

# Fruit cracking disorder in litchi

The cracking of litchi fruit is a general problem in all litchi producing areas of South Africa. This fruit disorder is more common in certain cultivars and production areas and the incidence vary from season to season. Although the physiological mechanisms behind this disorder are not fully understood, it appears to be related to weather conditions during the litchi fruit growing season and to tree agronomy. A few of these factors will be briefly discussed.

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SUBTROP

### SUSCEPTIBILITY OF DIFFERENT CULTIVARS – A GENETIC LINK

Studies in India and China have indicated that early cultivars are more prone to fruit cracking than later cultivars. In China up to 80% of No Mai Chee fruit may crack while Wai Chee, which is the latest cultivar, rarely cracks. In South Africa fruit cracking of Mauritius are a problem, while McLean fruit hardly ever cracks.

Skin morphology also plays a role. Cultivars with thinner skin are more prone to fruit cracking as those with thicker skins. The detailed structure of the skin was also investigated and several studies indicated that cultivars with more spongy tissue in the inner mesocarp (for example like Wai Chee) are less prone to fruit cracking. Other studies indicated that fruit cracking coincided with thinning of the skin during aril (fruit flesh) expansion (when fruit starts to turn red). However, the fruit did not crack at harvest when the skin was the thinnest.

The structure of the cell walls determines the strength of the skin. Studies indicated that load-carrying materials in the cell walls include cellulose integrated into micro-fibril networks and hemicellulose and pectin within the wall structure. Wai Chee had more of these materials in its cell walls than a cultivar like No Mai Chee. However, No Mai Chee had more wall-degrading enzymes (cellulose and pectinase) active in its skin than in Wai Chee, therefore the lesser resistance of No Mai Chee to fruit cracking. It was indicated that the application of calcium and gibberellin reduced the activity of cellulose, and therefore fruit cracking. However, throughout these studies it was indicated that the skin morphology only partially explains cracking of litchi cultivars.

### PLANT GROWTH SUBSTANCES

It was indicated that there was a relationship between fruit cracking and endogenous growth substances. Several studies found certain substances to be more in cracked fruit, while others were more in the seed during the critical period of cracking. These studies indicated applications of gibberellin (GA<sub>3</sub>) were partially effective to reduce fruit cracking, while auxins at concentrations lower than 40 mg/l reduced cracking.

### CLIMATE CONDITIONS

Studies in India and South Africa indicated drought conditions during fruit growth were associated with abnormal skin development, and therefore increased fruit cracking. However, fruit also crack during periods of high humidity and heavy rain when the fruit flesh is expanding. It was suggested that the higher water availability led to excessive water uptake of the fruit flesh. This increased the fruit turgor and therefore cracking. Cracking also occurs when trees under drought conditions are re-watered by irrigation or rain. This indicates that drought during the early stages of fruit development led to abnormal skin development, resulting in a



pericarp (fruit skin) that cannot stretch to accommodate the expanding fruit flesh. Drought conditions also hardened and reduced the elasticity of the skin. These changes were all related to a loss of calcium from the fruit skin and a direct inhibition of the skin development process.

### NUTRIENTS, PESTS AND DISEASES

Calcium was already mentioned to play an important role in litchi cracking. Other nutrients such as boron, zinc, copper, phosphorous, magnesium and nitrogen were also indicated to play an important role in this fruit disorder.

Pests and diseases such as fruit fly and *Colletotrichum gloeosporioides* that caused injury after early cell division will also induce cracking during fruit flesh development.

### CONCLUSION

Although there are still questions to be answered with regards to the physiological causes of fruit cracking, research has indicated a strong relationship between cracking and the onset of drought after fruit set. Calcium was also indicated to play a significant role in the fruit cracking phenomenon.

Therefore, high plant calcium concentrations should be maintained, excessive irrigation during fruit growth should be avoided where possible and fruit pests and diseases should be controlled. It is recommended that the trees should not be subjected to water stress or nutrients after flowering.

### REFERENCES

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Photograph: Cultivation of Litchi (ARC). 