

Impact of climate change on plant diseases

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Introduction: -

Diseases are one of the most important components that are having a major contribution to in affecting agriculture. Plant diseases are the result of interaction between susceptible host, virulent pathogen and favorable environmental conditions. As environment is one of the important components in disease development, changes in it can be strongly associated with the changes in disease severity and losses due to it (Elad and Pertot, 2014). Estimated the loss of at least 10% in global food production due to diseases. In context with plant diseases CO₂, Ozone and high temperature are mostly responsible for varying development of pathogen, host and their interaction. Green House Gases are the major drivers of climate change. According to Mahato (2014), GHG viz., CO₂, CH₄, N₂O, HFC, Ozone and water vapors trap reflected radiations and warm the earth's surface. Second is the increase in tropospheric ozone, which is toxic towards plants and enhances biotic stresses in plants. Climate change directly impacts crops, as well as their interactions with microbial pests. Changing weather can induce severe plant disease epidemics (Chakraborty, 2005), which threaten food security if they affect staple crops (Anderson *et al.*, 2004) and can damage landscapes if they affect are mostly conscientious for altering development of pathogen, host and their interaction.

Causes of climate change: -

Natural causes	Anthropogenic causes
Volcanoes	Greenhouse gases
Earth tilth	Deforestation
Solar radiation	Cole mining
Forest fire	Urbanization
Ocean current	
Tsunami	

Plant diseases and climate change: -

Plant Disease Triangle: -

Environmental factors considerably affect the development of plant diseases. Plant pathologists frequently use a disease triangle to illustrate the intimate relationship among plants, pathogens and the environment. For a plant disease to develop, a susceptible host, a virulent pathogen, and a suitable environment must occur simultaneously. Because of this intimate relationship among plants, pathogens, the environment, climate change is expected to affect the incidence and severity of plant diseases. Plant diseases require changeable environmental conditions to develop; thus, it is vital to understand the environmental requirements of individual plant pathogens before predicting responses to climate change.



Environmental factors affecting disease development: -**a) Temperature: -**

Temperature plays an important role in growth and development of plant as well as animal. Each pathogen has an optimum temperature for growth. In addition, dissimilar growth stages of the fungus, such as production of spore, their germination and the growth of the mycelium.

b) Relative humidity: -

Relative humidity is very critical in fungus spore germination. High humidity favors development of the large majority of leaf and fruit diseases caused by fungi and bacteria.

c) Soil moisture: -

High or low soil moisture may be a limiting factor in the development of assured root rot disease. High soil moisture level development of destructive water mold fungi such as species of Aphanomyces, Pythium and Phytophthora.

d) Elevated CO₂: -

- Increased host susceptibility
- More rapid/new development of pathogen
- More rapid vector development
- Increased pathogen transmission
- New diseases/minor diseases can be become major

Eg.- False smut of rice.



Conclusion: -

There has been only a limited investigate on impact of climate change on plant diseases under field conditions or disease management under climate change. However, some assessments are now available for few countries, regions, crops and particular pathogens which concern with food security. Now, emphasis must change from impact assessment to developing adaptation and mitigation strategies and options. First, there is need to evaluate under climate change the efficacy of current physical, chemical and biological control strategy, including disease-resistant cultivars, and secondly, to include future climate scenarios in all research designed at developing new tools and tactics. Disease threat analyses based on host–pathogen interactions should be performed, and research on host response and adaptation should be conducted to understand how an imminent change in the climate could affect plant diseases

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