International Journal of Tropical Insect Science
https://doi.org/10.1007/s42690-020-00198-5

ORIGINAL RESEARCH ARTICLE

Predicting the potential distribution of geographically-limited species, *Apsylla cistellata* Buckton (Psyllidae: Hemiptera) on mango (*Mangifera indica*) under different climate change scenarios

Gundappa Baradevanal[1] · P. K. Shukla[1] · S. Rajan[1]

Received: 20 November 2019 / Accepted: 19 June 2020

Abstract
The aim of present study was to predict the potential distribution of mango shoot gall psylla, *Apsylla cistellata* (Psyllidae: Hemiptera) under current and future climate scenarios of 2050 and 2070. This study was conducted across six states in India where their infestation and occurrence noticed. The study provided a deep insight on surveys of shoot gall psylla infestation that occurred between 2012 and 2018. Current and future climate change scenarios acquired from the WorldClim database and Maxent modeling technique was used to fit with occurrence points and current climate data to model potential shoot gall psylla distributions. The model performance was tested using area under the curve (AUC) of the receiver operating characteristic (ROC) values. Response curves depicted the relationships between bioclimatic variables and predicted probability of *A.cistellata* presence. MaxEnt model used to develop spatial map and their distributions for selected climate change scenarios (RCP2.6, RCP 4.5. RCP 6.0 and RCP 8.5) and mapped the habitat for *A.cistellata* suitability under current and future scenarios. Present study results suggested that under current climate change scenarios, the potential distribution of shoot gall psylla was noticed in Western and Central part of Uttar Pradesh and Eastern part of Madhya Pradesh. In future climate change scenarios predicted suitable habitat areas for *A.cistellata* was found mostly from regions of Western and Central Uttar Pradesh, Southern parts Himachal Pradesh and Uttarakhand. The predicted suitability maps developed from present study will be useful in planning and designing of pest management strategies to control pest effectively from designated areas. The study provides clutches of clues for understanding potential changes in distribution and activity of pest in designated areas in response to current and future climate change scenarios.

Keywords Shoot gall psylla · Mango pests · Climate change · MaxEnt · Species distribution models

Introduction

Plant feeding insects plays a key role in the structure and function of the ecosystem (Weisser and Siemann 2004). The agricultural crops ecosystem is very complex had various layers though several insect pest attacks on crops and causes devastating loss. Globally, crop loss was predicted due to insect pest is one third of the produce regardless of progress made in pest management strategies over the last five decades. Several studies highlighted that the climate change would favours spiking up of pests and diseases intensity in a incremental rate. The global mean surface air temperature is projected to rise by 1.8–4 °C by 2100 with additional changes in other drivers of climate change such as increased CO_2 levels and extreme weather events (IPCC 2007).

Insect habitat and survival hugely depends on climate change patterns, the major drivers of climate change viz.., increased CO_2, increased temperature and depleted soil moisture impacts on insect- pest population dynamics. Global climate change pattern could lead to a broader expansion of the geographical range of insect pests (Elphinstone and Toth 2008). Warmer temperature associated with climate change tend to influence insect population dynamics directly through effects on survival, generation time, fecundity and dispersal (Harrington et al. 2001). The most significant consequence of rising temperatures is the change in distribution in range of crops, pests and their

✉ Gundappa Baradevanal
Gundappa@icar.gov.in

[1] ICAR- Central institute for subtropical Horticulture, Lucknow, U.P 226 101, India

Published online: 30 June 2020