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# Effects of phase change material on the performance of solar dryer used for Eruca Sativa

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**Abstract:** This work presents experimental investigations of the performance for a solar dryer with and without phase change material (PCM) used to dry Eruca Sativa foodstuffs. This dryer consists of a solar collector with dimensions of (1000 mm as width by 1000 mm depth and by 1000 mm highest) which includes dryer chamber and the heat storage container inside it. The experimental work included the design and fabrication of the solar dryer, and the outdoor tests of the system. The experimental tests were performed under real outdoor weather conditions at the Technical College of Al-Mussaib located in Babylon, Iraq (32.5° N 44.3° E) during December 2019. Three modes of drying (natural drying, solar drying, and solar drying with PCM) were applied. The results showed that the moisture recorded lowest rating for using the solar dryer with PCMs by 17.3% with that of using the solar dryer without PCMs and 40% with using of natural solar drying. The maximum temperature in the drying chamber with PCMs was reached 45 ° C and while it was 40 ° C without PCMs and it was 20 ° C for sun drying. It found reducing of drying time with using of PCMs comparing with using others methods as: 5.3 hr, 7.3 hr, and 24 hr for solar dryer with PCMs, without PCMs, and sun drying respectively.

**Key words:** solar, dryer, phase change material, eruca sativa

## 1. Introduction

Eruca sativa Mill is known locally as Jarjeer in the Arabic region which employed as vegetable and spice. The plant was used at all civilization as food sources due to their important nutritious value, physiological influence, and as materials of pharmaceutical, also it considered as corresponding and alternative medicine [1, 2]. Medicinal and aromatic plants have a moisture high level and micro-organisms. Consequently, instantaneous drying represents the most significant operation in post-produce processes for avoiding losses of the valued [3]. Medicinal plants set up the main source of the new medications and healthcare harvests [4]. The postharvest processes feature is important to effective operation of the leaves; the quality of the leaves could be conserved with improved shelf life [5].

One preservation possibility is drying processes which included decreasing the water contented for minimizing the biochemical, chemical and microbiological deterioration. The dehydration indicated a useful method for preservative the leaves through which the spoilage could be disallowed [6]. The drying presented important processes in the conservation of agricultural foodstuffs. Food products have need of hot air at 45–60 °C temperature for the safe drying process. The drying in controlled conditions for temperature and humidity assistances the agricultural food production for drying

