Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 04, Issue: 02 (MAR-APR, 2024)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

How Does Climate Change Affect Crop Diseases

(*Pulkit Mittal and Mahaveer Meena)
Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan
*Corresponding Author's email: pulkitmittal824@gmail.com

Global climate change is being caused by human actions that are changing the amounts of greenhouse gases in the atmosphere. Depending on the place or time period, the effects of climate change can be positive, negative, or neutral, meaning that they may have no effect at all or a drop in disease rates. Globally, one of the biggest environmental challenges is climate change. The earth's surface warms due to the absorption of reflected radiation by greenhouse gases (GHGs), which include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs) and ozone (O_3). Global climate change is mostly caused by human activity and this has an immediate impact on ecosystem. In India, the inner peninsula, northeastern India, central India, and the west coast have all shown signs of global warming. Although, every year, 30% of crops are lost due to pests and diseases, resulting in an estimated annual loss of Rs. 90,000 crores. Globally, diseases are responsible for a loss of 10% of global food production. An estimated loss of 23 million t of food cereals, 12 million t of fruits and 21 million t of vegetables are reported each year, with a total estimated value of Rs 240 billion. Along with other elements of the agroecosystem, plants and other species will also be subject to these effects. Since it is difficult to determine these effects, experts from a variety of fields must cross disciplinary barriers and consider the effects of climate change in a larger context. The global temperature has risen by roughly 0.8°C during the last century and by 2100, it is predicted to have increased by 0.9–3.5°C. These alterations will have a significant impact on the development and growth of many crops as well as the severity, spread and reproduction of numerous plant diseases.

Effect of different factors and associated pathogens affect on crops

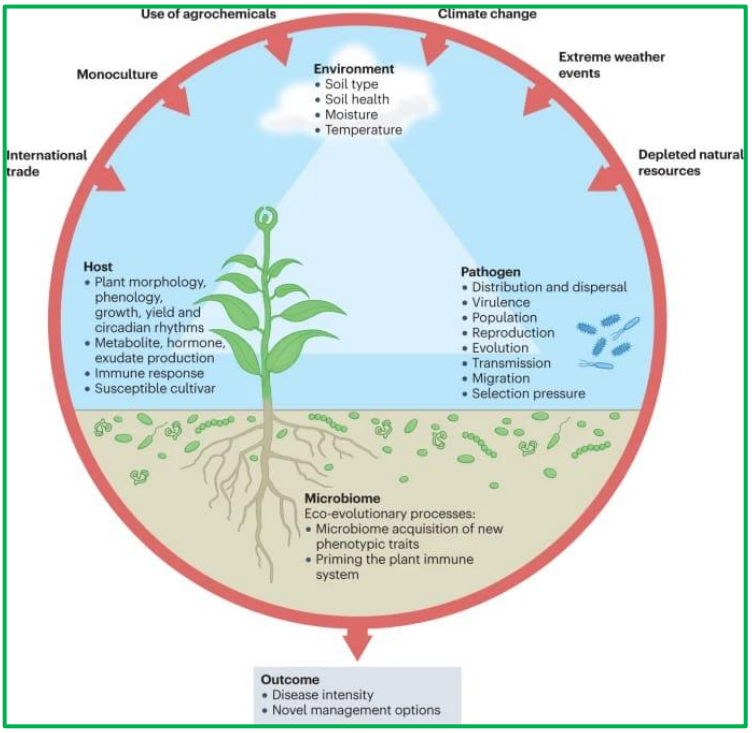
Temperature: Warmer temperatures can alter the distribution and activity of pathogens that cause crop diseases. Some pathogens thrive in warmer conditions, leading to increased disease incidence and severity. For example, in India, rust outbreaks are facilitated by lower daily temperatures because they decrease the latency period of the rust-causing fungus *Hemileia vastatrix*, which causes coffee leaf rust. The pathogen's incubation period shortens in response to warming temperatures, which increases the pathogen's prevalence during the growth season. greater temperatures and greater humidity levels are linked to increased disease severity of the oilseed rape phoma stem canker (*Leptosphaeria maculans*) and the potato blight pathogen (*Phytophthora infestans*).

CO_2: Increasing atmospheric CO_2 concentrations, an important factor contributing to climate change, have an immediate impact on diseases as well as crops. Elevated CO_2 might potentially hasten plant development, altering plant physiology and susceptibility to disease. The severity of powdery mildew on cucurbits caused by *Sphaerotheca fuliginea*, head blight and blotch on wheat produced by Fusarium spp. and Septoria tritici, respectively and the susceptibility of soybean to the downy mildew pathogen *Peronospora manshurica* were all

lessened. Atmospheric CO_2 influences plant immune responses and hormone levels that may influence interactions between plants and pathogens.

Humidity: Variations in relative humidity and soil moisture are among the main drivers of abundance and infectivity of plant pathogens and therefore climate-induced changes in humidity will likely impact future plant disease outbreaks. Many fungal diseases require high humidity to germinate spores and infect host plants. High humidity generally increases the virulence of viruses that invade aerial plant tissues. Higher humidity is also associated with higher formation of the mycotoxin deoxynivalenol by *F. graminearum*, a disease that infects a variety of crops, resulting in severe economic losses and lower food quality.

Other variables and future scenarios: Although we have a limited understanding on the combined effects of multiple environmental factors on plant–pathogen interactions, combined effects are more pronounced than individual effects and, in some cases, combinations of factors are required for outbreaks. For example, an abnormally warm and humid pre-harvest season as a result of climate change was ascribed to the outbreak of *M. oryzae triticum*, the causal agent of wheat blast disease, in Bangladesh. Similarly, high humidity and increased temperature promoted the disease incidence of *B. cinerea* in grape berries. Altered climates (for example, increased temperature and soil moisture) can promote pathogen invasion and transmission across novel geographical and host ranges.



There are some potential positive aspects of climate change that have positive effects on crop diseases

Shift in Disease Distribution: Certain crop diseases may become less prevalent in particular regions as a result of changes in temperature and precipitation patterns brought about by climate change. Certain infections may find it easier to develop and proliferate in some areas that were previously too cold for them. On the other hand, when circumstances change, a disease's prevalence in regions that were formerly hotspots for it may decrease.

Increased Genetic Diversity: Crop populations may be subject to selection pressures brought about by climate change, which could result in the creation of novel genetic variants that are more suited to shifting environmental factors and may even be resistant to specific diseases. This may eventually lead to a rise in genetic variety among crop species, which would be advantageous for efforts to produce crops resistant to disease. This may result in the identification of novel characteristics that give resistance to various stressors, rather than simply illnesses.