

Effect of Climate Change on Vegetable Production

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SUMMARY

Vegetables high in fibre enhance digestion, lower cholesterol, and reduce the risk factors for heart disease, diabetes, and obesity. Vegetables are the best resource for overcoming micronutrient deficiencies and provide smallholder farmers with much higher income and more jobs than staple crops. Vegetables are generally sensitive to environmental extremes and significant change in climate will impact vegetable cultivation and agriculture which affect the world's food supply. Climate change has the greatest impact on pests, diseases, and weeds. Several key natural and human factors also play a significant role in shaping the climate system.

INTRODUCTION

In India, agriculture is very important because it is the foundation of the country's economy and provides a living for most of the population. Latitudinal and altitudinal shifts in ecological and agro-economic zones, land degradation, extreme geophysical events, reduced water availability, and rise in sea level and salinization make it difficult to cultivate the traditional vegetables in particular zones in the world. There is a huge demand for fresh vegetables in the local as well as international markets, which includes Europe, Middle East, and Far Eastern markets but due to their perishable nature it is difficult to export this commodity. The world's farmers are challenged with growing abundant, safe and nutritious food for an increasing global population in the face of changing climate and pest pressures. Unless measures are undertaken to mitigate the effects of climate change, food security in developing countries will be under threat and will jeopardize the future of the vegetable growers in these countries.

Vegetables can be cultivated in off-season, with the induction of an artificial technique like greenhouse technology, in which temperature and moisture is controlled for specific growth of vegetables. Climate change is an imminent global challenge that poses significant threats to our planet's ecosystems, human societies, and overall well-being. Climate change refers to long-term shifts in temperature and weather patterns has shown all too clearly that climate change is here, and human activities have been the main driver of climate change. Global Warming which has triggered the melting of glaciers, sea level rise, weather fluctuation, erratic rainfall, and an increase in temperature patterns over the next century is predicted. The increasing population and the resulting requirement for higher crop production represent a significant challenge to food security. Storms, droughts, floods, precipitation, increased CO₂ levels, and higher temperatures all have a considerable impact on food supply. According to research, anthropogenic activities increase greenhouse gas concentrations, primarily carbon dioxide, resulting in climate change. Air and soil temperature, solar radiation, precipitation, relative humidity, and wind speed are all climatic variables that have a direct impact on plant physiological activities (Sharma 2014).

Vegetable crops are heavily impacted by insect pests and diseases due to their softness, fragility and short duration in comparison to other crops. The importance of climate change's effects on insect pests is increased by the fact that insects participate in numerous biotic interactions with plants, natural enemies, pollinators, and other organisms that are essential to ecological functioning (Boullis *et al.* 2015). According to EPA (2014), a variety of factors arising from natural phenomena and human activities may cause changes in the earth's energy balance and contribute to climate change

Causes of Climate Change

- Rise Impact of deforestation
- Fossil fuel consumption
- Urbanization and Land reclamation
- Agricultural intensification
- Freshwater extraction and Fisheries overexploitation

- Waste production and Fossil Fuels Combustion
- Solar Variability and Orbital Variations
- Ocean Current Alterations
- Impact of Volcanic Eruptions
- Glacier Melting and rise in Sea-Level
- Land use change
- Gas Emissions from Greenhouse
- Emissions of Air Pollutants

High temperature stress disrupts normal cell function in plants. In higher plants affects the photosynthetic function. Pre-anthesis stage high temperatures cause developmental changes in anthers, irregular epidermal growth, stomatal opening and closure, poor pollen development, colour development, inhibit fruit set, induce flower drop, improper fertilization in vegetables leading to reduction in the productivity and quality of the vegetable crops. For example - In pepper, high temperature at the pre-anthesis stage did not affect pistil or stamen viability, but high post-pollination temperatures inhibited fruit set, suggesting that fertilization is sensitive to high temperature stress. In tomato causing fruit set failure bud drop, abnormal flower development, poor pollen production, dehiscence, and viability, ovule abortion, poor viability, reduced carbohydrate availability and other reproductive abnormalities.

Low temperature or Cold stress (chilling and freezing) – As many crops are sensitive and intolerant to low temperature affect crop productivity. Stress causes membrane damage, changes in cytoplasm viscosity changes in enzyme activities leading to death of plants, no proper seed germination, reduced leaf expansion, wilting and chlorosis (yellowing of leaves) and may lead to necrosis (death of tissue), irregular plant growth, reduced pollen viability, pollen sterility, no flower and fruit set, triggers a series of morphological, physiological and biochemical changes in plants.

Mitigation and Strategies

- Greenhouse Gas Emission Reduction
- Crop Diversification
- Soil and Water Management
- Sustainable Pest Management
- Weather Forecasting Application
- Water Efficient Techniques
- Management of Crop Residue
- Use of Renewable Source of Energy
- Conservation Tillage

CONCLUSION

There is an urgent need to recognise the innovative and creative strategies for climate change's adaption and mitigation as climate change has seriously affected agricultural production of India. On the one hand, the population of India is increasing rapidly and on the other hand, agricultural production is negatively affected by climate change.

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