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Original Article:

Saffron and Climate Change; Assessment of the Saffron Water Requirement Changes Using the Smart Algorithms

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Abstract

This study investigates the effects of climate change on the water requirement of saffron in 13 regions of South Khorasan and Khorasan Razavi for three periods of 2030-2050, 2055-2075 and 2080-2100 using the Hybrid algorithms ANN-NSGA-II and ANN-ICA. For the first time, this research has obtained the water requirement of saffron based on climate change using the CMIP6 models and the scenarios of SSP245 and SSP585. In addition, for the first time, the main parameters of CMIP6 models have been calculated for the prediction of climatic variables. Statistical downscaling method and inverse distance weighting technique were used for downscaling and spatial interpolation of CMIP6 data, respectively. The ANN-NSGA-II model was used to select suitable parameters and the ANN-ICA model was used to predict the future of climatic variables and finally the Cropwat model was used to calculate the water requirement of saffron. The results of parameter selection showed that Hfls and Hfss parameters were selected for future prediction in 90% of cases. The mean percentage of precipitation decrease and increase of temperature of maximum and minimum were calculated for GFDL-CM4, MIROC6, and NorESM2-LM models (8.6, -1, 10), (10, 5.7, 8.7), and (6.6, 0.6, 9.1) in SSP245 scenario and (5.7, 5.6, 13), (12, 2.4, 11.6), and (8.2, 4.7, 3/17) in SSP585 scenario, respectively. The Water demand increased in 90% of stations, GCMs, and scenarios compared to the base period. The highest increase in water requirement was obtained in Golmakan for the MIROC6 model and the period of 2055-2075 with the amount of 87.1.

Keywords: **Water requirement of saffron, Scenario, Downscaling, CMIP6.**