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Prevention Strategies for Fruit Drop and Fruit Cracking in Litchi (*Litchi chinensis*)

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Abstract

Litchi (*Litchi chinensis*) is one of the most important fruit crops from subtropical zone. It consumed as fresh and dried forms in different Indian states. Due to its excellent quality, pleasant flavour, juicy pulp (aril) with attractive red colour, it is also popular among fruit crops. Stress can increase natural fruit drop in litchi, and stress may be increased by drought, temperatures that are colder than normal or nutrient deficiencies. Litchi is notoriously ready to drop fruit early, so being careful to minimize stress is important. There are several pests that may attack your tree and contribute to more fruit drop: litchi stink bug, fruit spotting bugs, erinose mites, and several types of moths and fruit flies.

Introduction

Litchi is one of the most important fruit crops from subtropical zone, it consumed as fresh and dried forms in different Indian states. Due to its excellent quality, pleasant flavour, juicy pulp (aril) with attractive red colour it is also popular among fruit crops. Although, litchi is liked very much as a table fruit, dried and canned litchi are also popular. A highly flavoured squash is also prepared from its fruits. Litchi is also an excellent source of Vitamin C, but it contains insignificant amount of protein, fat, pectin and minerals especially calcium, phosphorous and iron. Litchi reached India by the end of 17th century. The spread of litchi to other parts of the world has been limited and has taken place only in comparatively recent times. This is an account of its exacting requirements of climate. Even today, its original region remains the biggest producer of litchi. India ranks second in the world next to China in litchi production. Most of the litchi growing areas in India fall in North Bihar. Litchi fruit is a single seeded nut and its edible portion is aril (Ruby *et al.*, 2001).



Figure 1: Litchi fruit plant



Figure 2: Fruit cracking in Litchi

Stress can increase natural fruit drop in litchi, and stress may be increased by drought, temperatures that are colder than normal or nutrient deficiencies. Litchi is notoriously ready to drop fruit early, so being careful to minimize stress is important. Other reasons for dropping of fruits in Litchi at a high rate include infections and pests. There are several pests that may attack your tree and contribute to more fruit drop: litchi stink bug, fruit spotting bugs, erinose mites, and several types of moths and fruit flies. Downy blight disease causes brown lesions on fruit and early dropping. Birds can also cause fruit to drop early.

Fruit Drop and Fruit Cracking in Litchi

Fruit drop is the major problem in Litchi crop, so it is needed firstly to focus on reason and causes of litchi fruit drop, because whenever we make a plan or strategy start from the root of problem then after their solutions that's why after making prevention strategies for fruit drop in Litchi we focus on their cause.

Causes of Fruit Drop

Whenver the fruit detached and fall down on the earth from the pedicel due to its internal and external causes before its maturation is known as fruit drop. If your fruit is dropping early, there could be several reasons. Litchi trees generally set more fruits than its holding capacity, so some dropping can be the result of natural attrition. Fruit drop is one of the most wide spread problem. The initial fruit set in litchi is very high but a very small proportion finally matures. The premature fruit drop starts soon after fruit set and continues till fruit maturity. The main causes of fruit drop are due to embryo abortion, internal nutritional status, hormonal and external factors like high temperature, low humidity, strong winds, etc. The yield and quality of litchi fruits is affected by many physiological disorders like cracking of fruits, flower drop, fruit drop,

sunburn, retarded fruit development, irregular bearing and black spot etc. Therefore, management of these physiological disorders is essential in obtaining potential yield and quality of litchi fruits (Dutta et al., 2000).

Even after prolific flowering and fruit set, a heavy flower and fruit drop is a major concern in litchi. The flower and fruit drop in litchi may be due to-

- a) Internal factors like failure of fertilization, embryo abortion, nutrition and hormonal imbalance especially auxin.
- b) External factors like biotic (fruit borer and heavy mite attack) and abiotic factors (westerly winds, low humidity and high temperature).

The young bearing tree suffers fewer drops than the older trees. It has been reported that maximum fruit drop during the first fortnight after fruit set and continue up to maturity. The initial fruit set in litchi is very high but a very small proportion finally mature (2-18%). The endogenous level of auxin in developing fruit in litchi has also been taken into consideration for their fruit drops.

Prevention Strategies for Fruit Drop

- First, be sure that your tree is getting everything it needs to reduce stress. These trees require a lot of water, plenty of sun light, a slightly acidic soil, and an occasional general fertilizer to be their healthiest. The right conditions will both discourage early fruit drop and help trees better resist infections and diseases. You can also look out for signs of disease or pests on your trees and take steps to manage them early to minimize the damage and fruit drop. Check with your local nursery to find out what sprays are best for your fruit tree.
- Another strategy for preserving more of the fruit on your litchi is to bag the fruits. Netting, keeps birds off trees but not insects. Bagging the fruit protects it from both. To bag a litchi tree, use any kind of paper bag. Place the bags around individual panicles about six weeks after the tree has fully bloomed (the fruits will be about ¾ of an inch to 2 cm long). You can secure the bag any way that is easiest, but simply stapling or tying it around the stem is adequate.
- Two foliar spray of 0.2% Boron for ensuring better pollen germination, fruit growth and development and for enhancement of fruit retention.
- Two foliar applications of Plano fix @ 4 ml/5 litres of water may be done at an interval of 15 days when fruits attain peanut size.
- The application of plant growth regulators like NAA at 20-30 ppm, GA, at 20-25 ppm, 2,4-D at 10-20 ppm are effective in minimizing fruit drop when sprayed on panicles, before the flower opening.
- The sprays of ZnSO₄ @ 0.2% and synthetic auxins like 3,5,6-TPA can reduce the fruit drop.

- Keeping the honey bees, the main pollinators in litchi, to ensure better pollination and fertilization which increases the fruit set and retention. Avoid any type of chemical spray at the blooming stage to save pollinators.

Causes of Fruit Cracking in Litchi

The fruit cracking in litchi is an important physiological disorder and reported in almost all the important litchi growing tracts of the India. The Loss due to this disorder reported as high as 5-70%. It affects the fruit quality, market value of fresh fruits, shelf life, and also susceptible to storage diseases. Healthy cracked fruits mainly used for processing purpose as cracked fresh fruit has less demand in fresh market very short storage and shelf life. High temperature (above 38 °C), low humidity (below 60%) and low soil moisture conditions during fruit development promote this disorder. It entails the implicated roles of both internal and external factors. Besides climatic effects, abnormal development of the skin during early fruit growth promotes the disorder. In this context, a concept, ball skin versus bladder effect was theorized to describe the relationship between a pre-grown skin and a growing aril. To further conceptualize the problem. Zigzag unfolding model was developed which decipher the role of spongy tissue in pericarp extensibility necessary for preventing pericarp cracking. Cracking occurs during the final stage of fruit growth when the aril develops and exerts pressure on the inactively growing pericarp. Thus, a balance between turgor pressure from the expanding aril and the mechanical structure and elasticity of skin is indispensable to prevent fruit cracking (Singh *et al.*, 2013). The fruit cracking may occur due to-

- Varietal characters (most of Indian varieties are susceptible to fruit cracking except Swarna Roopa), the cultivars with thick skins are less susceptible to cracking than those with thin skin.
- Soil water management, drought soon after fruit set as it affects development of fruit skin which becomes inelastic.
- Irrigation or heavy rain, or just an increase in relative humidity.
- Deficiencies of nutrients like calcium and boron in soil.
- Injury to skin by pest or mechanically during pericarp development phase may also lead to fruit cracking.
- Higher concentrations of abscisic acid (ABA) and lower level of Gibberellins found in the fruit pericarp, seed and aril of cracked fruits.
- Insects, hail, and the sun can damage the skin during cell expansion and induce cracking towards harvest.
- Hot wind during summer and over maturity of fruits. The cracked fruits worsen rapidly and thereafter suffer secondary infestation by disease causing organisms and insect-pests become non-marketable.

Prevention Strategies for Fruit Cracking in Litchi

- Spray of plant growth regulators like 2,4-D and NAA at the concentrations of 20 ppm reduces cracking.
- Application of calcium @ 2 m/l liquid formulations and Gibberellins @ 20 ppm, reduces the activity of cellulose and thereby reduced cracking as deficiency of calcium in soil and low endogenous level of gibberellins also causes cracking.
- Spray of Borax or Boric acid @ 2g/l (to meet the boron requirement) at the initial stage of aril development with sufficient soil moisture in the root zone checks fruit cracking significantly.
- Constant moisture and appropriate humidity are needed at the time of fruit maturity.
- Irrigation at 30-40% depletion of available soil moisture is quite helpful in reducing cracking of fruits.
- Installation of micro irrigation (drip as well as micro sprinkler) below the canopy area has been reported to be effective in reducing the fruit cracking.
- Mulching has also been recommended in stabilizing the temperature and moisture level in root zone.
- Planting wind break around the orchard provides protection from desiccating hot winds.
- To save the cracking problem at maturity stage, fruit plants may be covered only on the top and permit free air flow into the sides. Control of cracking by covering the plants with net.
- Bagging: It is also a remedial operation to escape the sunlight from the plant surface because water is lost by transpiration through stomata.

Conclusion

Fruit drop and fruit cracking are problems associated with Litchi crop provide huge loss to fruit growers. Many external and internal factors are responsible for cracking and dropping of fruits in Litchi. So that it is needed to minimize fruit cracking and fruit dropping by using different techniques with that can minimize the loss.

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