

**تصميم مجفف مزدوج يعمل بالطاقة المتجددة وتأثير استخدامه
على جودة الأغذية المجففة به**

رسالة مقدمة من الطالبة

آلاء الله طارق يوسف

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لاستكمال متطلبات الحصول علي درجة الماجستير
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معهد الدراسات والبحوث البيئية
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DESIGN OF A DUAL SOURCE RENEWABLE ENERGY DRYER AND ITS IMPACT ON DRIED FOOD QUALITY

Submitted By

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B.Sc. of Agric. Sci. (Mechanization), Faculty of Agriculture,

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Diploma of Environmental Sciences, Institute of Environmental Studies and Research, Ain

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A thesis submitted in Partial Fulfillment
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ABSTRACT

The present study was conducted in order to design and test a dual source solar dryer in the shape of a truss for drying some agricultural crops, including figs, strawberries, grapes, and tomatoes by using solar cells, and a source of illumination – in Egypt. Furthermore, in comparison, the dryer was tested without a solar cell, and the results were compared to each other and also compared with those of another (half-inclined) solar dryer, as well as an electrical dehydrator, and circle electric and solar dehydrator – in Saudi Arabia. The dual source solar dryer consisted of a wooden frame painted dim black to increase the rate of solar radiation absorption inside the dryer. A double-wall made of transparent Lyxan polycarbonate with black thermal insulation was placed in between; and two food trays with a wooden frame encasing black perforated plastic polypropylene that can withstand high temperature and is safe for food, as it does not react nor stick to dried food. There is also a wire screen to prevent the entry of insects through the vents; a filter to purify the air inside the dryer; a black solar collector; a fan; a solar cell to run the fan, an electrical inverter; and a light bulb to provide heat.

The results showed the following:

1. The temperatures inside the dryer reached 70.1°, 64.1°, 67°, and 50°, as compared to the temperatures outside the dryer which reached 41.9°, 37.1°, 49.1°, and 31.6° for the figs, strawberries, grapes, and tomatoes, respectively. In other words, there were differences of 28.2°, 27°, 35.4 and 18.4 respectively between the temperatures inside and outside the dryer.

2. When the drying time increased, the relative air humidity decreased; and the rate of decrease for the relative air humidity was higher inside the dryer than outside it, as the percentage of moisture reached 10%, 41%, 22%, and 10% inside the dryer at the end of the experiment for the figs, strawberries, grapes, and tomatoes, respectively – as compared to the humidity percentages outside the dryer which were 21%, 52%, 24%, and 45% for the figs, strawberries, grapes, and tomatoes with differences of 11%, 11%, 2%, and 35% in air humidity inside and outside the dryer, respectively.

Keywords: Solar dryer, electric dehydrator, how to dry figs, strawberries, grapes and tomato, solar collector, solar fan, temperature, moisture content, air velocity, relative humidity, rehydration percentages, TSS, and cost.

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