EVALUATION OF QUALITY ATTRIBUTES OF DEHYDRATED FIGS PREPARED BY OSMOTIC-DRYING PROCESS

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Abstract

This study was carried out to evaluate the quality attributes of osmotic-dried figs pretreated with various types of osmotic date syrup (40, 50, 60 and 70% syrup), compared with the quality attributes of untreated figs (control). The figs pretreated with date syrup 70% had the lowest dehydration time for osmotic figs followed by date syrup 60, 50, and 40%, respectively. The physicochemical properties, microbiological assessment and quality attributes of osmotic-dried and control figs just after processing and during the storage for 6 months were also evaluated. Results indicated that osmotic-dried figs pretreated with date syrup 70% had the highest retention of ascorbic acid followed by date syrup 60, 50 and 40%, respectively. Reducing sugars content of the final product was ranged from 51.69 to 56.50% for osmotic-dried figs in all various pretreatment processes. While, the corresponding values of fibers were ranged from 9.53 to 9.75%. The untreated dried figs (control) had the highest total bacteria count ($9.1x10^2$ cfu/g), while the osmotic-dried figs pretreated with date syrup 70% recorded the lowest total bacteria count ($2.6 x10^2$ cfu/g). On the other hand, both total count of bacteria and total count of yeasts and molds were proportionally decreased with extending the storage period and reached to the maximum reduction after 6 months of storage. The osmotic-dried figs pretreated with date syrup 70% recorded the highest sensory scores of color, texture, taste, flavor and overall acceptability followed by osmotic-dried figs pretreated with date syrup 60, 50 and 40% and the untreated figs (control) immediately after processing and during the storage at ambient temperature. Therefore, pretreatment of figs with osmotic date syrup to produce osmotic-dried products played an important role in producing higher quality dried figs compared with the untreated dried figs.

Key words: Dehydrated figs, osmotic dehydration, sensory evaluation, microbiological assessment.

INTRODUCTION

Osmotic dehydration process is widely applied to obtain high quality intermediate moisture foods. Dehydration kinetics and mass transfer mechanisms are very important for understanding and controlling the osmotic dehydration process (Derossi *et al.*, 2008).

Osmotic dehydration is used for partial removal of water from materials such as fruits and vegetables, when immersed in a concentrated solution of sugar or salt (Rastogi *et al.*, 1997). On the other hand, the use of osmotic dehydration like a previous step to drying process could be an interesting option in order to reduce costs or to preserve the characteristics of food material (Moreira *et al.*, 2007). Also, the osmotic dehydration is a simple, economical and nondestructive process with least wastage of fruit during processing (Sharma *et al.*, 2006).

Date syrup (locally named Dibis) is probably the most common date product. It is produced by extraction and boiling down the juice. The process consists of extraction, clarification and concentration of the date juice. Date syrup is thick- dark brown syrup. Glucose and fructose sugars are the major sugars presented in the date syrup and total sugar contents reach to 88%. In addition to sugar, date syrup contains macro- and micro-elements which may play an important role in considering the date syrup as rich nourishment (Al- Hooti *et al.*, 2002).

The earliest uses of dried food desiccation were consisted simply of exposing fresh foods to sunlight until drying. Through this method of drying, which is referred to as sun drying, certain foods may become fully preserved if the temperature and relative humidity allow. Fruits such as figs may be dried by sun-drying. This method, requires a large space for large quantities of the product. Some advantages of the direct osmosis in comparison with other methods during drying process include minimized heat damage to color and flavor, less discoloration of the fruit by enzymatic oxidative browning (Ponting *et al.*, 1966). Contreras and Smyrl (1981*)* noted that osmosis process was effective in preventing fruit discoloration by enzymatic oxidative browning, thus precluding the use of sulphur dioxide. Farkas and Lazar (1969) and Kanner *et al.* (1981) indicated that increasing sugar content in the concentrated fruit produces a sweeter flavor in the processed fruits.

Moreover, this type of technology is a primary stabilization process such as sterilization or freezing, where, the water activity ($a_{w)}$ is not the unique factor affecting the shelf- life of this product and furthermore the most consistent changes in its composition occurred in about two hours of process (Giangiacomo *et al.*, 1987).

The objective of this investigation was to study the effect of using various osmotic date syrups as pretreatments for producing osmotic-dried figs on dehydration, physicochemical properties, microbial assessments and sensory evaluation during the storage for up to 6 months at the ambient temperature.

MATERIALS AND METHODS

Materials

Conadria figs (*Ficuscarica* L) were obtained from El-Obour market, El-Obour city, Cairo, Egypt. Siwi date fruits (*Phoenix dactylifera L.*) were obtained from Esna city at Qena region of Upper Egypt.

Methods

Preparation of date syrup (dibis):

Siwi dates (semi-dried dates) were washed with water and pressed in a double-jacket container at 50°C for two weeks. The collected date syrup (dibis) was cooled to room temperature, packed in plastic container and then stored under frozen conditions until using according to the method of Al-Hooti *et al.* (2002).

Osmotic dehydration:

Fig fruits were washed *thoroughly* with tap water, blanched in the presence of 1% NaOH at 90°C for 30 sec and then sulphurized with 0.5% sodium meta bisulfite. After that, the fruits were divided into 5 groups (T1 to T5). The figs of T1, T2, T3 and T4 groups were immersed in solutions of 40, 50, 60 and 70% date syrups previously prepared in the presence of 1% calcium chloride at 50°C for 12 hr. At the end of immersion, the syrups were drained and re-concentrated to be re-used as osmotic agent for another osmotic process. The fig samples after draining rinsed quickly in a stream of tap water and blotted with tissue to remove the adhering solution according to the method of El-Gharably *et al.* (2009). The figs of T5 group were kept untreated as the control sample. The obtained samples (T1, T2, T3, T4 and T5) were then weighed and dried in an oven at 50°C for about 24-37 hr according to type of osmosis solution used for pretreatment. An additional group of figs was used to evaluate the physicochemical properties of fresh figs.

Packaging and storage

Samples were packed in polyethylene bags of about 500 g capacities with removing the air. Finally bags were sealed by heat and stored for 6 months at ambient temperature.

Analytical methods

Physicochemical analyses

Moisture, total solids, ascorbic acid, total titratable acidity, total sugars, reducing sugars, non-reducing sugars, ash and crude fibers contents were determined according to AOAC (2005).

Microbial analysis

Samples were serially diluted and plated on total count agar for total flora counts and on acidified (10% tartaric acid) potato dextrose agar for mold and yeast counts. Plates were incubated for 48 hr at 30ºC for total flora, and for 5 days for molds and yeasts APHA (1992).

Sensory evaluation

The method of Aparicio-Cuesta *et al.* (1992) was carried out by the evaluation of five sensory characteristics (color, texture, taste, flavor and overall acceptability) of the osmotic dehydrated and untreated dried (control) figs, where 10 will-trained panelists independently assigned scores for each sensory characteristic on a 10-point category scale.

Statistical analysis

The data set of sensory evaluation was statistically analyzed using the statistical analysis system (SAS, 1996), and the significant differences among means of the treatments were ascertained at 5%

RESULTS AND DISCUSSION

Physiochemical properties of date syrup (dibis)

Chemical constituents of date syrup are presented in Table (1). It is noticed that date syrup contained 16% moisture content, 5.88% ash, 1.61% fat, 1.12% protein and 91.39% total sugars. On the other hand, total solids, total soluble solids, total titratable acidity and pH values were 84%, 80%, 0.18% and 6.11, respectively. While ascorbic acid, sodium, potassium, iron, magnesium and calcium in date syrup were 3.2, 13.0, 202.8, 7.8,143 and 338 mg/100g, respectively.

Dehydration of osmotic solution

Dehydration of osmotic dried figs is shown in Table (2). The Brix concentration of solutions used for osmosis were 40, 50, 60 and 70 Brix just before processing of figs at temperature of 50°C. However, the concentration of osmoses solutions used for osmotic processing were lowered at the end of osmosis process to become 35, 45, 52 and 60 Brix for T1, T2, T3 and T4 solutions, respectively. The osmosis time was changed by the driving force of the drying process as the alteration of the type of osmosis solution. Meanwhile, the T4 solution had the lowest drying time for the osmotic figs followed by T3, T2, T1 and T5, respectively. It is worth to know that the sugars in the fruits were considered as a distinctively characteristics of the fruit varieties. As the equilibration time increases, the ratios between the various components show considerable changes (Giangiacomo *et al.*, 1987). These results may be explained by Tedjo *et al.* (2002) and El-Gharably *et al.* (2003), who mentioned that, solid uptake during osmotic dehydration (OD), may not necessarily be a function of cell permeability alone but may also depend on the type of chemical and structural changes caused by the pretreatments. The osmosis process also reduced the time of dehydration of grapes compared with grapes dried with sun drying. It may be due to the choice of osmosis solution and the addition of NaCl to osmotic solutions which caused an increase in the driving force of the drying process. These results are in agreement with the results of Lerici *et al.* (1985).

Effect of storage period for 6 months on physicochemical properties of osmotic-dried figs at ambient temperature

The data given in Table (3) show the physicochemical composition of osmotic-dried figs during storage period that has extended for 6 months. The moisture content was 83.40% in fresh figs. The average moisture contents of dried figs pretreated with different osmotic solutions immediately after processing were 15.75, 15.42, 15.30 and 15.11% in T1, T2, T3 and T4 respectively, compared with 15.88% in T5 (control). So, the osmotic solutions reduced the moisture content of figs in the initial period and the reduction was the highest when osmotic solution 70% was used. An increment in moisture contents was found in all samples during storage, and reached to its maximum level by storage for 6 months. The untreated control figs (T5) always had moisture contents higher than those of all other osmotic-dried fig treatments at any of the storage periods. Also, the figs pretreated with the osmotic solution 70% (T4) had always less moisture contents than the figs of the other osmotic solution treatments at any of the storage periods. The moisture content reached to 15.70% in the dried figs pretreated with osmotic solution 70% (T4) after 6 months of storage at ambient temperature compared with 16.30% in the untreated control fogs (T5).

Total solids of fresh figs were 16.6%, while it greatly increased by drying figs. The increase in total solids was found in osmotic-dried and untreated figs and was affected by the storage for up to 6 months and the type of osmotic solution used for pre-treating figs before drying. The total solids ranged from 84.12 to 84.89% in the initial period, from 83.99 to 84.6% after 3 months of storage and from 83.7 to 84.3% after 6 months of storage.

The stabilization of ascorbic acid during processing is of importance, not only from the nutritional point of view but also because ascorbic acid degradation accelerates non enzymatic browning reaction, which does not only cause changes in color but can adversely affect flavor (Paakkomen and Mattiala, 1991). According to El-Gharably *et al.* (2003), the main mechanisms of the loss in vitamin C appears to be due to water solubility, mass transfer, heat sensitivity and enzymatic oxidation. Table (3) indicates that ascorbic acid content decreased during storage. The content of ascorbic acid was 190.40 mg/100g on dry weight basis in fresh figs, and decreased by osmotic by drying and storage. It ranged from 89.20 to 94.32 mg/100g in osmotic-dried figs immediately after processing (initial period), where figs pretreated with osmotic solution 70% (T4) had the highest ascorbic acid content followed by T3, T2 and T1 respectively, compared with 96.45 mg/100g in the untreated dried figs (T5). The ascorbic acid content gradually decreased with increasing the storage period to 6 months in osmotic dehydrated and control fig samples, and reached to 78.15, 79.92, 81.32, 84.15 and 86.92 mg/100g in T1, T2, T3, T4 and T5, respectively. The reduction of ascorbic acid in osmotic-dried figs may be due to the native ascorbic acid contents in figs, the type of used osmosis solutions, the immersing time in osmosis solution, the temperature of dehydration process and the extending shelf life at ambient temperature. These results coincide with the results of El-Gharably *et al.* (2003), who reported a decrease in ascorbic acid content in osmotic dehydrated cherries during the first four months and further decreases were found during next two months of storage.

The initial total titratable acidity in fresh figs was 1.00% as malic acid. The total acidity were in the range of 1.11-1.21% in the osmotic-dehydrated figs immediately after processing (initial period), compared with 1.01% in the untreated control figs. In all samples, total acidity content gradually increased during storage and reached to 1.20-1.27% in the osmotic-dehydrated figs after 6 months of storage compared with 1.16% in the untreated dried figs (T5).

Also, Table (3) shows that total sugar content in fresh figs was 64.20%, and was divided to 49.93% for reducing sugars and 14.27% for non-reducing sugars. There were little increases in total sugars in spite of using different types of osmosis solution for pretreatment of figs before the drying process. The total sugars reached to 65.20, 66.90, 68.80, 70.90 and 64.21% in T1, T2, T3, T4 and T5 immediately after processing (initial period) and decreased to 63.17, 63.90, 66.71, 67.45 and 63.10% after 6 months of storage at ambient temperature. The amount of reducing sugars immediately after processing ranged between 51.69 and 56.50% in osmotic dried fig samples, and the corresponding values of non-reducing sugars ranged between 13.51 and 14.40%. Also, little changes were found in reducing sugars and non-reducing sugars due to the osmotic pretreatment and storage of osmotic-dehydrated and untreated dried figs. The untreated control dried figs had less total sugars and non-reducing sugars than all osmotic-dehydrated samples in all storage periods. These results are supported by the results reported by Torreggiani *et al.* (1988).

Ash and crude fibers were 3.34 and 9.40% in fresh figs. The ash content was 3.41–3.51% in the osmotic dried figs pretreated with various osmotic solutions immediately after processing, compared with 3.36% in untreated dried figs. The storage of all fig samples resulted in little reduction in ash content to 3.34-3.44% in osmotic dehydrated samples versus 3.27% in untreated dried sample after 6 months of storage at ambient temperature. While the content of crude fibers ranged between 9.53–9.75% in osmotic dried fig samples, and was 9.33% in the control dried figs. Similarly, little gradual reduction of crude fibers was noticed with the extension of storage period and reached to 9.36-9.41% in all osmotic-dried figs and 9.18% in the control figs after 6 months of storage.

Microbiological assessment

Table (4) shows the assessment of total counts of bacteria and yeasts and molds in osmotic-dried figs pretreated by various osmotic solutions as well as the control-sample during storage for up to 6 months at ambient temperature. The behavior of the different groups of microorganisms immediately after processing was quite different and depended upon the type of pretreatment used before dehydration. Immediately after processing, the untreated control figs had the highest total counts of bacteria ($9.1x10^2$ cfu/g) followed by osmotic-dried fig pretreated by immersing in osmotic solutions of 40, 50, 60 and 70% date syrup ($6.3x10^2$, $5.2x10^2$, $3.7x10^2$ and $2.6x10^2$ cfu/g, respectively). The counts of yeast and molds ranged from $0.92x10^2$ to $1.22x10^2$ cfu/g in the osmotic dehydrated figs in the initial period, and a higher count of $1.94x10^2$ cfu/g was in the control sample. So, the immersion of figs in different osmosis solutions before dehydration was efficient in reducing the total counts of bacteria and total counts of yeasts and molds. In this concern, the immersion of figs in osmosis solutions 70% (T4) and 60% (T3) were more effective in reducing the total counts of microorganisms, followed by osmosis solutions 50% (T2) and 40% (T1), respectively. The viable microbial population gradually decreased in all samples by extension of the storage period to 6 months, at which the total count of bacteria ranged from $1.5x10^2$ to $3.4x10^2$ cfu/g in the osmotic dried samples, compared to $4.6x10^2$ cfu/g in the control sample, and the total count of yeast and molds was $0.70x10^2$ to $0.98x10^2$ cfu/g in osmotic dried samples versus $1.00x10^2$ cfu/g in the control sample. These results reveal that the growth of microorganisms decreased with the osmosis treatments and storage. In other words, the inactivation and/or death of the microorganisms were proportional to the osmosis solution and extension of the storage period. Thus, the trend of decreasing the total counts of bacteria and yeast and molds was well-correlated with the type of osmotic solution used in the pretreatment before dehydration as well as the storage period.

Sensory evaluation of osmotic-dried figs

The results of analysis of variance in color, texture, taste, flavor and overall acceptability of the dehydrated figs are shown in Table (5). The results indicated significant differences in color, texture, taste, flavor and overall acceptability among dehydrated samples, and the differences were shown immediately after processing (initial period), and after 3 and 6 months of storage at ambient temperature. The differences depended also on the type of pretreatment used. Osmotic-dried figs pretreated with date syrup 70% recorded the highest scores of sensory attributes followed by osmotic-dried figs pretreated with date syrup 60, 50 and 40% respectively, whereas the control dried figs recorded the lowest sensory scores. Therefore drying figs reduced the scores of sensory attributes, however the pretreatment of figs with osmotic solutions resulted in increasing the scores of sensory attributes, and the highest scores were when figs were pretreated with date syrup 70%.

Table 1. Physiochemical properties of date syrup in dry weight basis

Components (%)	Date syrup
Moisture content	16
Ash content	5.88
Total solids on dry weight	84.0
T.S.S	80
pH values	6.11
Total acidity	0.18
Total sugars	91.39
Total proteins	1.12
Total lipids (fats)	1.61
Ascorbic acid (mg/100 g)	3.2
Sodium (mg/100 g)	13
Potassium (mg/100 g)	202.8
Iron (mg/100 g)	7.8
Magnesium (mg/100 g)	143
Calcium (mg/100 g)	338

Table 2. Effect of different concentrations of osmotic solutions on the characteristics of osmosis dried figs

Processing conditions	°Brix of osmotic solution		Dehydration time (hr)
	Before	After	
T1 (40% date syrup)	40	35	30
T2 (50% date syrup)	50	45	28
T3 (60% date syrup)	60	52	27
T4 (70% date syrup)	70	60	24
T5 (untreated control)		-	37

Table 3. Effect of storage period for 6 months at ambient temperature on physicochemical properties of osmotic-dried figs pretreated with various osmotic solutions

Constituent			Moisture %	Total Solids %	Ascorbic acid (mg/100g)	Total Acidity %	Total sugars %	Reducing sugars%	Non-reducing sugars%	Ash %	Crud fiber %
Fresh figs			83.40	16.60	190.40	1.00	64.20	49.93	14.27	3.34	9.40
Storage period (month)	Initial period	T1	15.75	84.25	89.20	1.11	65.20	51.69	13.51	3.41	9.75
		T2	15.42	84.58	90.15	1.16	66.90	53.10	13.80	3.46	9.55
		T3	15.30	84.70	93.62	1.18	68.80	54.70	14.10	3.49	9.50
		T4	15.11	84.89	94.32	1.21	70.90	56.50	14.40	3.51	9.53
		T5	15.88	84.12	96.45	1.01	64.21	49.90	13.31	3.36	9.33
	After 3 months	T1	15.97	84.03	81.72	1.14	64.10	50.89	13.21	3.39	9.50
		T2	15.83	84.17	83.62	1.18	65.21	51.49	13.72	3.44	9.42
		T3	15.80	84.20	85.42	1.20	67.60	53.65	13.95	3.47	9.44
		T4	15.40	84.60	88.23	1.24	69.11	54.85	14.26	3.48	9.47
		T5	16.01	83.99	90.12	1.11	64.70	51.50	13.20	3.33	9.27
	After 6 months	T1	16.12	83.89	78.15	1.20	63.17	50.02	13.15	3.34	9.39
		T2	15.91	84.09	79.92	1.22	63.90	50.28	13.62	3.41	9.36
		T3	15.88	84.12	81.32	1.25	66.71	53.01	13.70	3.43	9.39
		T4	15.70	84.30	84.15	1.27	67.45	53.25	14.20	3.44	9.41
		T5	16.30	83.70	86.92	1.16	63.10	50.12	12.98	3.27	9.18

T1 (40% date syrup), T2 (50% date syrup), T3 (60% date syrup), T4 (70% date syrup),

T5 (untreated control).

Table 4. Total counts of bacteria and yeasts and molds in osmotic-dried figs pretreated with various osmotic solutions and stored for 6 months at ambient temperature

Parameter		Treatment	Total count of bacteria (cfu/g)	Total count of yeasts and molds (cfu/g)
Storage period (month)	Initial period	T1	6.3 x 10^2	1.22 x 10^2
		T2	5.2 x 10^2	1.10 x 10^2
		T3	3.7 x 10^2	0.98 x 10^2
		T4	2.6 x 10^2	0.92 x 10^2
		T5	9.1 x 10^2	1.94 x 10^2
	After 3 months	T1	5.2 x 10^2	1.12 x 10^2
		T2	4.1 x 10^2	0.94 x 10^2
		T3	2.8 x 10^2	0.90 x 10^2
		T4	2.0 x 10^2	0.83 x 10^2
		T5	7.9 x 10^2	1.54 x 10^2
	After 6 months	T1	3.4 x 10^2	0.98 x 10^2
		T2	3.2 x 10^2	0.82 x 10^2
		T3	2.1 x 10^2	0.73 x 10^2
		T4	1.5 x 10^2	0.70 x 10^2
		T5	4.6 x 10^2	1.00 x 10^2

T1 (40% date syrup), T2 (50% date syrup), T3 (60% date syrup),

T4 (70% date syrup), T5 (control).

Table 5. Sensory evaluation of dried and osmotic-dried figs during storage for 6 months at ambient temperature

Osmotic solution used before dehydration process			T1 40% date syrup	T2 50% date syrup	T3 60% date syrup	T4 70% date syrup	T5 control
Quality attributes of osmo-dried figs during storage	Initial period	Color	7.0^{c}	7.4^{c}	8.6^{b}	9.6^{a}	6.1^{d}
		Texture	7.1^{c}	7.4^{c}	8.4^{b}	9.2^{a}	6.2^{d}
		Taste	7.3^{c}	7.5^{c}	8.2^{b}	9.1^{a}	6.0^{d}
		Flavor	7.1^{c}	7.1^{b}	8.2^{b}	8.6^{a}	6.0^{d}
		Overall acceptability	7.2^{c}	7.3^{c}	8.1^{b}	9.2^{a}	6.1^{d}
	After 3 months	Color	6.7^{c}	7.3^{c}	8.3^{b}	8.6^{a}	5.9^{d}
		Texture	6.8^{c}	7.2^{c}	8.2^{b}	8.7^{a}	5.8^{d}
		Taste	6.6^{c}	7.1^{c}	8.1^{b}	8.8^{a}	5.9^{d}
		Flavor	6.7^{c}	7.1^{c}	7.9^{c}	8.5^{a}	5.8^{d}
		Overall acceptability	6.6^{c}	7.0^{c}	7.6^{c}	8.6^{a}	5.7^{d}
	After 6 months	Color	6.6^{c}	6.9^{c}	7.7^{b}	8.3^{a}	5.8^{d}
		Texture	6.5^{c}	6.9^{c}	7.5^{b}	8.4^{a}	5.6^{d}
		Taste	6.3^{c}	6.4^{c}	7.4^{b}	8.3^{a}	5.7^{d}
		Flavor	6.2^{d}	6.5^{c}	7.6^{b}	8.2^{a}	5.6^{d}
		Overall acceptability	6.5^{c}	6.8^{c}	7.5^{b}	8.2^{a}	5.7^{d}

Means with different superscripts in the same raw are significantly different at $P<0.05$

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تقييم جودة التين المجفف المعامل مبدئيا بالتجفيف الاسموزي

منال عباس الجندى

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أجريت هذه الدراسة بهدف تقييم عينات التين المنتج بالتجفيف والمعامل اسموزيا بتركيزات مختلفة من شراب البلح (الدبس) ٤٠ ، ٥٠ ، ٦٠ ، ٧٠% ومقارنتها بالعينة غير المعاملة (كنترول). هذا وقد أوضحت الدراسة أن غمر التين فى محاليل الاسموزية ادى الى تقليل وقت عملية التجفيف وأوضحت الدراسة أن أقل وقت للتجفيف كان باستخدام تركيز ٧٠% من الدبس كمعاملة ابتدائية لتجفيف التين تليها تركيز ٦٠% ثم تركيز ٥٠% ثم تركيز ٤٠% من شراب البلح علي التوالي. يضاف إلي ذلك أنه قد أخذ في الاعتبار دراسة الخواص الطبيعية والكيماوية والتقييم الميكروبيولوجي وخصائص الجودة للعينات المجففة مباشرة بعد التصنيع وكذلك أثناء تخزينها علي درجة حرارة الغرفة لمدة ٦ شهور. وقد بينت الدراسة أن التين المجفف والمعامل ابتدائيا بالمحاليل الاسموزية بتركيز ٧٠% من شراب البلح كان أكثر احتفاظا بمحتواه من فيتامين ج ، تلى ذلك التين المعامل إبتدائيا بتركيز ٦٠% ثم تركيز ٥٠% ثم تركيز ٤٠% على التوالي. كما تراوحت نسبة السكريات المختزلة والالياف في التين المجفف اسموزيا من ٥١,٦٩–٥٦,٥٠%، ٩,٥٣–٩,٧٥% على التوالي. وقد أظهرت نتائج التحليل الميكروبيولوجي أن العينات غير المعاملة اسموزيا كانت عالية فى سجل العدد الكلي للبكتريا (٩,١x ١٠^٢ خلية مكونة لمستعمرة / جم)، بينما المحلول الاسموزي بتركيز ٧٠% أظهر أقل عدد للبكتريا الكلية (٢,٦X١٠^٢ خلية مكونة لمستعمرة / جم) و كذلك للفطر والخمائر. من ناحية أخري، لوحظ من الدراسة حدوث انخفاض تدريجي في المحتوي الميكروبي الكلي وكذلك الفطر والخميرة بزيادة فترة التخزين حيث وصلت إلي أقل معدلاتها بعد ٦ شهور من التخزين علي درجة حرارة الغرفة.

وقد سجل التقييم الحسي للتين المجفف والذي عومل اسموزيا ابتدائيا بتركيز٧٠% شراب البلح أعلي القيم لخواص اللون، القوام ، والطعم ، النكهة والقبول العام تلى ذلك التين المجفف والمعامل إبتدائيا بتركيز ٦٠% ثم تركيز ٥٠% و تركيز ٤٠% من شراب البلح بعد التصنيع مباشرة وكذلك بعد التخزين لمدة ٣ ، ٦ أشهر علي درجة حرارة الغرفة مقارنة بالعينة الغير معاملة (كنترول) والتى سجلت أقل القيم في خصائص التقييم الحسي.

وعلي ذلك فقد أوضحت الدراسة أن المعاملة الابتدائية بالمحاليل السكرية الاسموزية لإنتاج منتجات مجففة اسموزيا تلعب دورا هاما في الحصول علي منتجات ذات خصائص جودة عالية مقارنة بتلك التى لم تعامل اسموزيا.