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# Modeling the invasion risk of Bactrocera zonata (Saunders) (Diptera Tephritidae) in the African continent under current and future climatic conditions

Invasions by fruit flies (Diptera: Tephritidae) such as Bactrocera zonata (Saunders) continue to threaten horticulture in tropical and subtropical countries resulting in substantive economic losses. Due to the huge damages B. zonata inflicts in its native and invaded areas, there is need for improved methods for predicting areas of its potential invasion and establishment for early intervention and control. Thus, in this study, we employed the maximum entropy (MaxEnt) species distribution modeling algorithm to predict the potential climatic suitability of B. zonata in Africa under current climate and four future Representative Concentration Pathways (RCPs) for the year 2050. Bioclimatic variables were used as predictors in the MaxEnt models together with native and invaded confirmed occurrence records of B. zonata. Probability of occurrence derived from the MaxEnt models were merged with data on B. zonata's available host extracted from the Spatial Production Allocation Model (MapSPAM) to map areas potentially more vulnerable to B. zonata invasion. All MaxEnt models for both current and future climate change scenarios had AUC values greater than 0.92, indicating satisfactory performances of the models. Mean temperature of the coldest quarter, precipitation of driest month and temperature seasonality significantly influenced the potential establishment of B. zonata. The models indicated high climatic suitability in tropical and subtropical areas in Africa, including areas where the fruit fly has already been recorded. Suitable areas were predicted in West, East and Central Africa. Future climatic scenario models, RCP 4.5 and 8.5 show significant potential range expansion of B. zonata in Western Sahara, while RCP 4.5 highlighted expansion in Southern Africa as well. Contrarily, RCP 2.6 showed considerable decrease in B. zonata range expansion in Central, East and West Africa. There was increased climatic suitability of B. zonata in Egypt under RCP 6.0. In Madagascar, Angola, Mozambique, and Zambia suitable habitats were detected under RCP4.5. In Libya, Egypt, Sudan, Chad, Niger, Mali, Mauritania, Western Sahara we predicted areas less vulnerable to the potential establishment of B. zonata. Our findings can help to guide biosecurity agencies in decision-making and enhance management strategies for the containment of the pest.