Chapter 4
Impact of Climate Change on a Key Agricultural Pest: Thrips

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ABSTRACT

The world population is expected to exceed 9 billion by 2050 and most of this growth will occur in developing countries. As population increases, more arable lands will be used to construct cities and these activities increase CO_2 in the atmosphere and contribute to climate change. Climate assessments have shown rising sea levels and increase in the frequency of droughts in many dry areas. Prolonged droughts can decrease the relative amounts of water available for human consumption and agriculture. In developing countries agriculture contributes to more than 15% of GDP and when crops and livestock are deprived of water they become more susceptible to pests and diseases. As climate change continues to occur there is a need to develop strategies to manage key invasive pest and disease species that threaten agricultural production. Thrips are major agricultural pests with the majority of species in tropical regions. They are cosmopolitan in nature and damage crops when they feed and lay eggs in many parts of the plant. Thrips are also vectors for spreading plant diseases. They disperse quickly into new areas where susceptible hosts exist. This chapter focuses on a few important thrips species that threatens agricultural production in the Americas including Central and South America and the Caribbean. The chapter discusses the ecology and pest management strategies for key invasive thrips species and examines the potential effects of climate change on these troublesome species.

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INTRODUCTION

World Perspective of Thrips as an Agricultural Pest

The world as we know it is an ever changing place, world population is expected to exceed 9 billion by 2050, significantly reducing the space of arable land for agriculture and food production. The vast majority of population growth over the next 4 decades is likely to occur in developing countries putting considerable strain on the resources that support human development (food, water and energy). This will significantly increase the use of fossil fuels for energy and the consumption of inorganic products including pesticides, fertilizers and growth hormones for crops and livestock production. Unless special efforts are made to combat the effects of human activities on the environment, the potential for environmental contamination will increase; and there will be an increase in the levels of carbon dioxide (CO_2) in the environment, resulting in an overall increase in global temperatures. Changes in our climatic conditions increase the potential for invasive pests and disease problems, which can threaten long-term human existence and can impact all terrestrial and aquatic forms of life.

Thrips are a key agricultural pest that affects the vast majority of our agricultural crops. They are distributed worldwide with the majority of the species in tropical regions. Some temperate species exist and a few species are also found in colder arctic areas. Most thrips species are of no economic consequence to man and usually go unnoticed unless they become pests causing direct feeding damage to crops, spreading viruses to agricultural crops or being a nuisance to humans. The incidence and impact of thrips as pests are highly variable worldwide and differs between geographical locations and the agricultural commodities they affect (Lewis, 1997; Stannard, 1968). There are many pest thrips species that are economically important worldwide, but for the scope of this chapter, we will focus on a select few species that are currently causing problems or will potentially be problematic in the Americas including the islands of the Caribbean. The purpose of this chapter is to outline the important role that pestiferous thrips play in agricultural systems, and to discuss the potential impact of thrips and their crop hosts in response to climate change.

BACKGROUND

Influence of Climate Change Factors on Thrips' Population

Climate in this context refers to the conditions of the environment that include temperature, precipitation, humidity, air pressure, solar radiation, cloud and wind movements in a particular area over an extended period of time, usually a decade or more. Weather, on the other hand, describes these phenomena over the short term such as hours, weeks or months. Climatic and weather factors are known to influence the distribution and abundance of insects such as thrips; insects are also known to be influenced by microclimates (Davidson et al.,1948a; 1948b; Tscharntke et al., 2002). The influence of climatic factors can be observed in the annual fluctuations in insect populations, which come from the inter-annual variability in weather and climatic related events (Porter et al., 1991). Therefore, anthropogenically induced changes in these climatic factors will also have a substantial effect on insects and insect pests.

Climate change as defined by the Intergovernmental Panel on Climate Change (IPCC) is a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/