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Bioclimatic Niches of Endangered Garcinia indica Species on the Western Ghats: Predicting Habitat Suitability under Current and Future Climate

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Abstract : In recent years, climate change has become a major threat and has been widely documented in the geographic distribution of many plant species. However, the impacts of climate change on the distribution of ecologically vulnerable medicinal species remain largely unknown. The identification of a suitable habitat for a species under climate change scenario is a significant step towards the mitigation of biodiversity decline. The study, therefore, aims to predict the impact of current, and future climatic scenarios on the distribution of the threatened Garcinia indica across the northern Western Ghats using Maximum Entropy (MaxEnt) modelling. The future projections were made for the year 2050 and 2070 with all Representative Concentration Pathways (RCPs) scenario (2.6, 4.5, 6.0, and 8.5) using 56 species occurrence data, and 19 bioclimatic predictors from the BCC-CSM1.1 model of the Intergovernmental Panel for Climate Change's (IPCC) 5th assessment. The bioclimatic variables were minimised to a smaller number of variables after a multicollinearity test, and their contributions were assessed using jackknife test. The AUC value of 0.956 ± 0.023 indicates that the model performs with excellent accuracy. The study identified that temperature seasonality (39.5 ± 3.1%), isothermality (19.2 ± 1.6%), and annual precipitation (12.7 ± 1.7%) would be the major influencing variables in the current and future distribution. The model predicted 10.5% (19318.7 sq. km) of the study area as moderately to very highly suitable, while 82.60% (151904 sq. km) of the study area was identified as 'unsuitable' or 'very low suitable'. Our predictions of climate change impact on habitat suitability suggest that there will be a drastic reduction in the suitability by 5.29% and 5.69% under RCP 8.5 for 2050 and 2070, respectively. Finally, the results signify that the model might be an effective tool for biodiversity protection, ecosystem management, and species re-habitation planning under future climate change scenarios.

Keywords : Garcinia Indica, maximum entropy modelling, climate change, MaxEnt, Western Ghats, medicinal plants
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