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# Influence of Stress Factors on Fruit Crops

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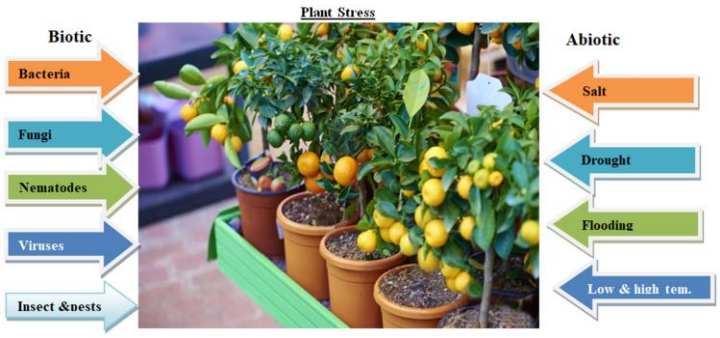
## INTRODUCTION

As a result of environmental stresses, fruit crops yields are reduced and impeded. Both abiotic and biotic stresses are encountered by plants, and they can be classed as such. Radiation, salt, floods, droughts, temperature extremes, heavy metals, and other abiotic stressors are some of the most common causes of crop plant losses around the world. Biotic stress, on the other hand, includes pathogen attacks by fungus, bacteria, oomycetes, nematodes, and herbivores. Plants are unable to avoid these environmental cues since they are confined to their natural habitats. They have devised a variety of ways in which they can protect themselves from both natural and man-made hazards.

**Stress**

Any alterations in the environment that could affect a plant's growth or development negatively. (Levitt, 1980).




**Stresses and their Significances**

**Biotic stress**

E.g.-Bacteria, Fungi, nematodes, viruses and insect pests.

**Abiotic stress**

Abiotic stress is defined as the harmful effects of nonliving elements on living organisms in a given environment.
Ex-Salt, drought, flooding, low and high temperature

- Fruit crops lose 25-30% of their yield due to diseases in the field and in storage conditions (Rangaswami & Mahadevan, 2002)
- More than 600 insects and mite pests can be found in temperate region of India affecting the temperate fruit crops (Sharma & Singh, 2006)

**Biotic Stress**

Bacteria, viruses, fungi and nematodes are all examples of organisms that can cause harm to plants.

**Potential damage by biotic stress**

- Plant illnesses are caused by fungi far more frequently than by any other type of biotic stress
- Plant wilt, leaf spot, root rot, and seed damage can all be caused by microorganisms.
- Plants can be severely harmed by insects
- Additionally, insects can spread viruses and bacteria between plants that are already affected and healthy ones

**Impact of Abiotic Stresses on Fruit Crops**

- Germplasm extinction
- Poor vernalization
- Unsatisfactory chilling hours
- Poor activity of pollinators
- Advanced bud burst-frost injury
- Cracking
- Delayed emergence of panicle (Mango)
- New spectrum of pest and diseases
- Change in metabolites viz Amino acids, Amines, Sugars etc
- Increased vegetative growth
- Shifting fruit cultivation from lower area to high altitude

**Effect of Abiotic Factors on Fruit Plants**

1. **Temperature (High temperature)**

- Excessive membrane fluidity
- Disruption of protein functions
- Metabolic imbalance
- Disruption of normal protien synthesis
- Disruption of normal mRNA precursor

**Affects crop at**

- Vegetative growth
- Flowering
- Fruit yield
- Metabolic processes

**Vegetative growth**

- Increases vegetative growth for a short period of time before ceasing growth
- A periderm-like layer separates the twisted and compressed cells from the surrounding tissue in almond bud failure-like symptoms at a temperature of $43^0$ C (Hellali & Kester, 1979).

**Flowering**

- In temperate fruit trees, an abnormal pattern of bud break and development has been observed
- In apricot, warm temperatures ($16^0$C) that are 3-$5^0$ C greater than normal result in pistils that are undeveloped (Rodgigo & Herrero, 2002).

**Fruit set and Yield**

- The greater temperature during the fruit let stage has an effect on the fruit retention as well as the fruit quality
- When subjected to temperatures between 30-$35^0$ C for 48 hours in a controlled environment, trifoliate orange rootstock produced more fruit drop
- It was found that upon exposure IAA conc. increased in the leaves but dropped in the fruit lets
- As a result, there was minimal effect on ABA levels in leaves, while ABA concentrations and ethylene released at higher temperatures were responsible for fruit drop in oranges (Hu et al., 1998).

**Metabolic processes**

- High temperatures have a direct impact on biological processes such as respiration and photosynthesis as well

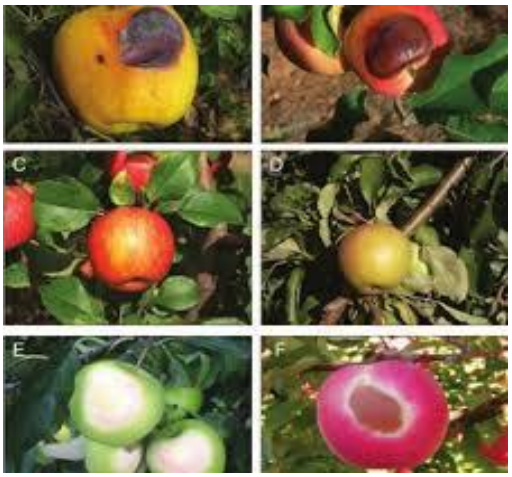
**Adverse Effect of High Temperature on Fruit Crops**

**Sunburn**

- Leaf and fruit burning is a common
- Transpiration losses are also significantly higher during this period
- There may be fissures in the bark of the damaged tree trunk and branches
- Trees may die and become disabled as a result

**Sunscald**

- Hot intense sun rays falls on the exposed parts of the trees resulting into sunscald injuries
- Scorching of developing fruits, especially those of citrus
- Malformed and misshaped fruits
- The affected portion of the fruits first turn yellow then brown on further scorching turn black
- Such fruits cease to growth from the affected side, whereas the growth on the other side continues as usual
- Splitting of fuji
- Bitter pit in jonagold
- Poor colour development in citrus
- Spongy tissue and fruit cracking in mango
- Reduced fruit set in avocado
- Accelerated pollen tube growth in cherry
- Reduction in the no. of buds, flowers and fruits in apricot



**Adverse Effect of Low Temperature on Fruit Crops**

**Mechanism of injuries due to low temperature**

- Extra cellular freezing
- Intracellular freezing


**Black heart in pineapple**

**Adverse effect of low temperature**

- Black heart (Pineapple)
- Collar injury
- Crotch injury
- Splitting of bark
- Citrus- Drying on twigs of fruit
- Almond- Pollination and fertilization are severely hampered.
- Aonla- Fruits dripping with water
- Ber- Fruits get shrivelled, discoloured, and eventually black
- Pomegranate- Hardening of fruits
- Banana- Low temperatures cause inflorescence impedance and bunch deformity Mango- Floral induction

## CONCLUSION

Short term control of primary stress is expensive and only moderately effective. Long term control involves the understanding of physiological mechanism and using genetic improvement. Transgenic technology is the most useful tool to produces resistant plants to various stresses, when the success of resistance is not present in the related genera/species. At genetic level gene isolation that imparts resistance to different types of stresses in fruit need to be improved.

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