

## IMPACT OF CLIMATE CHANGE ON INSECT PESTS, PATHOGENS AND THEIR NATURAL ENEMIES

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Received: 28 January 2011 Accepted: 27 May 2011

Desai, S. and Rao, M.S. (2011). Impact of climate change on insect pests, pathogens and their natural enemies. *Natural Rubber Research*, 24(1): 174-186.

Climate variability and climate change are exerting additional load on developing countries of tropics and subtropics which are already burdened with the increasing demand for food owing to increasing population pressure. Even a small rise in temperature in these areas will cause significant yield decline in major food grain crops. The changing climate not only influences the crop growth and development but is also expected to alter stages and rates of development of the pathogen, modify host resistance, and change in the physiology of host-pathogen interactions. It is expected that the range of many insects, diseases and weeds will expand or change, and new combinations of pests and diseases may emerge when natural ecosystems respond to altered temperature and precipitation profiles. Although, the research in establishing the climate change impacts on pathogens and their natural enemies is at its infancy, independent studies conducted across laboratories world wide could be used to draw inferences. Elevated CO<sub>2</sub> levels are known to increase foliar density which in turn will influence the microclimate of the pathogen, altered host morphology which affects host-pathogen interaction, enhanced sporulation of pathogen, and increased dry-root rot under moisture stress conditions. For instance, an increase in temperature may lead to increased host susceptibility, a new/rapid development of the pathogen, more rapid vector development leading to faster spread of the vector transmitted viral diseases, a variable overwintering/over-summering of the pathogen/vector and shift in spread pattern of the pathogens. Initial studies show an increased sporulation and altered bio-control traits in *Trichoderma*, a known bio-control agent. Efforts are underway at CRIDA and other research organizations to assess climate change impact on important pathogens and their natural enemies. The present paper reviews the interaction of weather variables with different insects, diseases and weeds and the probable threats to food grain production, availability and quality.

**Keywords:** Climate change, Climate variability, Insect-pests, Natural enemies, Plant pathogens.

### INTRODUCTION

The increased temperature, precipitation and atmospheric concentration of greenhouse gases (GHG) such as carbon dioxide, methane *etc.* are the major drivers of climate change. During the past 100 years global average surface temperatures has increased

by approximately 0.6 °C (Houghton *et al.* 2001). The third IPCC report predicts that the global average surface temperature will increase further by 1.4-5.8 °C by 2100 with increase in atmospheric carbon dioxide (CO<sub>2</sub>) from 540 to 970 ppm over the same period. Atmospheric CO<sub>2</sub> concentration and tem-