

Article

Osmotic Pretreatment and Solar Drying of Eggplant in Tunisian Rural Areas: Assessing the Impact of Process Efficiency and Product Quality

Sarra Jribi ¹, Ismahen Essaidi ^{2,*} , Ines Ben Rejeb ³ , Raouia Ghanem ⁴, Mahmoud Elies Hamza ⁵ and Faten Khamassi ⁶

- ¹ Department of Agri-Food Industries, National Institute of Agronomy of Tunisia (INAT), University of Cathage, UR17AGR01, Tunis 1082, Tunisia; sarra.jribi@gmail.com
- ² Research Laboratory Agrobiodiversity and Ecotoxicology (LR21AGR02), High Agronomic Institute of Chott Mariem B.P 47, University of Sousse, Sousse 4042, Tunisia
- ³ Laboratory of Microbial Ecology and Technology (LR05ES08), National Institute of Applied Sciences and Technology (INSAT), Carthage University, BP 676, Tunis 1080, Tunisia; ines.benrejeb@insat.ucar.tn
- ⁴ National Institute of Agronomy of Tunisia (INAT), University of Cathage, Tunis 1082, Tunisia; raouiaghanem86@gmail.com
- ⁵ Laboratory of Agricultural Machinery, National Institute of Agronomy of Tunisia (INAT), University of Carthage, Tunis 1082, Tunisia; director@spa-rac.org
- ⁶ Laboratory GREEN-TEAM (LR17AGR01), National Institute of Agronomy of Tunisia (INAT), University of Carthage, 43 Avenue Charles Nicolle, Tunis 1082, Tunisia; fatenkhamassi@gmail.com
- * Correspondence: saidi.ismahen@gmail.com

Abstract

The drying process plays a crucial role in enhancing the shelf life of food products by reducing moisture content. As climate change contributes to rising temperatures, alternative drying methods, such as solar drying, offer promising solutions for sustainable food preservation. This study investigates the solar drying of eggplant (*Solanum melongena* L.) slices, with a focus on the effect of salting pretreatment on drying efficiency. Eggplant slices were subjected to salting pretreatment for partial moisture removal prior to drying. Drying kinetics were monitored to construct the characteristic drying curve. The dried eggplant slices were evaluated for their proximate composition and rehydration capacity, as well as textural and thermal properties. The results showed that salting pretreatment significantly enhanced the solar drying process by accelerating moisture removal. Notably, water activity (aw) decreased significantly from 0.978 to 0.554 for the control sample and to 0.534 for the salted sample. Significant differences were observed between the dried and salted dried slices, particularly in rehydration capacity, which decreased following salting. Additionally, the salted dried samples showed reductions in protein, carbohydrate, and potassium contents. In contrast, ash content and hardness increased as a result of osmotic pretreatment. These findings suggest that while dry salting pretreatment effectively reduces solar drying time, it may adversely affect several nutritional and textural properties.

Keywords: solar drying; drying kinetics; eggplant; nutritional properties; functional properties; climate change



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1. Introduction

Evolution in lifestyle and dietary habits has led to a significant shift towards the consumption of processed and ultra-processed foods, which are typically high in energy, fat, sugar, and salt. This dietary transition is closely associated with increasing risks of

mortality, heart diseases, and type 2 diabetes [1]. In contrast, fruits and vegetables are a valuable matrix rich in nutrients, phytochemicals, and bioactive compounds, which play a crucial role in maintaining health. Accordingly, the World Health Organization (WHO) recommends that adults eat at least 400 g of fruits and vegetables per day [2]. Unfortunately, actual consumption levels worldwide, and particularly in Tunisia, remain below these recommendations [3]. Factors limiting adequate intake include limited access and availability, inefficiencies in food distribution systems, and socio-cultural influences within family environments [4]. To address these challenges, multifaceted strategies such as nutrition education, improving accessibility, and implementing supportive food policies have been advocated [1,4].

Despite their nutritional interest, fresh fruits and vegetables are highly perishable due to their moisture content, often exceeding 80% [5]. Approximately one-third of harvested food is wasted as a result of insufficient post-harvest processing practices. Moreover, the demands for energy, infrastructure, and resource management at every stage from harvesting to waste disposal place a significant burden on farmers, producers, businesses, and governments. In developing countries, inadequate post-harvest food processing, from farm to retailer, further contributes to food waste [6]. This situation underscores the urgent need for integrated interventions that not only prevent food waste but also promote healthy diets by effectively addressing post-harvest losses and improving food system sustainability. Drying is one of the oldest and most effective methods for preserving food by reducing water activity, extending shelf life, and facilitating storage and transport [7,8]. Various drying techniques have been developed for food preservation, including solar drying, convective drying, freeze-drying, vacuum drying, osmotic drying, microwave drying, heat pump drying, ultrasound drying, and spray drying, along with hybrid methods such as intermittent microwave–convective drying [6,9,10]. The quality of fruits and vegetables is greatly influenced by the drying method used and the specific drying parameters applied. While drying extends the shelf life of fresh produce, it also affects their physical, chemical, sensory, and nutritional properties [10,11]. However, industrial drying is energy-intensive, accounting for approximately 3.6% of the world's total energy consumption and up to 25% of industrial energy use in some countries [6,12,13]. This high energy demand, combined with the environmental impact of fuel use, underscores the need for more sustainable drying technologies [14]. Solar drying, harnessing abundant and renewable solar energy, emerges as a promising, eco-friendly alternative that aligns with the United Nations' Sustainable Development Goal 12 for responsible consumption and production [15]. Although traditional sun drying is relatively slow and is prone to poor quality due to insect infestation, enzymatic reactions, microorganism growth, and variable climatic conditions [16], controlled solar drying systems can mitigate these issues by providing a safer, faster, and more hygienic drying environment [16,17]. Moreover, climate change, despite its adverse effects on agriculture, offers the potential advantage of increased solar radiation, which may further improve solar drying efficiency [18].

Among pretreatments to enhance drying efficiency, salting is a traditional preservation method widely used to reduce moisture content and inhibit microbial growth by lowering water activity [19]. It is applicable to various food products, including vegetables, dairy, meat, and fish. The global market for dried fruits and vegetables is expanding rapidly, with an expected market size of USD 37.89 billion by 2030 [20]. Energy consumption and product quality are key factors when selecting a drying process [21]. Hybrid drying methods, which combine different drying technologies, warrant particular attention for optimizing energy efficiency, product quality, drying time, and both investment and operational costs in food drying applications within developing countries [6].

Eggplant (*Solanum melongena* L.) is a diploid species ($2n = 24$), botanically classified as a berry [22]. Well adapted to hot and humid environments, eggplant holds agronomic and economic value worldwide [22]. It ranks as the third most widely cultivated solanaceous vegetable after potatoes and tomatoes, with a global production exceeding 59 million tons in 2022 [22,23]. Rich in nutrients and bioactive compounds, eggplant offers considerable health benefits, particularly for low-income populations. However, its high moisture content, up to 94%, makes it highly perishable [21,24]. Drying is therefore a practical approach to extend its shelf life and reduce losses [25]. Dried eggplant could be used as a new ingredient in foodstuffs, like soups and sauces, but it usually needs rehydration, which is a complex process involving the absorption of water by dehydrated products. Understanding both the amount and rate of water absorption is essential during the reconstitution of dehydrated products, as these factors influence not only preparation time but also key sensorial attributes such as texture and flavor. In fact, rehydration characteristics are commonly used as key quality indicators, reflecting the physical and chemical changes that occur during the drying process [26,27].

Several studies have investigated the drying kinetics of fruits and vegetables under solar drying conditions, demonstrating the influence of factors such as temperature, relative humidity, and air velocity on drying rate and product quality [28–30]. Mathematical models like the Page, Henderson–Pabis, and Midilli–Kucuk models have been commonly employed to describe drying behavior and optimize process parameters [28,29]. However, limited research has addressed the combined effect of osmotic or salting pretreatments with solar drying on eggplant, particularly within the context of Tunisian rural areas.

Therefore, this study aims to evaluate the impact of salting pretreatment combined with solar drying on the drying kinetics and quality attributes of eggplant, with a view to developing sustainable preservation methods adapted to local conditions.

2. Materials and Methods

2.1. Raw Material and Sample Pretreatment

Fresh raw eggplants (*Solanum melongena* L.) were purchased from a local market in Jendouba Province, Tunisia. The samples were thoroughly washed under running water and sliced into 10 mm thick pieces. Eggplant slices were covered with salt at a ratio of 1:5 (w/w) salt to eggplant and maintained at room temperature for 8 h to perform osmotic dehydration as a pretreatment. Subsequently, the slices were rinsed with water to eliminate excess surface salt prior to solar drying. For comparison, a control sample was prepared by cutting eggplant fruits into slices and leaving them untreated under the same conditions and duration.

2.2. Solar Drying and Drying Kinetics

Both pretreated and untreated eggplant slices were subjected to solar drying using a laboratory-scale forced convective solar dryer. The dryer (Figure 1) consists of two main chambers: an upper chamber, which contains nine racks (each measuring $1.2 \times 0.6 \text{ m}^2$) for holding the product, and a lower chamber, which houses a blower that generates horizontal airflow to enhance moisture removal. The air velocity within the dryer was adjustable from 0 to 3.5 m.s^{-1} and was set at 2.5 m.s^{-1} for the experiment. Eggplant slices were uniformly distributed on the drying trays to ensure uniform drying conditions.



Figure 1. The forced convective solar dryer.

Drying data were collected by measuring the weight of the samples at regular time intervals using a digital balance until a constant mass was achieved. The recorded weight data were subsequently converted into moisture content values for use in drying kinetics analysis. Each day, the samples were dried for 9 h and then stored overnight and placed back in the dryer the following day. Moisture content, expressed on a wet basis (% wet basis), was determined at the beginning (M_0) and at the end of each drying trial according to the AOAC method [31]. Approximately 5 g of the sample was added to a tared Petri dish, which was subsequently placed in the oven at 105 °C for about 24 h. After drying, the Petri dish was removed from the oven, placed in a desiccator to cool, and weighed again. The final weight was recorded. M_0 was calculated according to Equation (1).

$$\text{Moisture content (\%)} = [(M_1 - M_2)/m] \times 100 \quad (1)$$

Here, M_1 is the sample weight + weight of the drying container, M_2 is the dried sample weight + weight of the drying container, and m is the initial weight of the test sample.

The moisture content at any given time (M_t) during drying was calculated based on the sample's mass loss.

The moisture ratio (MR) was calculated according to Equation (2):

$$\text{MR} = (M_t - M_{eq}) / (M_0 - M_{eq}) \quad (2)$$

Here, M_t is the moisture content at time t , M_0 is the initial moisture content, and M_{eq} is the equilibrium moisture content.

Drying experiments were conducted in duplicate for each sample during March 2024.

2.3. Rehydration Capacity

Rehydration capacity was evaluated at 30 °C and 60 °C, as suggested by Özkan-Karabacak et al. [32]. Briefly, 5 g portions of dried eggplant slices were immersed in 150 mL of distilled water and placed in a water bath set to the desired temperature. The excess surface water was removed by gentle blotting, and the samples were weighed every 60 min until a constant weight was achieved. The rehydration capacity was calculated according to Equation (3):

$$\text{Rehydration capacity (g/g)} = W_t / W_i \quad (3)$$

Here, W_t is the weight of the sample at time t during rehydration, and W_i is the initial dried sample weight.

2.4. Physicochemical Properties

The moisture content of all samples was determined using the AOAC oven-drying method [31]. Water activity was measured at 25 °C using a Novasina Labmaster a_w device (Novasina AG, Zurich, Switzerland), which measures the relative humidity of the atmosphere surrounding the sample, after establishing equilibrium conditions. Proximate analysis was performed according to AACC methods [33]. For ash content, calcination was conducted at 550 °C for 6 h. For crude fat content, approximately 20 g of the sample was subjected to Soxhlet extraction using hexane as the solvent. The solvent was then evaporated, and the extracted fat residue was weighed to determine the crude fat content. For protein content, the Kjeldahl method was used, which involves mineralization and distillation, and the catalyst used was a saturated solution of copper sulfate. Total carbohydrates were calculated by difference. Vitamin C content was evaluated according to the AOAC titrimetric method [34]. In brief, 2 mL of the 3% metaphosphoric acid–8% acetic acid eggplant extract was titrated with indophenol solution (containing 25% 2,6-dichlorophenol and 21% sodium bicarbonate in water) until a light but distinct pink color appeared and persisted for at least 5 s. Potassium content was determined using inductively coupled plasma mass spectrometry (ICP-MS). Approximately 0.2 g of each sample was accurately weighed and subjected to microwave-assisted acid digestion using 65% nitric acid (8 mL), a heating program of up to 155 °C, for a total time of 20 min. The resulting solutions were diluted with ultrapure water to a final volume, and potassium content was then quantified by ICP-MS [35].

2.5. Textural Properties

Textural parameters, including hardness, adhesiveness, and elasticity, were measured using a Shimadzu EZ texture analyzer (Shimadzu Corporation, Kyoto, Japan), following the method described by Lopez et al. [28]. A double-compression cycle test was performed, compressing the sample to 50% of its original thickness using a stainless-steel compression plate and a P/10 mm cylindrical probe. The test was conducted on ten independent samples for each treatment, with a stroke distance of 4 mm and a crosshead speed of 1.0 mm/s.

2.6. Thermal Properties

Thermal properties were determined using a Differential Scanning Calorimetry 131 instrument (SETARAM, Caluire-et-Cuire, France) according to Grujić and Savanović [36], with modifications. Approximately 10 mg of each sample was weighed into hermetically sealed aluminum pans and allowed to equilibrate at room temperature for 2 h prior to testing. An empty sealed pan was used as the reference. DSC analyses were performed through a heating–cooling cycle. Samples were first held at 25 °C for 5 min and then heated from 30 to 110 °C at a rate of 10 °C.min^{−1}. Subsequently, samples were cooled from 105 °C to 25 °C at a rate of 20 °C.min^{−1}. The obtained thermograms were used to determine characteristic thermal parameters such as onset temperature (T_i), peak temperature (T_p), and end-set temperature (T_f), associated with the observed transitions.

2.7. Statistical Analysis

All experiments were carried out in duplicate, and the results are expressed as mean $\pm$ standard deviation (SD). Data analysis was performed using IBM SPSS Statistics 26. One-way analysis of variance (ANOVA) was applied to assess significant differences among treatments. Also, the means were compared using Tukey's multiple-range test at p -value < 0.05 .

3. Results and Discussion

3.1. Drying Kinetics

The weight loss data collected during the drying of eggplant slices (treated and control samples) were converted into moisture content values (Figure 2) and subsequently into moisture ratios (Figure 3). As can be observed in Figure 2a, the salted samples exhibited a significantly lower initial moisture content compared to the control, with values of 84.63 ± 8.47 and $69.51 \pm 6.49\%$, respectively, primarily due to the osmotic dehydration effect of salting, which promotes water migration from plant tissues prior to drying. In both cases, a progressive decrease in moisture content was observed with increasing drying time, reaching 25.31 ± 1.01 and $21.13 \pm 1.62\%$ for the control and treated samples, respectively, after 15 h of drying. This reduction in moisture was accompanied by a significant increase in drying temperature, rising from 14.75 ± 2.61 to 22.15 ± 4.74 °C (Figure 2b). This indicates an initial period of approximately constant drying rate followed by a period of declining drying rate. In fact, the drying of agricultural products is primarily governed by moisture diffusion mechanisms, especially during the falling-rate period. This drying behavior is commonly observed in various agricultural materials [25,37]. However, notable differences were observed between the two treatments. Moreover, the drying rate of salted eggplant was markedly higher during the initial stages. After only 5 h of drying, the moisture content of the salted samples had dropped below 40%, whereas the control samples still retained around 60% moisture. The final moisture contents differed significantly between the control and the treated samples, with values of 13.58 ± 0.27 and 9.39 ± 0.09 , respectively. This result confirms the improved efficiency of solar drying when combined with osmotic pretreatment.

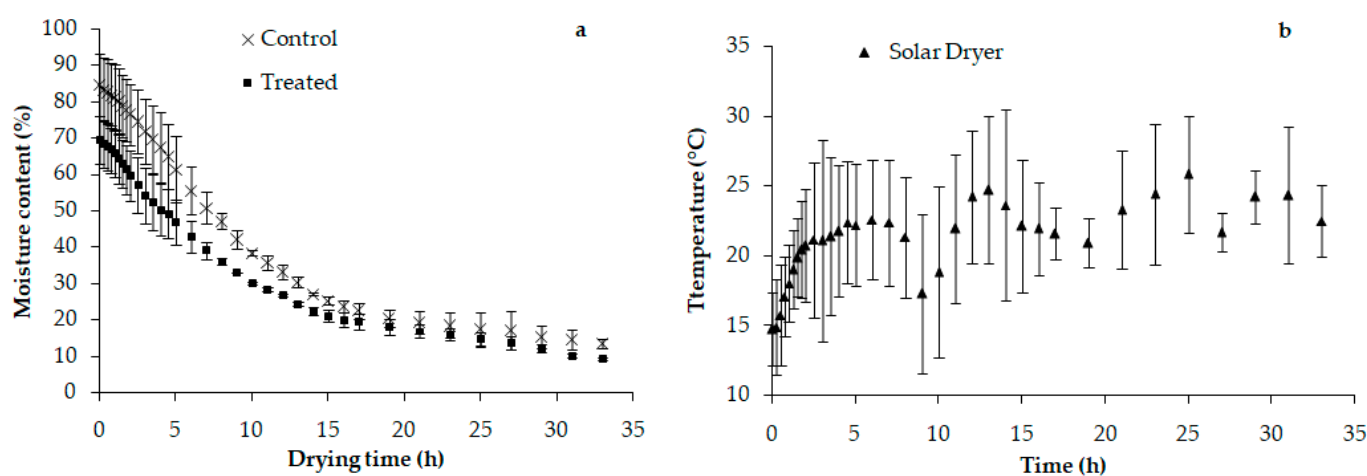


Figure 2. Moisture content variation in dried (control) and salted dried (treated) eggplant (a) and the solar dryer's temperature profile (b).

A similar trend was observed in the evolution of the moisture ratio (MR). The MR of the salted samples declined more rapidly and consistently, reaching values close to 0.2 within 15 h, whereas the control samples maintained higher MR values throughout the drying process. This notable enhancement in drying kinetics for the salted samples can be attributed to the combined effect of osmotic dehydration and the disruption of cellular structure, both of which enhance water diffusion and accelerate moisture removal. Although both treatments resulted in comparable final moisture contents and MR values by the end of the drying period, the salted eggplants consistently exhibited lower moisture levels at each stage of drying. Previous findings by Xanthopoulos, Yanniotis, and Talaiporou [38] indicated that pretreating tomato halves with salt reduced the theoretical drying time by an average of 20% compared to unsalted samples. This reduction is attributed to the

osmotic dehydration effect induced by salting, which promotes water migration from the plant tissue prior to drying. Similarly, Osidacz and Ambrosio-Ugri [38] reported an average reduction of 10% in drying time for eggplant samples that underwent salting as a pretreatment. The significant reduction in drying time observed in the present study (exceeding 50%) can be attributed to the pretreatment conditions, specifically the higher salt concentration and longer immersion duration, compared to a previous study [39], in which osmotic pretreatment was performed using a lower salt concentration (10% NaCl) and a shorter duration (20 min). However, the results of the current study are consistent with the range of drying time improvements (10–70%) reported in other studies using osmotic dehydration as a pretreatment for vegetables [40]. Indeed, pre-drying treatments such as salting are commonly employed to accelerate the drying process, improve product quality, and reduce overall energy consumption [41].

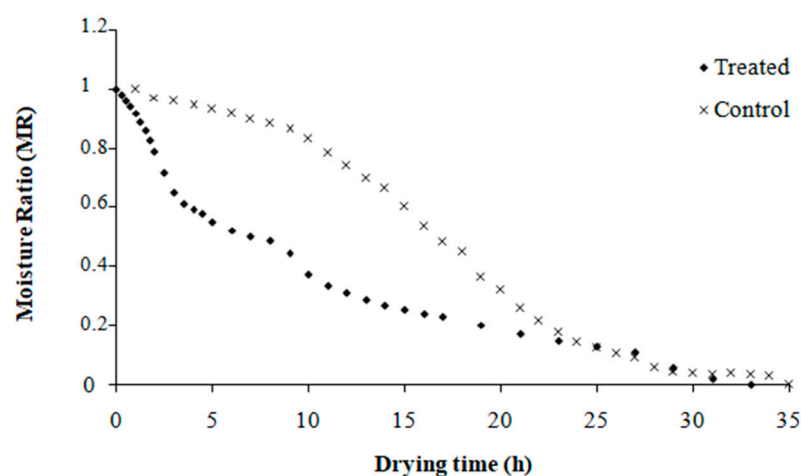


Figure 3. Drying curves of dried (control) and salted dried (treated) eggplant slices.

3.2. Rehydration Capacity

The results of rehydration capacity are illustrated in Figure 4a,b. As shown by the curves, a similar rehydration trend was observed for both samples and at both temperatures: an initial rapid water uptake phase was followed by a slower absorption rate until the samples reached their saturation point. Such findings have been previously reported for various dried agricultural products [39,42]. The rehydration temperature considerably influenced the time required to reach saturation: at 30 °C, saturation was observed after approximately 8 h for both sample types, whereas at 60 °C, saturation occurred more rapidly, within 5 h. Additionally, dry salting had a notable impact on the rehydration capacity. For the control sample, the maximum water absorption reached 5.58 g/g at 30 °C and 5.23 g/g at 60 °C. However, the salted samples presented lower rehydration capacity, with average values of 2.73 g/g at 30 °C and 2.58 g/g at 60 °C. These results suggest that salt pretreatment before drying negatively impacts the rehydration capacity of eggplant, likely due to cellular structure alterations and increased solid loss during blanching and salting. These changes reduce the tissue's ability to reabsorb water. These findings are in disagreement with those reported by Adiletta et al. [43], who demonstrated that salting pretreatment enhanced the rehydration capacity of eggplant treated with 0.5% dihydrate trehalose and 0.5% anhydrous NaCl for 5 min. This divergence in results could be attributed to a higher concentration of salt and the longer duration of the applied treatment in the present study.

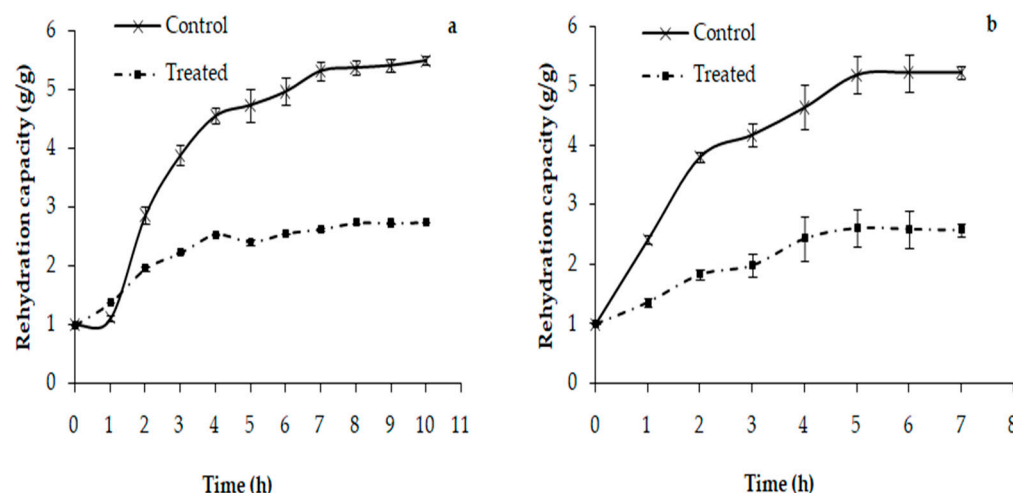


Figure 4. Rehydration behavior of dried (control) and salted dried (treated) eggplant slices at 30 °C (a) and 60 °C (b).

3.3. Physicochemical Properties

The physicochemical properties of raw, dried, and salted dried eggplant are summarized in Table 1, highlighting significant transformations induced by processing. Fresh eggplant exhibited a high moisture content of $92.40 \pm 0.52\%$, which was comparable to the values reported by Niño-Medina et al. [44], ranging between 90% and 92%. Additionally, it showed a high water activity of 0.984. Both parameters were considerably reduced in dried and salted dried samples, with the lowest values observed in the salted dried slices. This reduction is critical for enhancing product stability and extending shelf life by inhibiting microbial growth. These findings align with those of Fellows [45], who reported that drying processes significantly reduce water activity in fruits and vegetables. These results confirm the effectiveness of solar drying in preserving eggplant slices.

Table 1. Physicochemical properties of raw and dried eggplant.

Parameters	Eggplant Samples			<i>p</i> -Value
	Fresh	Dried	Salted Dried	
Moisture (%)	92.40 ± 0.52^a	13.58 ± 0.27^b	9.39 ± 0.09^c	<0.001
aw	0.984 ± 0.007^a	0.554 ± 0.007^c	0.539 ± 0.002^b	<0.001
Protein (% DM)	0.94 ± 0.01^c	9.08 ± 1.95^a	5.11 ± 0.12^b	<0.001
Crude fat (% DM)	1.35 ± 0.56^a	0.20 ± 0.01^b	0.33 ± 0.20^b	0.003
Ash (% DM)	0.64 ± 0.02^c	5.62 ± 0.17^b	7.93 ± 0.89^a	<0.001
Carbohydrates (% DM)	4.80 ± 0.85^c	79.56 ± 0.01^a	69.22 ± 3.12^b	<0.001
Vitamin C (% DM)	1.11 ± 0.07^a	0.84 ± 0.01^c	0.97 ± 0.00^b	<0.001
Potassium (mg/kg)	1951.30 ± 333^c	$30,890.43 \pm 2115^a$	$17,104.47 \pm 818^b$	<0.001

DM: dry matter basis; ^{a, b, c} means in the same row that do not share a common letter are significantly different according to the Tukey test ($p < 0.05$).

However, several nutritional attributes were negatively affected by salting pretreatment. A significant reduction in protein content was observed compared to untreated dried samples. Similar decreases in protein content following salting and drying have been previously reported in meat and fish [46,47]. This reduction may be attributed to the effect of salt on protein behavior: while low salt concentrations enhance protein solubility, higher concentrations reduce solubility and promote protein precipitation through the salting-out phenomenon [48]. Crude fat content decreased following solar drying, likely due to lipid oxidation during the drying process. Catorze et al. [49] similarly reported fat

oxidation in raspberries and blueberries subjected to solar drying. In contrast, ash content significantly increased in salted dried eggplant slices, which can be attributed to salt uptake during the salting process. This observation is consistent with findings by Hwang et al. [50], who reported that higher salt concentrations lead to increased ash content in dried salted milkfish. Carbohydrate contents in the dried samples were approximately 69% and 79%, which are higher than the values reported by Rodriguez-Jimenez et al. [51] for eggplant dried at different temperatures. Additionally, the results showed that the salting process significantly reduced carbohydrate content. Regarding vitamin C concentration, significant differences were observed between the eggplant samples. The highest levels were found in the fresh sample. These results align with those reported by Rodriguez-Jimenez et al. [51], who confirmed that vitamin C is highly sensitive to heat and oxygen, making it particularly susceptible to degradation during hot-air drying. However, the loss of vitamin C in the treated sample was less than in the control, with values of 12.81% and 24%, respectively. This result is consistent with the findings of Nudar, Roy, and Ahmed [52] about vitamin C loss in treated dried citrus, who reported that osmotic treatment facilitates partial moisture removal from the sample at room temperature while helping to preserve vitamin C. Additionally, the migration of solutes into the tissue during osmotic treatment may create a barrier effect, limiting the leaching of vitamin C from the sample during subsequent hot-air drying. Finally, potassium is an essential mineral involved in various physiological functions. Our results revealed significant differences in potassium content among the eggplant samples, with the lowest level observed in fresh eggplant (1951.30 ± 333 mg/kg). This value is consistent with previously reported ranges in the literature, which vary between 1210 and 1910 mg/kg across different cultivars [44]. The drying process increased potassium content in both control and treated samples [53]; however, salting appeared to limit the accumulation of potassium. Dried eggplant slices may contribute meaningfully to dietary potassium intake, which ranges from 3000 mg/day for children aged 1 to 3 years to 4700 mg/day for adults and children aged 4 years and older, according to the Food and Drug Administration (FDA).

3.4. Textural and Thermal Properties

Textural attributes influence consumer acceptance of food products. Drying and pretreatment processes can alter the food matrix structure, thereby affecting its textural attributes [11]. The textural properties of fresh, dried, and salted dried eggplant slices are presented in Table 2. A significant increase in hardness was observed after drying ($p = 0.036$), with the salted dried samples showing the highest value (11.15 ± 4.60 N), compared to the fresh (4.51 ± 2.33 N) and dried (6.19 ± 2.60 N) slices. This increase in hardness can be attributed to moisture loss and tissue shrinkage caused by both drying and the osmotic effect of salting, leading to a denser cellular matrix. In contrast, both adhesive and elastic forces were not significantly affected by drying or salting ($p = 0.228$ and 0.214 , respectively), suggesting that these parameters were less sensitive to moisture loss and solute concentration within the studied range. The textural modifications induced by salting significantly affected the rehydration capacity of the dried eggplant. Specifically, osmotic pretreatment in a salt solution increased tissue hardness and reduced porosity, which limited water absorption during rehydration. As a result, the salted dried eggplant exhibited a lower rehydration capacity compared to the untreated dried sample. To address this issue in culinary applications, it is recommended to extend the soaking time in warm water prior to cooking or to incorporate the salted dried eggplant directly into stews and dishes with prolonged simmering, allowing sufficient time for gradual rehydration and softening. Additionally, adjusting the salt concentration or duration of the osmotic treatment could help improve the balance between drying efficiency and the product's rehydration

behavior. These findings contrast with those of Ferrão et al. [25], who reported that drying operation reduced hardness and increased elasticity when compared to fresh eggplants. Regarding thermal analysis (Table 2), the results indicated that the onset (Ti), peak (Tp), and final (Tf) transition temperatures remained relatively stable after drying, with only a slight decrease in Ti observed in the dried samples. Within the tested temperature range (30–110 °C), a single endothermic event was observed at approximately 107 °C, likely corresponding to protein denaturation. These findings are consistent with the results of Oomah, Der, and Godfrey [54], who reported thermal transitions between 84 and 117 °C in flaxseed protein extracts.

Table 2. Textural and thermal properties of eggplant slices.

Parameters	Eggplant Samples			<i>p</i> -Value
	Fresh	Dried	Salted Dried	
Texture				
Hardness (N)	4.51 ± 2.33 ^b	6.19 ± 2.60 ^{ab}	11.15 ± 4.60 ^a	0.036
Adhesive force (N) × 10 ^{−3}	−2.92 ± 0.002	−4.75 ± 0.001	−4.69 ± 0.002	0.228
Elastic force (N/mm ²)	0.042 ± 0.006	0.039 ± 0.012	0.054 ± 0.017	0.214
Thermal properties (°C)				
Ti		102.05	100.78	
Tp		107.44	107.38	
Tf		107.85	107.77	

N: Newton; ^{a, b} means in the same row that do not share a common letter are significantly different according to the Tukey test (*p* < 0.05); Ti: initial temperature; Tp: peak temperature; Tf: final temperature.

Overall, the results suggest that while textural attributes of eggplant slices are notably influenced by drying and salting, their thermal stability is largely preserved, which is an advantageous characteristic for subsequent heat processing applications.

4. Conclusions

Drying remains one of the most energy-intensive operations in the food processing industry. In this study, the potential impact of rising ambient temperatures due to climate change was addressed by exploring solar drying as a sustainable alternative. The use of a forced convective solar dryer under controlled conditions demonstrated effective drying performance for the eggplant slices, highlighting its feasibility for small- to medium-scale applications. Additionally, the application of a dry salting pretreatment significantly accelerated the drying kinetics, offering an efficient method to improve the processing time. However, several quality attributes were negatively affected. Hardness increased following the salting pretreatment, while rehydration capacity, protein, and potassium contents decreased. These findings underscore the value of integrating solar drying and simple, cost-effective pretreatments in food preservation strategies, particularly in regions with high solar potential.

Author Contributions: S.J.: writing—original draft, formal analysis, investigation; I.E.: writing—review and editing, methodology, software; I.B.R.: writing—review and editing, methodology; R.G.: formal analysis, writing; M.E.H.: conceptualization, writing—review and editing, methodology; F.K.: supervision, writing—review and editing, validation, project administration. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflicts of interest.

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