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REVIEW ON IMPACT OF CLIMATE CHANGE ON PLANT DISEASES

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Tarun K. Mandaviya

Agriculture Officer, Agriculture Research Station, JAU, Mahuva-364290, Gujarat

Email: tarun0756@gmail.com

Climate change refers to any change in climate over periods time, whether due to natural unpredictability or because of human interferer (IPCC, 2007). Climate encompasses the long-run pattern of numerous meteorological phenomenon (e.g. temperature, humidity, atmospheric pressure, wind, rainfall, sunshine etc.) in a given location or larger region. Worldwide losses due to diseases range from 9 to 16% in rice, wheat, maize, barley, potato, cotton, soybean and coffee. Plant diseases was respond to climate change, through a number of interactions, take place among the host, pathogen and potential vectors. Effects of climate change on plant diseases, crop yield as well as on pathogen activities. As results, currently, more than 800 million people do not have ample food and at least 14% of global food production is declined due to plant diseases (Agrios, 2005). Weather parameters like temperature, an elevated level of CO_2 and ozone, precipitation and humidity play a dynamic role in diseases development. Changes in temperature and precipitation have influence disease epidemiology.

Climate change refers to a change of climate that is attributed directly or indirectly by human bustle that alters the composition of the global atmosphere, and climate variability observed over comparable periods. It refers to any change in climate over time, whether due to natural variability or because of human interferer (IPCC, 2007). Climate encompasses the long-run pattern of numerous meteorological phenomenon(e.g. Temperature, humidity, atmospheric pressure, wind, rainfall, sunshine etc.) in a given location or larger region. Plant diseases significantly reduce the production of more than 25 crops that stand between the rapidly expanding world population and starvation. Worldwide losses from diseases range from 9 to 16% in rice, wheat, maize, barley, potato, cotton, soybean and coffee. In the USA alone, fungicides worth over the US $11.2 billion for control diseases. (Agrios, 2005). Plant diseases was respond to climate change, through a number of interactions, take place among host, pathogen, potential vectors. Plant diseases continue to cause serious problems in global

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food production. Currently, more than 800 million people do not have adequate food and at least 14% of global food production was decline due to plant diseases (Agrios, 2005).

Effects of Climate Changes on Plant Diseases

Elevated CO_2adversely affect the physiology of host and pathogen interaction, increase in the canopy have a positive correlation and increase the density of foliar diseases, moisture stress increase dry root rot disease incidence and severity in case of anthracnose.

Host susceptibility has a positive correlation with temperature and moisture *i.e.* impact of temperature on stem rust of wheat was observed. In wheat varieties, resistant was observed at 15^{o}C, and it was fully susceptible at 20^{0}C. Due to high temperature, the rapid development of pathogens was observed i.e., rust on groundnut (Mayee, 1996), Pathogens on chickpea, UG– 99 stem rust of wheat and Rhizoctonia in chickpea as well as Phytophthora on Pigeonpea and Soyabean. More rapid vector development like a vector of viral diseases of rice and vector of citrus tristeza virus was also the effect of temperature fluctuation.

According to Scherm and Coakley, 2003 fluctuation in temperature and humidity also increased over-summering and overwintering of pathogen as well as a vector like Barley Yellow dwarf, Oospore of sunflower downy mildew, Chlamydospore of pigeonpea wilt and Charcoal rot of sorghum.

Effects of Climate Changeon Crop yield

Table-1: Temperature Effects on Crop Yield of Several Major Crops

Crop	T_{opt} ^{O}C	T_{max} ^{O}C	Yield at T_{opt}, t/ha	Yield at 28 ^{O}C, t/ha	Yield at 37^{O}C, t/ha	% Decrease in yield
Rice	25	36	7.55	6.31	2.93	54
Soybean	28	39	3.41	3.41	3.06	10
Dry bean	22	32	2.87	1.39	0.00	100
Peanut	25	40	3.38	3.22	2.58	20
Grain Sorghum	26	35	12.24	11.75	6.95	41

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Rao, 2009 at Hyderabad reported that 100 per cent yield losses observed due to temperature fluctuation in dry bean crop followed by Rice (54%) and grain sorghum (41%).

Effects of Climate Change on Pathogen

Pangga *et al.*, 2004 studied the relative importance of canopy size and induced resistance *to Colletotrichum gloeosporioides* at atmospheric CO_2 concentrations of 350 and 700 ppm on Susceptible *Stylosanthes scabra* in a controlled environment facility in the field and reported that up to twice as many lesions per plant were produced in the high CO_2 plants, because the enlarged canopy trapped many more pathogen spores. Lake and Wade (2009) deliberate the interactions between *Erysiphe cichoracearum* and *Arabidopsis thaliana* under elevated levels of CO_2 and stated that the number of established colonies on mature leaves increased significantly.

The effects of carbon dioxide (CO_2) and ozone (O_3) on three soybean diseases (downy mildew, Septoria and sudden death syndrome) in the field condition have a correlation that elevated CO_2 reduced downy mildew disease severity. However, increased brown spot severity and without effect in sudden death syndrome (Eastburn*et al.*, 2010).

Shin and Yun (2010) also studied the effects of elevated CO_2 and temperature on the incidence of four major chilli pepper diseases *Anthracnose*, *Phytophthora* blight and two bacterial diseases and concluded that elevated CO_2 and temperature have a positive correlation with bacterial diseases that significantly increased the incidence of two bacterial diseases where on other hand *Anthracnose* decreased and *Phytophthora* blight slightly increased.

According to Woods *et al.* 2003, In British Columbia, red band needle blight is causing unprecedented mortality in lodgepole pine plantations and mature stands. The disease outbreak is driven by increases in summer precipitation that are beyond the range of previously recorded weather patterns. Snowmelt exposes shallow fine roots to colder temperatures and results in spring freeze injury that is killing millions of yellow-cedar in Alaska (Hennon and D'Amore 2006, Hennon and Shaw 1997).

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Conclusion

- Now a day climates change is no more myth.
- If changes in atmospheric composition and global climate continue in the future as forecast, there will be the relocation of crops, and their diseases and influences will be felt in economic terms from crop loss.
- Changes in the level of CO_2 and O_3concentration will influence disease by modifying host physiology and resistance.
- Changes in temperature and precipitation will influence disease epidemiology.
- Survival, longevity and aggressiveness are increased with the passage of time due to change in the climatic parameter.

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