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Apricot Fruit Greenhouse Drying Under Ras Sadr Climate Conditions

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ABSTRACT

The drying characteristics of apricot were determined using Open Sun and three Greenhouse Drying (Black Mesh Shading, white and black poly film plastic in as absorbers plate covering greenhouse. pretreatments (control, sucrose syrup and Sodium bicarbonate) were used before drying conditions at (Open air, White and Black poly film plastic greenhouse and Black Mesh Shading). total soluble sugar and moisture content were also measured for the different fresh and dried apricot. The fresh apricot fruit initial moisture content was 80.03% d.b. Results showed that the moisture content and total soluble sugar were highest in sodium bicarbonate blanched sample, immediately after dehydration. Under using Black polyethylene greenhouse dryer for untreated apricot, the drying time was 660 min. where losses in moisture content decreased from 79.25 at 60 min to 26.5 % at 660 min. The maximum value of Total soluble sugar in Black poly film plastic greenhouse was 0.417 mg/ml for treated by Sodium bicarbonate while the minimum value was 0.173 mg/ml for un-treated apricot, in White poly film plastic greenhouse

1. INTRODUCTION

The Apricot (Prunus Armeniaca L.) is a dicotyledonous plant belonging to rosaceae family. apricot is very important fruit crop food in many countries including Egypt**(J Food Sci Technol. 2019 Ja).**

Being perishable in nature, it has a short shelf-life of 4–5 days under ambient conditions. Its shelf-life is only about 2–3 weeks, even under low temperature storage conditions (1 °C) and high relative humidity (90–95%) and can develop some physiological problems, including firm and juiceless flesh and internal browning **(Wu et al. 2015) .**

As known, the fruit of apricot is not only consumed fresh but also used to produce dried apricot, frozen apricot, jam, jelly, marmalade, pulp, juice, nectar, extrusion products, leather, bar etc **(Wani et al. 2016).**

Although some apricot varieties mature as late as September, the fruit quality and nutritional values, such as fruit weight and size which are important quality traits in fresh fruits and the total soluble solids "TSS" which influence the fruit taste are sometimes poor **(Costa and Vizzotto 2010).**

Apricot (Prunus armeniaca L.) has an important place in human nutrition, as it is a rich source of sugars, fibers, minerals, bioactive phytochemicals and vitamins like A, C, thiamine, riboflavin, niacin and pantothenic acid **(Leccese et al. 2007).**

Among the phytochemicals, phenolics, carotenoids and antioxidants are important for their biological value. Sucrose, glucose, and fructose are the major sugar components **(Akin et al. 2008).** apricot fruit has also some pharmacological significance due to high amount of antioxidants. Some studies have reported antimicrobial, antimutagenic, cardio protective, hepatoprotective, anti-inflammatory and anti-nociceptive activities (**Wani et al. 2015)** of apricots.

The Republic of Egypt ranks second in the Arab world and ninth in the world, with an annual production of 102 thousand tons.

Before drying apricots, several pre-treatment techniques, such as osmotic pre-treatment, **(Tylewicz, et al., 2017) .** that this method allows reducing water content by up to 50% weight. To decrease the effect of spoilage reactions, to facilitate the drying process, to prevent browning, to ensure colour stability, and to improve the overall product quality, some pretreatments are advised **(Wani, T. A., 2019).**

Akoy et al., (2015) stated that in most tropical and subtropical nations, sun drying is still the most popular technique for preserving agricultural products.

Badee Adel et al., (2019) found that solar drying is the process of enhancing drying without direct sunlight by using the sun's rays. Open-air sun drying is not included, although it depends on utilizing the sun's energy for drying. When compared to mechanical dryers, solar dryers are more cost-effective and more efficient than open-air sun drying. It is a low-cost, straightforward, and useful technique that is easily adaptable to a variety of drying needs. Even though many designs have received technical validation, none are in popular usage.

However, to the best of our knowledge, there are no investigations on the effect of dipping the whole apricot in NaCl, sucrose, and sodium bisulphite solutions **(Bousselma, A., 2021).**

The values of the dried apricot color spaces (L*, was 14.22, a* was 13.17 and b* was 18.04) while chroma, hue angle, and Browning Index was 22.33, 53.87and 390.12 Black Mesh Shading with pretreatments at Sodium bicarbonate) There was not much change on the ascorbic acid contents of fresh and dried apricot. **(Fouda, et, al, 2022).**

However, different drying methods and pre-treatments significantly influence the quality of dried apricot. Therefore, the aim of study was conducted to study the suitable

drying methods and pre-treatments for preserving maximum quality traits total soluble sugar.

2. MATERIALS AND METHODS

The present investigation was carried out in Ras Sidr, Egypt. The aim of the study was to determine the optimum drying conditions for apricots and the optimum initial treatments to obtain better quality.

Experimental set up

Raw Apricot

Apricot was procured during the month of July 2022. Fresh apricots were washed, halved, divided on three trays made of stainless-steel mesh (covered with a plastic) and then dried by direct exposure to sunlight, with an overall maximum daytime air temperature of around 40°C. After that, apricots were pre-treated by, un treated (**T1**control), and treated with blanched with **1) T2** sucrose syrup (5g in 1liter of hot water at 100°C for 1min).

2) T3 in Sodium bicarbonate (5g in1liter of hot water at 100°C for 1min), then it put in Sodium chloride and ascorbic acid (5: 20g in 1liter of cold water for 1 min). Chemicals were purchased from local market for analysis.

Apricot was spread evenly in a single layer on trays. The trays were placed (open air drying; inside three greenhouses (1- Black Mesh Shading greenhouse, 2- white and black poly film plastic greenhouse covering in as absorbers plate. Three trays made of stainless-steel mesh (27 cm x 20 cm) were put in inside drying green house.

During the drying process, the relative humidity of the air was 53 % and average wind speed was 17 m/sec. This traditional sun-drying method is a common process applied by the farmers and the families in several regions in Ras Sidr, aiming to preserve the excess of production and make apricots available for longer periods.

Moisture content determination

At the end of the experiments, the moisture content of the dried samples was determined using an air oven set at 78ºC during 48 h even weight stability, three replicates carried out for sample according to the Association of Official Analytical **(AOAC, 2005).**

moisture content of the samples was calculated on a percent dry basis and the average value of the triplicate samples was used.

$$\text{Percent Moisture} = \frac{W_w - W_d}{W_d} \times 100 \quad \text{.....(1)}$$

where:

Ww is the initial weight of apricot samples (g);

Wd is the dry weight of apricot samples (g).

Quality Evaluation of the dried apricot

Determination of total soluble sugar

Total soluble sugars: TSS were determined by Anthrone reagent. Briefly 8 mg of Anthron reagent was taken in 250 mL beaker and then 40mL H2SO4 was added to make reaction mixture. After preparing reaction solution, 1 mL from the above prepared solution was taken and mixed with 100 µl samples. Test tubes containing reaction mixture were kept in water bath for 1 hour. Samples were cooled and then absorbance was read at 630 nm (Thimmaiah, S.R., 2004).

3. RESULTS AND DISCUSSIONS

Ras Sadr climate Conditions.

The hourly average solar radiation available during the experimental work at July 2022 in Ras Sadr, Egypt was measured and recorded. The hourly average available Air temperature and relative humidity as shwoing in Figure (1)

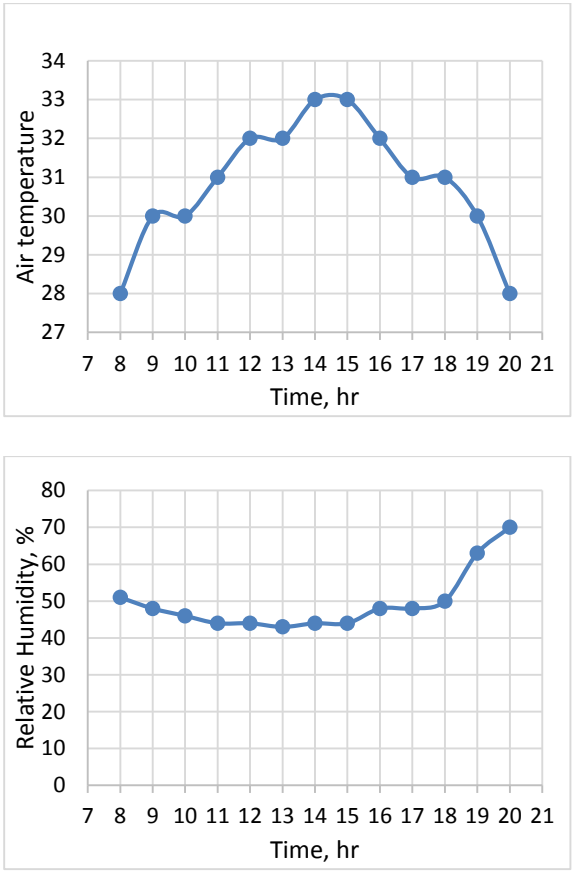


Figure (1): Air temperature and relative humidity of air as related to drying time

Quality of fresh apricot

Physicochemical properties of fresh apricot fruit were indicated in table 1. The average initial moisture content was 80.03% on a dry basis. These findings were consistent with previous studies by (Kayran, S., Doymaz, I., 2017) who reported the initial moisture content of 85.66 %. The total soluble sugar content of fresh apricot were 0.474mg/ml. The results of total soluble suger solids were in close agreement with (Ali, S., , 2011), who reported ranged from 12.67 to 20.00 ◦Brix, for apricot.The finding of this study was not in agreement with values reported by (Ivanova, D., 2017,) and (Nguyen, K.Q., 2018), for apricot.

The influence of drying methods on quality of dehydrated apricot (losses in moisture content. %). losses in moisture content and drying time with various greenhouse dryer were evaluated and the results indicated in Figures 2, 3 and 4.

The results show, Under using Black polyethylene greenhouse dryer for untreated apricot, the drying time was 660 min. where losses in moisture content decreased from 79.25 at 60 min to 26.5 % at 660 min fig (1). under using black polyethylene greenhouse dryer for sugar-treated apricot the drying time was 480 min. where losses in moisture content decreased from 108.91 at 60 min to 10.02 % at 480 min fig(2). Under using thiram greenhouse dryer for NaHCO3-treated apricot, the drying time was 420 min. where losses in moisture content decreased from 105.54 at 60 min to 6.75 % at 420 min fig(4).

Quality of chemical properties dehydrated apricot

The influence of drying methods on quality of dehydrated apricot total soluble sugar. Chemical properties of dried apricot were evaluated and the results indicated in Figures 4, of apricot samples Total soluble sugar ranged from 0.038 to 0.474 mg/ml as show in table (1).

Table(1):Effect of greenhouse types and treated by Sodium bicarbonate on the apricot total soluble sugar

Treatment	Black poly film plastic greenhouse	White poly film plastic greenhouse	Black Mesh Shading greenhouse	Open air drying
T1	0.173	0.17	0.289	0.038
T2	0.364	0.152	0.139	0.305
T3	0.417	0.222	0.474	0.414

The maximum value of Total soluble sugar in Black poly film plastic greenhouse was 0.417 mg/ml for treated by Sodium bicarbonate while the minimum value was 0.173 mg/ml for un-treated apricot, in White poly film plastic greenhouse The maximum value was 0.222 mg/ml for treated by Sodium bicarbonate while the minimum value was 0.17 mg/ml for un-treated apricot, in Black Mesh Shading greenhouse The maximum value was 0.474 mg/ml for treated by Sodium bicarbonate while the minimum value was 0.139 mg/ml for sugar-treated apricot, in Open air drying The maximum value was 0.414 mg/ml for treated by Sodium bicarbonate while the minimum value was 0.038 mg/ml for un-treated apricot. As shwoing **Fig(5)**

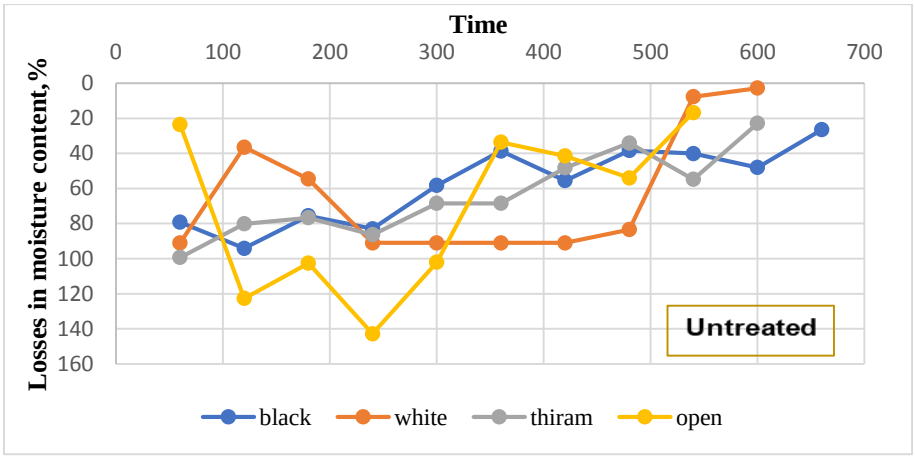


Fig. (2): The relation between losses in moisture content and drying time with various greenhouse dryer for untreated apricot

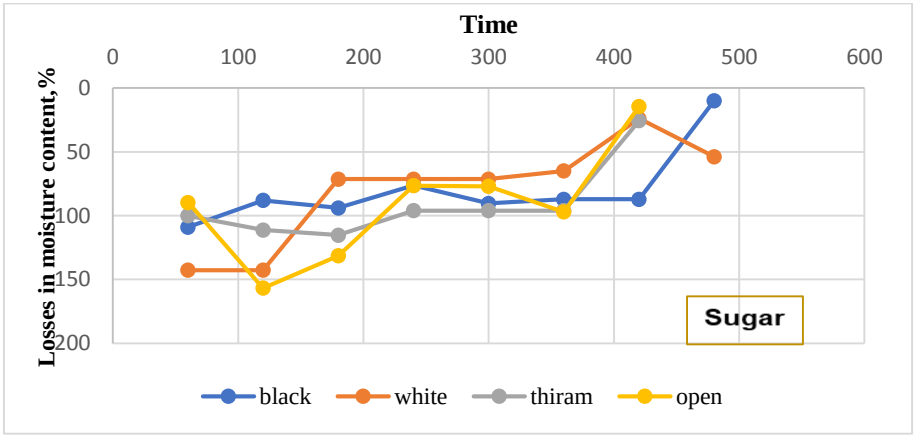


Fig. (3): The relation between losses in moisture content and drying time with various covers for untreated apricot

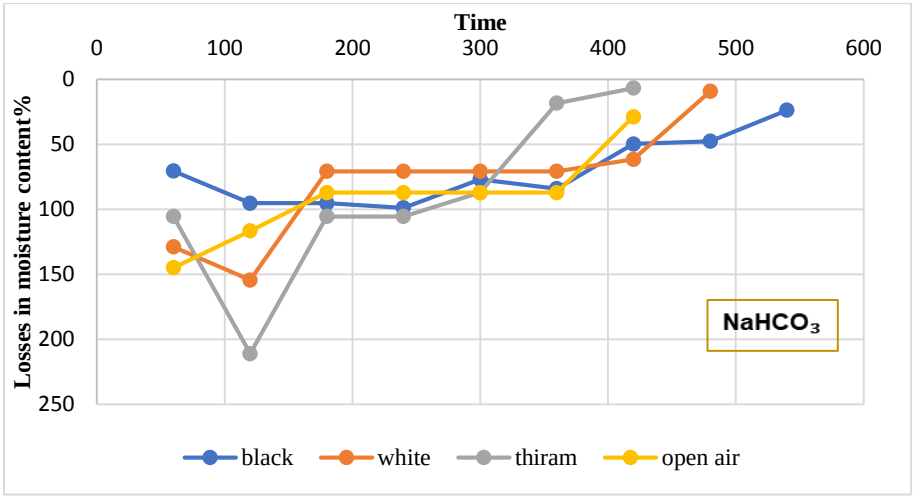
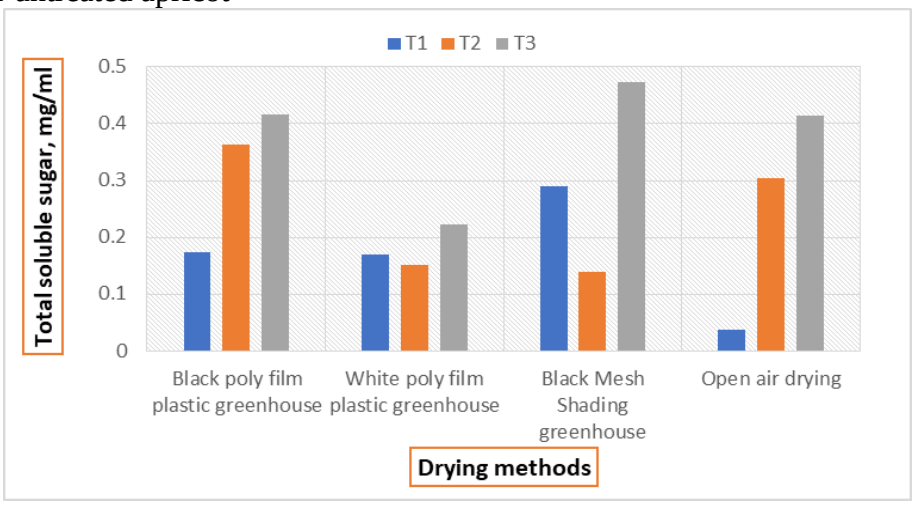


Fig. (4): The relation between losses in moisture content and drying time with various covers for untreated apricot



Fig(5): Effect of pre-treatment methods on Total soluble sugar of dried apricot

4. CONCLUSION

Apricot drying properties were determined using Open Sun and three Greenhouse drying (black mesh shaders, black and white poly film plastic as absorbent sheet covering greenhouses. Pre-treatments (control, sucrose syrup and sodium bicarbonate) were used prior to drying conditions in (Open). Content was measured Total soluble sugar and moisture for different fresh and dried apricots. The maximum value of total soluble sugar was recorded in the plastic greenhouse with black poly film for treatment with sodium bicarbonate, while the minimum value was for untreated apricots, in the plastic greenhouse with white poly film. , in open air drying the maximum value increased by treatment with sodium bicarbonate and sugar

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