

## Various causes of Fruit Drop in Kinnow (*Citrus reticulata* blanco) and its Control with Growth Regulators - A Review

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### Fruit Drop

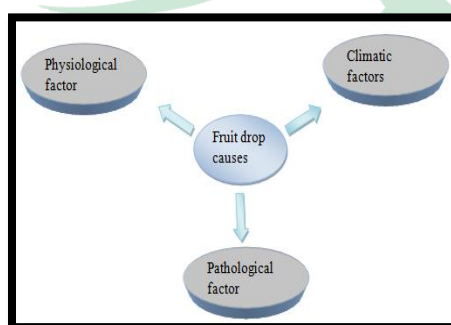
In citrus, fruit drop is the major causes of yield loss. Fruit drop can be defined as shedding of unripe fruit from plant either due to physiological disorder or pathological condition. The phenomenon of fruit drop can be attributed to physiological, pathological and environment factors. Aforementioned factors can act alone or in combination to induce the fruit drop (**Figure 1.1**).

### Causes of Fruit Drop

Pre-harvest fruit drop is serious problem not only in citrus but also in other fruits like mango, peach, plum and litchi. Literature suggested that depending upon the reason, fruit drop can be of three types namely

- a) Climatic factor induced fruit drop,
- b) Pathological factor induced fruit drop,
- c) Physiological factor induced fruit drop,

All above mentioned causes may work together to induce fruit drop (**Figure 1.1**).



**Figure 1.1** Diagrammatical representations of various causes of fruit drop.

### **Climatic Factors Induced Fruit Drop**

Fruit drop due to adverse climatic factors are universal problem. Climatic factors namely temperature, relative humidity, wind and rainfall are considered to have profound influence on citrus fruit drop. Extreme weather condition can trigger unfavourable physiological pathways resulting in excessive pre-harvest fruit drop. High temperature and low humidity has been recorded as major cause of immature orange drop. Fruit drop is more common during the dry and cool weather.

### **Pathological Factors Induced Fruit Drop**

Pathological condition can be induced by any microorganisms capable infecting the plant. Bacteria, fungi, virus as well as pest are known to induce pathological condition in fruit crops. Most profound symptom of diseased plant is development of brown discoloration near stem-end of fruits. As the disease progress, this discoloration covers whole of the fruit and causes rotting. Sometimes discoloration remains limited to stem end only and cause dropping of the fruit without rotting. In case of late infection, the diseased fruits shrink, become black, light in weight and become mummified. Mummified fruit may remain hanging to the stalks for a long time. The twigs of the infected trees show die-back symptoms. Fawcett reported the stem-end rot of citrus fruits in Florida for the first time.

### **Physiological Factors Induced Fruit Drop**

Physiological states of plant decide organic product yield just as natural product quality. Plant physiological condition is impacted by both biotic and abiotic factors. Abiotic factors like climate condition, supplement accessibility has critical effect on physiological condition of plant. Biotic elements like pathogenic microorganism, helpful microorganism and irritation can change physiological status of plant. Mineral component like N, P, K, Zn B, Mn and Fe have been found to control natural product drop in citrus by modifying the physiological condition of plant. The basal and foliar application of Zn and B significantly affect the growth, yield and quality parameters in kinnow. Different cultivar may have different physiological state under given condition. Fruit drop in nagpuri local oranges was the maximum in April. Physiological (40-63%) and pathological (5-25%) drop in kinnow is a great matter of concern as the pre-harvest fruit drop results in direct economic losses to the

growers. Fully grown fruits have already drawn the metabolites from the tree and exhausted its nutrients. Climatic and pathological factor has ultimate effect on the physiology of plant. Thus it would not be an exaggeration to say that by modulating physiological state of plant by growth regulator researcher can control pre-harvest fruit drop as well as increase quality parameters of fruit.

## **Controlling Fruit Drop By Plant Growth Regulators**

Plant growth regulators (PGRs) comprise of natural atoms created artificially and used to change the development of plant. The American Science Society for Horticultural additionally isolates the plant development controllers into six classes including gibberellins, auxins, cytokinins, ethylene, development inhibitors and development retardants. For modifying physiological factors in citrus plant 2,4-dichlorophenoxyacetic corrosive, Gibberellic corrosive and Naphthalene acidic corrosive are generally utilized in pre reap application. Auxin (2,4-D and NAA) has better job in decreasing pre collect organic product drop than gibberellins. Application of 2,4-D and NAA dramatically increases total number of fruit buds per plant, total soluble solids, acidity, vitamin C, reducing sugar. Fruit drop in citrus may occurs due to imbalance in combination of nutrient and pest attack. Therefore treatment with formulation of 2,4-D, salicylic acid, K and Zn amend the yield and quality of kinnow in Punjab. Application K and Zn increases the fruit weight, juice content and control pre harvest fruit drop. Exogenous application of GA<sub>3</sub>, 2,4-D in different concentration were improved Juice quantity, TSS, total sugars and reducing sugars in blood red. Various growth regulators have been reported to control fruit drop but 2,4-D has been reported to controlling be more effecting in controlling pre harvest fruit drop under various agro climatic regions when used as foliar spray and application of 2,4-D has improves quality of kinnow mandarin. At Pea and Gravel stages of kinnow application of 20ppm NAA increases 45% fruit retention and similarly 2% spray of urea increases weight of 100 fruit upto 16.70 KG. 2,4-D and salicylic acid effective against fruit drop in citrus and other included 2,4-5 trichlorophenoxypropionic acid NAA & GA<sub>3</sub> helps in synthesis of protein, opening of stomata & activation of enzyme. Deficiencies of micronutrients like Zn, Cu, Fe and Mn in citrus orchards of Pakistan and among them Zn is more acute and is beneficial against the fruit yield and quality. So the perfect combination of macro-, micronutrients and growth

regulators mask the effect of fruit drop and improve the citrus fruit yield and its quality. Growth regulators treatments 2,4-D, GA<sub>3</sub>, NAA at 15 and 20ppm concentrations respectively reduced fruit drop in kinnow mandarin. The highest fruit drop control was exhibited by 2,4-D resulting in high yield and quality. Exogenous application of gibberellins had no effect on abscission in citrus. Application of different growth regulators (GA<sub>3</sub>, 2,4-D and NAA alone and in combination) on 'Pera' orange had no influence on the development of the fruit such as length; diameter and fresh fruit mass.

### **Conclusion**

Pre- harvest fruit product drop was basically because of physiological issue and neurotic condition. Blend of synthetic growth regulator and wide range fungicide was utilized in the current investigation to beat physiological confusion and obsessive condition. Aside from lessening pre-reap organic product drop, splash detailing was additionally assessed for upgrading the natural product nature of foods grown from the ground. Engineered development controllers in particular 2,4-Dichlorophenoxy acidic acid and Naphthaleneacetic acid (NAA) was utilized to modify physiological condition. 2,4-Dichlorophenoxy acidic corrosive and Naphthaleneacetic corrosive are notable engineered auxin. Auxin are phyto-hormones answered to assume basic job in plant development.