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Eco-physiological Factors Relation with Successful Fruit Crops Production

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SUMMARY

Many abiotic environmental factors, such as temperature and rainfall, have an effect on the production of fruit crops. Changes in abiotic factors have a significant impact on various types of natural resources around the world, especially water, which is essential for life. Changes in biodiversity, natural resources, and the biosphere have a negative impact on human health and quality of life, as well as yield and productivity.

INTRODUCTION

More irregular rainfall patterns and volatile high temperature spells are two major parameters of climate change that have far-reaching effects on agriculture in general, and horticulture in particular. As a result, crop productivity would be reduced. Land loss as ecological and agro-financial zones change latitudinal and altitudinal. Water supply is thought to be reduced during high geophysical activities, as well as an increase in sea stage and salinization (FAO, 2004). Mango, banana, citrus, guava, grape, pineapple, and apple are the most common fruits grown in India. The processing time of crops is primarily influenced by abiotic factors such as temperature. When the temperature increases, crops such as citrus and grapes grow faster and mature 15 days earlier. Breaking dormancy in pome and stone fruits needs unique chilling hours. The occurrence of physiological disorders such as black tip of mango has increased as a result of air pollution, which has decreased the yield of fruit crops. When temperatures rise above average and moisture stress increases, some fruit crops, such as apples, apricots, and cherries, experience more sunburn and cracking, while high temperatures during maturity cause fruit cracking and burning in litchi (Kumar and Kumar, 2007). Other abiotic factors that affect citrus include late monsoon, low rainfall, and inconvenient rains during the water stress cycle, supra-optimal temperature during flower emergence and fruit production, and hailstorms. Hot temperatures, on the other hand, have a negative effect on pollination, floral abortions, and fruit drop. Temperatures below 10 OC cause inflorescence impedance and bunch malformations, and the plant shows chilling symptoms after 2 to 4 days. The need for annual irrigations is increasing, and the heat unit demand is being met in far less time. For every 3.3 ºC to 3.7 ºC increase in least or mean temperature from 10 ºC to 20 ºC or 13.5 ºC to 25 ºC, respectively, plant leaf development increases by one leaf per month.

Effect of abiotic environmental factors on fruit crops

Abiotic environmental factors have an effect on the cultivation of high-quality and yielding fruit crops. As previously discussed, the following are the effects on fruit crops:

Mango

Mango fruit setting was influenced by a sudden rise in temperature (maximum 35°C) during peak flowering, resulting in a decrease in fruit setting. Low temperatures (4-11°C) in January and February, combined with high humidity (> 80%) and cloudy weather, may delay panicle emergence. As a consequence, fruit defects, such as chilling injury, carbon dioxide injury, soft-nose, stem end breakdown, jelly seed, and spongy tissue, have been reported as the environmental factor causing symptoms. CO_2 injury is linked to the formation of off-flavors, internal pitting (Chaplin, 1986), browning with associated exudates, and ripening inhibition in this case (Thompson, 1971). Chilling injury is initially seen as a skin condition with brown spots or patches of discoloration followed by pitting in the skin, but it can also affect the flesh, according to Lizada *et al*., 1984.

Citrus

Citrus crops are impacted by winter rains, which encourage vegetative growth rather than flowering flushes, and temperature variations have an impact on bahar management, flower retention, fruit retention, and fruit production. Due to the low non-freezing temperature, citrus fruits can suffer from chilling injury.

Pomegranate

Increased temperature had a significant effect on pomegranate fruit set, fruit cracking, and high fruit drop, as well as a negative effect on fruit growth and color development.

Apples and other temperate fruits

Temperate fruits need chilling to break dormancy and promote plant growth and development, which has an effect on the growth of apples and other temperate fruits. Sunburn and cracking are caused by excessive temperature and moisture stress in apple, apricot, cherry, and litchi (Kumar and Kumar, 2007). Apple output has steadily increased, but efficiency has decreased as abiotic factors in the ecosystem have changed (Awasthi *et al*., 2001). Climate variability, soil, crop improvement, and other factors are cited as contributing factors. Of all the factors that reduce production, the climate is difficult to control. Anthocyanin production in apples can be influenced by higher temperatures.

Fig: Skin colour disorder of apples due to high temperature

Grape

The large temperature differences between day and night promote the production of anthocyanin and color development. After April pruning, higher temperatures affect vine growth in general and fruit bud differentiation in particular. Pink berry is a severe physiological issue that lowers the consistency of the dominant Thompson variety. Seedless, and this disease can become more prevalent as temperatures rise.

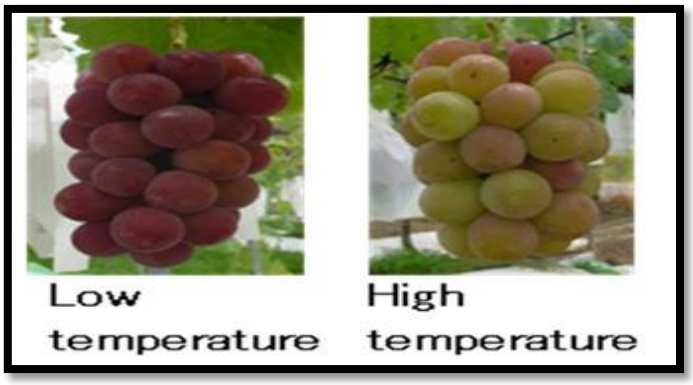

Fig: Skin colour disorder of grapes due to high temperature

Banana

Increased leaf injuries caused by hot wind during the summer months can result in poor plant growth in bananas. High wind velocity can cause pseudostem lodging and breaking. Because of the higher temperature, banana plants have low bunch growth and mature early. Increased temperature combined with low relative humidity (60%) reduced banana leaf spot disease, particularly in sub-humid areas. Unprecedented rains, as well as fluctuations in temperature and relative humidity, exacerbated the infestation of thrips and tinged bugs, as well as the spread of fungal diseases.

Severity of damage due to frost

The survey was conducted in Bikaner and the surrounding areas immediately after the frost cycle to assess the impact of frost on the survival and severity of damage to arid fruit crops (Datta, 2007).

S. No.	Severity of damage (frost)	Fruit crops
1.	Severely affected	Aonla, Phalsa, Ber, *Ficus* sp. etc.
2.	Moderately affected	Pomegranate
3.	Less affected	Sapota and Bael
4.	Unaffected	Date palm

CONCLUSION

Horticulturists may play a critical role in the climate change scenario, and effective methods for preserving horticulture must be devised. Conservation agriculture, renewable energy, forest and water conservation, reforestation, and other measures to maintain productivity, as well as changes in current horticultural practices and increased use of greenhouse technology, are some of the solutions to mitigate the effects of climate change. The key strategies to address these challenges are the development of new cultivars of horticultural crops that are resilient to high temperatures, resistant to pests and diseases, and produce good yields under stress conditions, as well as the adoption of hi-tech horticulture and judicious management of land use resources.

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