Investigation of a Solar-Powered Evaporative Cooling System under Tunisian Climate	
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Abstract: The demand for cooling continues to increase in line with environmental changes and a greater desire for human comfort. In north Africa and middle eastern countries, and particularly in Tunisia, cooling constitutes a big problem as it is recommended for human and animal breeding. This study aimed to analyze the performance and suitability of an evaporative cooling system powered by solar energy and to assess the economic and environmental impact under Tunisian weather conditions. Numerical modeling and simulations were performed, revealing the effects of inlet air temperature and relative humidity on system performances. An experimental study based on the construction of an evaporative cooling prototype formed by environmentally friendly and locally available components was also performed. This study showed the dependence of the process performances on the humidity and temperature of the ambient air. The obtained results revealed that the efficiency of the evaporative cooler exceeds 90%, with maximum efficiency being reached at a high wet-bulb depression, while minimum efficiency was observed when the dry air has a high relative humidity and a low dry-bulb temperature. Experimental results showed that, for input temperatures ranges between 36 and 47 °C and relative air humidity between 15 and 50%, a direct humidifier produces air with a temperature range between 25 and 29 °C and humidity range between 55% and 85%. Thus, evaporative cooling is feasible and suitable under Tunisian climate conditions during the hot season.

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