown very good results in many crops.

2. Foliar spray of nutrients - Spray of boron @0.2% can be used to control fruit cracking in pomegranate.

3. Pruning & top working- Regular pruning of trees is useful in reducing the incidence of cracking. Top working of affected trees with cultivars less prone to cracking can overcome the problem.

4. Use of rootstocks- Different rootstocks have different influences on different varieties. Less fruit cracking was observed on cultivars grafted on sour orange than that of Carrizo citrange rootstock (Agusti *et. al.*, 2003).

5. Cuticle Protectants - Reduce fruit cracking due to rain water absorption by fruit surface up to 50%. e.g. Rain guard, Parka. In cherry rain guard spray – 1st spray 4 week prior to harvest and then at 7-10 Days interval was found effective.

6. Retractable Row Covers- These are highly effective but are costly and labour intensive. Mostly used in Cherry in European countries.

7. Selection of variety –

| S.No. | Crop | Susceptible varieties | Free from / less cracking |
|-------|--------|--|-----------------------------|
| 1. | Litchi | Dehradun, Muzaffarpur | Seedless Late, Swarna roopa |
| 2. | Lemon | Kagzi Kalan, Italian lemon, Eureka, Pant lemon-1 | Nepali Oblong, Genoa |
| 3. | Mango | Dashehri | Langra, Neelum, Amrapali |
| 4. | Guava | Thai | Allahabad Safeda |

Conclusion

Cracking of fruits alters the structural integrity of the fruits which further results in various changes and make the fruits unmarketable. There are various causes which can lead to fruit cracking like biotic factors, hormonal factors *etc.* Therefore, management of fruit cracking is must and various measures have been adopted in order to manage and reduce this physiological disorder.

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