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SHORT COMMUNICATION

Assessing the risk of mango quarantine pest *Deanolis sublimbalis* Snellen under different climate change scenarios

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Abstract
Considering the quarantine importance of the red-banded mango caterpillar, *Deanolis sublimbalis* (Crambidae: Lepidoptera), studies were carried out to predict the impact of climate change on its geographical distribution using the ecological niche modeling. Predictions were made based on the analysis of the relationship between occurrence points of *D. sublimbalis* and the corresponding current and future climate data of the study area, which was retrieved from the worldclim database. Spatial analysis software DIVA-GIS was used for visualization of the maps. The maximum entropy algorithm provided reasonable estimates of the species range in respect of discrimination of suitable and unsuitable areas for its occurrence in both present and future climatic conditions. The model provided a good fit for species distribution with a high value of area under the curve (0.971). Jackknife test indicated temperature seasonality to be the most important bioclimatic variable determining the potential geographical distribution of *D. sublimbalis.* The model predicted higher suitability areas for the pest occurrence in eastern parts of Andhra Pradesh, coastal regions of Orissa, southern parts of West Bengal, and some parts of Tripura. In future climate scenarios of 2030, 2050, 2070, and 2080, model-predicted relative increase in its distribution. Prediction of likely changes in the pest distribution with climate change will be useful in formulating effective management strategies against mango fruit borer.

Keywords Climate change · Ecological niche modeling · Pest distribution · Quarantine pest · Red-banded mango caterpillar

Introduction

Climate change has been accepted as a clear and emerging global issue, and its adverse impacts on biological elements of the ecosystem have been reported worldwide (Bellard et al. 2012). Climate change effects have been documented for both human populations and biodiversity (Chang et al. 2015); examples of the latter include pest and disease outbreaks (Woods et al. 2005), temporal reproductive isolation (Lowry and Willis 2010), and changes in species' distribution and phenology (Peterson et al. 2008). The situation is predicted to become more serious as the pace and magnitude of environmental changes intensifies (Meehl et al. 2007) and may prove to be more adverse in developing countries as compared to developed countries (IPCC 2014).

Ecological niche modeling is a rapidly evolving field to study the species distribution under different climate change scenarios (Peterson 2011). Many methods are available for predicting species distribution using geo-referenced species presence data with environmental variables (Elith et al. 2006; Guisan and Zimmermann 2000). One of the currently most popular methods is MaxEnt (Halvorsen et al. 2015; Elith et al. 2011; Phillips et al. 2006), which is based upon the maximum entropy principle, estimating a probability distribution for the modeled target species (Elith et al. 2011; Phillips et al. 2006, 2009). MaxEnt has proved to provide models with acceptable predictive ability even when few presence records are available (Peterson 2011; Elith et al. 2006; Hernandez et al. 2006). Species distribution models have many applications, such as mapping and monitoring of rare and endangered species (Edvardsen et al. 2011),

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