

***Effect of pretreatments on physical and sensory properties of fig pickle***

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**Abstract**

This work was performed to evaluate chemical composition, total phenol content, vitamins A and C content of raw breba fig fruit (R) and the effect of blanching (B) and soaking in sodium hydroxide (N) as a pretreatment procedure on the color, hardness, total phenolic content, titratable acidity and vitamins A and C content of breba fig pickle treatments, also sensory evaluation was conducted for all treatments under study after 14 days of pickling process. A control treatment (C) was carried out without any pretreatment. Results showed that the nutritional values of R sample were 76.30, 2.00, 0.30, 0.30 and 13.97%, for moisture, crude protein, ash, ether extract and crude fiber content, respectively. Total phenolic content, vitamins A and C content of R sample was 38.46 mg GAE/g, 15.06 IU/g, 19.66 mg/100g, respectively. There was a color balance occur for both peel and pulp color of all pickle treatments. Blanching pretreatment exhibit a good hardness behavior at the end of pickling process. Moreover, there was a decrement trend occurred in total phenolic content, vitamins A and C content for all pickle treatments when compared with R treatment. The C and B treatments recorded a higher total phenolic content and same titratable acidity values. The high vitamin A value was observed with the C treatment followed by N and B treatments with same values, whilst the highly vitamin C value was found with treatment C followed by B then N treatments. Regarding sensory evaluation, treatment B manifest an excellent overall acceptability.

**Key words:** Blanching pretreatment, breba fig, pickling process, titratable acidity, total phenol.

## **Introduction**

Fig tree (*Ficus carica* L.) belongs to the Moraceae family, considered one of the oldest fruit trees cultivated in the Mediterranean region. Fig fruit represents an important constituent of the diet, because of their nutritional and medicinal values (**Flaishman et al., 2008**). Fig's fruit is actually an aggregate fruit made up of several hundred individual drupelets that form from the ovaries. More recently, there is a long tradition in mediterranean countries of producing fig-based product such as dried figs, jams, syrups and fig spirits, also, figs are used in sauces complimenting savory meat dishes, mixology creations, and sliced on pizza, flatbreads and salads (**Rodríguez-Solana et al., 2018**). Fig fruit used for the treatment of various ailments such as anemia, cancer, diabetes, leprosy, liver diseases, paralysis, skin diseases, and ulcers (**Badgujar et al., 2014**).

Fig tree varieties which produce two crops per year called "biferous", the first crop on the previous season's growth called breba crop and the second crop on current growth is the main fig crop (**Solomon et al., 2006**). The breba is also called early fig or breva. It was developed on the old wood of common fig trees during spring after the fig leaves emerge. The branches which bear the breba crop are from the previous year's main fig crop production (**Stover et al., 2007**). Brebas are nutritious fruits with health promoting potential, it is rich in fiber (with more than 28% of the fiber of the soluble type), potassium, calcium, iron, free of sodium and fat, they are a good source of vitamins, minerals, amino acids and phenolic compounds (**Vinson, 1999, Solomon et al., 2006, Duenas et al., 2008 and Vallejo et al., 2012**). Breba figs don't always have desired fruit color, shape and flavor and not sweet as the main fig crop, it looks like unrip green fig, therefore the growers of figs tend to suppress the breba crop production to conserve the energy and nutrients so that it does not affect the main fig crop properties.

Pickling process is one of the oldest preservation methods which used for the preservation of vegetables and fruits by anaerobic

fermentation in brine (salt water solution) to produce lactic acid . Pickling is a conventional method to developing low cost ready to eat food products with improving their quality attributes (**Behera et al., 2020**).

Pre-treatments considered to be a treatment done to adjust the food substrate before processing which could affect the properties of food substance after processing (**Taiwo and Baik, 2007**). Breba fig fruit is a perishability fruit, nevertheless, no literature is available regarding how to preserve breba fruits and converting it into value-add product, thus, in order to avoid wasting this fruit, the current research focused on the possibility of preserve breba fig fruit by pickling process and investigate the effect of pretreatments such as blanching and soaking in sodium hydroxide solution on the color, hardness, titratable acidity, vitamins A and C, total phenolic content and sensory characteristics of pickling breba fig fruit.

### **Materials and methods**

Breba fig fruits (*Ficus carica* L.) were obtained from farm of faculty of Environmental Science and Agriculture, Matrouh University, Fouka, Matrouh Governorate, Egypt. The pickling process was done by using 10% salty saline according to **Sultana et al., (2014)**. Raw breba fig fruits (R) where directly collected and brought to the laboratory, washed and divided into three treatment groups. The first treatment group (C) was pickled directly in brine (10% NaCl) without pretreatment, the second treatment group (B) was blanched in boiling water at 100°C for 2 minutes, then rinsing and cooling by tap water to room temperature then placed directly in brine (10% NaCl), where the third treatment group (N) was soaked in 0.1% NaOH solution for 30 minutes, then rinsing and washed by tap water then placed directly in brine (10% NaCl). All pickle treatments were fermented at room temperature for 14 days according to **Yuliana and Sari, (2020)**, then stored into refrigerator (4°C) until analysis.

#### **Analytical methods:**

Moisture, total ash, ether extract, crude protein and crude fiber content were assessed for R sample according to the methods described in the **A.O.A.C. (2005)**. The total carbohydrates contents were calculated by difference.

Color of all pickle treatments were measured at zero, 7 and 14 days by using Chroma meter (Konica Minolta, model CR 410, Japan) calibrated with a white plate and light trap supplied by the manufacturer at Cairo University Research Park (CURP), Faculty of Agriculture, Cairo University. Color was expressed using the CIE L, a, and b color system (CIE, 1976). A total of three spectral readings were taken for each sample. Lightness (L\*) (dark to light), the redness (a\*) values (reddish to greenish) and the yellowness (b\*) value (yellowish to bluish) were evaluated.

Hardness (N) of all pickle treatments was measured at zero, 7 and 14 days using Instron Universal Testing Machine (Model 2519-105, USA) at Research Park (CURP), Faculty of Agriculture, Cairo University. Six replicates from each sample were taken. The machine test speed was 200 mm/min and hardness (N) was recorded electronically.

Total phenolic content of the R sample and all pickle treatments were estimated, after 14 days, colorimetry by Folin–Ciocalteu reagent according to **Singleton and Lamuela-Raventos, (1999)**. and were expressed as mg gallic acid equivalent /g sample.

Titrate acidity was estimated according to **Paul et al., (2010)** for the R sample and all pickle treatments, after 14 days, by titrating 10g crushed sample dissolved in 50ml distilled water, then filtered and titrated by 0.1N NaOH solution using phenolphthalein as an indicator, to pink end point persisting for 30 seconds.

Vitamin C of R sample and all pickle treatments was measured after 14 days were estimated according to **Baja and Kaur (1981)** where 5 gm of each sample were extracted with 100 ml of the oxalic acid – EDTA solution. The extract is filtered through filter – paper and then centrifuged. A 5 ml aliquot is then transferred into a 25 ml calibrated flask and mixed with other reagents (0.5 ml of the metaphosphoric acid – acetic acid solution and 1 ml of 5% V/V sulphuric acid), followed by 2 ml of ammonium molybdate reagent. After 15 minutes measure the absorbance at 760 nm against a reagent blank using UV/V is spectrophotometer, Jenway, England, at temperature 20°C.

Vitamin A of R sample and all pickle treatments was measured after 14 days were estimated according to **Brubacher et al., (1985)** where the

tested samples were saponified and extracted. The unsaponifiable matter reacted with trifluoroacetic acid. The absorbance is measured at 620nm using UV/V is spectrophotometer, Jenway, England, at temperature 20°C.

Sensory evaluation of all pickle treatments was evaluated for color, texture, taste, flavor and overall acceptability, which was rated on a hedonic scale ranging from 1 to 10, where the number 1 corresponded to less pleasurable, 5 corresponded to middle pleasurable and 10 corresponded to very pleasurable according to **Guine et al., (2016)**.

#### **Statistical Analysis:**

The data obtained were subjected to statistical analysis of variance (ANOVA). All analyses were performed in triplicate. All tests were conducted at the 5% significant level according to **Armonk, (2011)**.

## **Results and Discussion**

#### **Chemical composition of raw green fig fruit:**

There is a lack in studies about the breba fig fruit properties, so, it was important to determine the chemical composition of raw breba fig fruit. Data in table (1) clarify that, R sample found to have a good crude fiber content (13.97%) and total carbohydrate content (7.13%), where the moisture, crude protein, ash and ether extract content was 76.30, 2.00, 0.30 and 0.30%, respectively. Pereira et al., (2017) described a higher protein values and lower crude fiber contents for nine varieties breba fig fruits when compared to our results, whereas crude fiber content was ranged between 6.7 to 5.1%, while the mean values of protein content was found to be ranged between 4.4 and 6.7% for nine varieties of breba fig fruits. Also, regulation on Nutrition and Health Claims (European Commission 2007) allows claims to be made with respect to the fiber content of food if fiber levels exceed 3 g per 100 g (source of fiber), so incorporation of breba fig fruit could be good to fortify food matrix (**Buttriss and Stokes, 2008**).

#### **Effect of pretreatments on color of fig pickle treatments:**

Color is an important factor that affected the food product quality. Therefore, the peels and pulp color of all pickle treatments were estimated at zero, 7 and 14 days in order to track the change in color to reach the appropriate degree of mature pickled fig.  $L^*a^*b^*$  are the

parameter color space. Parameter  $L^*$  is the matrix of pixel values of darkness to lightness, parameter  $a^*$  is the matrix of pixel values of (greenness to redness), where parameter  $b^*$  is the matrix of pixel values of (blueness to yellowness).

Color of green fig peel and green fig pulp, during the time duration mentioned above, were showed in table (2), which elucidated that, at zero day, the highest significant mean average  $L^*$  values were found with the C treatment followed by N and B treatments. The same trend of action was also observed with the  $a^*$  values, where the highest significant mean average of  $a^*$  value was found with the C treatment (-10.72) followed by N treatment (-2.61), whilst the  $a^*$  value for the B treatment was 2.09. These mean that, both C and N treatments were more greenish at the zero day than B treatment, that may be due to the blanching treatment which affected the green fig color. Silva et al., (2016) mentioned that, loss of green color in many vegetables after thermal treatment is affect the quality of pickled foods, where the chlorophyll level decreased after boiling as compared with the raw fruit color. Also, Andrés-Bello et al., (2013) illustrated that, chlorophyll levels could be affected when temperature treatment used reached more than 50°C. After 7 days, there was a significant increment in  $a^*$  value for the three treatments, where the  $a^*$  values was 5.47, 5.28 and 6.23 for the C, B and N treatments, respectively.

Moreover, as seen from data in table (2), after 14 days, there was a highly significant decrement in  $L^*$  values and a slightly significant decrement in  $a^*$  values between the three treatments. On contrary, there was a significant decrement in  $b^*$  values for both C and B treatments. As well as, data in table (3) clarify that, there was a significant decrement in the mean values of  $L^*$  parameter for pulp color of the C, B and N treatments at zero day and after 14 days. Furthermore, the mean values of  $a^*$  parameter was significantly differences for pulp color of the C, B and N treatments at zero day. Also, it was noticed that, after 14 days, the mean  $a^*$  values of the pulp color of the C treatment were increased, while the mean  $a^*$  values of the pulp color of both B and N treatments were decreased.

Treatment B presented a lower mean  $b^*$  values than those observed with C and N treatments, that is may be due to the effect of blanching treatment on the browning enzymes where **Yerliturk *et al.*, (2008)** indicated that thermal treatment inactive the browning enzyme activity. Moreover, **Chiralt and Talens (2005)** informed that pickling process could affected the activity of polyphenol oxidase which is in charge of enzymatic browning. So, from results in table (2 and 3) it could be observed that, there was a color balance occur for both peel and pulp of fig pickle after 14 days of processing which mean that fig pickle could be consumed after 14 days of processing. Moreover, treatment B was the best treatment that showed an excellent effect on all color parameters at time zero and within 14 days of pickling process compared to both treatments C and N.

#### **Effect of pretreatments on hardness of fig pickle treatments:**

Pickle texture was a critical property for pickle quality. Data presented in table (4) showed the hardness values of the fig pickle treatments. There was a highest significant decrement in hardness value observed with the B treatment followed by the C treatment then the N treatment at zero time. After 14 days of processing, there was a reduction trend occurred in hardness values all over the pickle treatments among the 14 days of processing, but the lowest significant rate of reduction was obtained with B treatment and these mean that the blanching pretreatment affect positively on the hardness of fig pickle among the processing time. Reduction in hardness values of B treatment at zero time could be due to softening of tissues under high temperature (**Rahman *et al.*, 2014**).

Also, **Badwaik *et al.*, (2016)**, explain that, during the blanching process, the turgor pressure increases within the cell structure which forces the cell membrane against the cell wall and results in the loss of integrity of cells with ultimate loosening of the fruit texture.

#### **Effect of pretreatments on total phenolic content of fig pickle treatments:**

Pickling process affect the total phenolic content of the pickled vegetables (**Sayin and Alkan, 2015**), therefore it was important to assess the total phenolic content of all pickle treatments. Figure (1) clarified the

total phenolic content of the R and all pickle treatments. It was noticed that, after 14 days of pickling there was a highly decrement in the total phenolic content occurred for all pickle treatments when compared with the R sample.

The highly decrement in total phenolic content was noticed with the N treatment (9.28 mg GAE/g), whilst the lower decrement in total phenolic content was observed with both C and B treatments with a nearly total phenolic content (13.48 mg GAE/g and 13.66 mg GAE/g, respectively). The same trend of decrement in total phenolic compound was obtained with 10 different kind of vegetables after 15 days of pickling processing (**Sayin and Alkan, 2015**). The reduction in TPC in blanched pickles might be due to the greater degradation of these volatile compounds under heat exposure (**Tan et al., 2013**). Moreover, the reduction of TPC could also be due to the transfer of the compounds from the fruit pericarp to the soaking solutions during blanching and/or pickling under concentration gradient (**Yadav and Singh, 2014**).

**Effect of pretreatments on titratable acidity of fig pickle treatments:**

Titratable acidity is the total amount of acid present in the food matrix which is determined using a standard titrant i.e. sodium hydroxide. It is important for assessing the keeping quality of the product. Titratable acidity measures the total acidity in different kind of foods which plays an important role in producing distinctive flavors of pickles as well as reducing the activity of undesirable microorganisms and consider as one of the key factors for evaluating product quality (**Jordan, 2010 and Suri, et al., 2021**).

Titratable acidity of R sample and all pickle treatments were estimated and showed in figure (2). There was an increment in the titratable acidity value of all pickle treatments after 14 days as compared with the R sample. The highly significant increment was observed with the N treatment (0.662%) followed by B treatment (0.557%) then C treatment (0.531%), with no significant differences between treatment B and C. Singh, (2018) reported an increment in acidity of unrip green mango pickle and attributed to the cause of lactic acid fermentation. The acidity value of pickles affected by pickling process (**Srivastava and Kumar,**



2002). Moreover, **Suna (2021)** revealed that increment in total acidity at the end of the pickling process could be due to the fruit's composition.

**Effect of pretreatments on vitamins A and C of fig pickle treatments:**

Data in figure (3) clarify the effect of pretreatments on vitamins A and C content of R sample and all pickle treatments. It was noticed that there was a decrement in both vitamins A and C content in all pickle treatments as compared with the R sample. Vitamins A and C content for the R sample were 15.09 IU/g and 19.66 mg/100g, respectively. Regarding to vitamin A, the C treatment found to have the highest significant vitamin A content (8.23 IU/g) followed by B and N treatments (5.56 IU/g and 5.88 IU/g), respectively, with no significant differences. For vitamin C content, the lowest significant decrement rate was obtained with C treatment (3.86mg/100g) followed by B treatment (1.13 mg/100g), whilst the N treatment registered the highest significantly decrement rate (0.28 mg/100g).

**Al-Azzawi and Al-Abdullah, (2019)** recorded a loss in vitamins content in processed cucumber pickle when compared with the fresh cucumber. **Singh, (2018)** reported a decrement in ascorbic acid content in unrip green mango pickle and informed that, loss in ascorbic acid content due to the osmotic action happened by added salt. Blanching affect vitamins A and C content where, during blanching, changes occurred on fruit cell membrane which lead to cell membrane distribution and affect the cell permeability resulted in nutrient loss (**Badwaik et al., 2016, Zhang et al., 2011**). **Ramli and Saadon, (2021)** pointed out a reduction in ascorbic acid value during guava pickling process. **Gutowska et al., (2019)** notify a decrement in vitamin C content in both red pepper and cucumber pickles after pickling process.

**Effect of pretreatments on sensory characteristics of fig pickle treatments:**

Consumer acceptability is an important factor for the success of food products, mainly with the innovative food products. sensory evaluation is the guide way for consumer to evaluate the new food product acceptability, therefore all pickle treatments were evaluated for sensory characteristics in terms of color, taste, texture, flavor and overall acceptability. Data presented in figure (4) showed that, treatment B

recorded a highly significant score for all sensory attributes. Concerning to treatment C and N, there was no significant differences between them expect for the taste attribute, C treatment scored a lower significant value.

Furthermore, both color and texture sensory scores of B treatment was corresponded with the values obtained by color and texture measurements. From data in figure (4), treatment B appeared to have a best sensory score which mean that the blanching pretreatment exhibit an excellent overall acceptability score, this result was not in accordance with **Khaskheli et al., (2017)** who returned the reason of lower sensory attributes score of pickles to the blanching treatment. **Al-Azzawi and Al-Abdullah, (2019)** illustrated that both taste and flavor properties depend on type of fermentation process. Texture returned to action of enzymes, thermal treatment and the kind of fruit used for pickling. **Singh, (2018)** declared that, pickling unripe green mango with different recipes scored a good overall acceptability. **Gocan et al., (2021)** illustrated that blanching was a good preheating treatment for cucumber pickles with a good taste and texture properties.

## **Conclusion**

Our results showed that the green breba fig fruit had a good nutritional, total phenolic, vitamin A and vitamin C content. The pretreatment, blanching and soaking in sodium hydroxide solution, affected the properties of breba fig pickled. The blanching treatment found have a good color and hardness values with an excellent proportion of total phenolic content, vitamins A and C and also, scored a higher overall acceptability when compared with both control and sodium hydroxide soaking treatments. More research should be done in order to produce a new food product with good properties.

**Table 1. Chemical composition of raw green breba fig fruit (fresh weigh).**

Chemical composition parameters	(%)
Moisture content	76.30±0.13
Ash content	0.30±0.01
Ether extract	0.30±0.01
Crude protein	2.00±0.01
Crude fiber	13.97±0.01
Total carbohydrate*	7.13±0.1

Data are mean ± Standard deviation, \*Calculated by differences.

**Table 2. Peel and pulp color of fig pickle during pickling days.**

Treatments	Peel color of fig pickle		
	<i>L</i> *	<i>a</i> *	<i>b</i> *
<b>CZ</b>	52.12 <sup>a</sup> ±1.85	-10.72 <sup>a</sup> ±1.21	25.05 <sup>a</sup> ±2.52
<b>BZ</b>	38.42 <sup>b</sup> ±0.09	2.09 <sup>c</sup> ±0.09	14.73 <sup>b</sup> ±0.15
<b>NZ</b>	39.93 <sup>b</sup> ±0.33	-2.61 <sup>b</sup> ±0.12	12.35 <sup>b</sup> ±0.39
<b>C7</b>	41.51 <sup>b</sup> ±0.05	5.47 <sup>b</sup> ±0.28	14.52 <sup>a</sup> ±0.40
<b>B7</b>	38.15 <sup>c</sup> ±0.11	5.28 <sup>b</sup> ±0.10	12.68 <sup>b</sup> ±0.48
<b>N7</b>	41.97 <sup>a</sup> ±0.17	6.23 <sup>a</sup> ±0.06	14.14 <sup>a</sup> ±0.29
<b>C14</b>	43.24 <sup>a</sup> ±0.03	4.48 <sup>b</sup> ±0.11	15.11 <sup>a</sup> ±0.29
<b>B14</b>	37.83 <sup>b</sup> ±0.08	4.37 <sup>b</sup> ±0.06	12.10 <sup>b</sup> ±0.04
<b>N14</b>	36.44 <sup>c</sup> ±0.13	4.78 <sup>a</sup> ±0.11	11.53 <sup>c</sup> ±0.30

(CZ) control green fig pickle at zero day, (BZ) blanching green fig pickle at zero day, (NZ) green fig pickle treated with NaOH at zero day. (C7) control green fig pickle, (B7) blanching green fig pickle after 7 days, (N7) green fig pickle treated with NaOH after 7 days. (C14) control green fig pickle after 14 days, (B14) blanching green fig pickle after 14 days, (N14) green fig pickle treated with NaOH after 14 days. Mean value ± Standard deviation of three replicates, means sharing the same letter in a column (between treatments within pickling days) are not significantly different at  $p \geq 0.05$ .

**Table 3. Peel and pulp color of fig pickle during pickling days.**

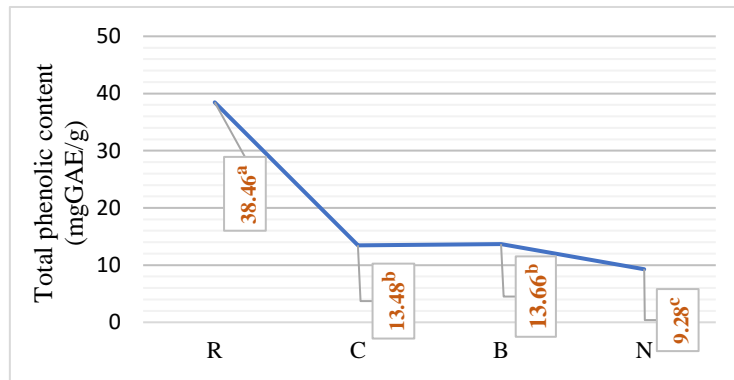
Treatments	pulp color of fig pickle		
	<i>L</i> *	<i>a</i> *	<i>b</i> *
<b>CZ</b>	62.74 <sup>a</sup> ±1.34	4.01 <sup>c</sup> ±1.6	20.62 <sup>a</sup> ±1.18
<b>BZ</b>	42.68 <sup>c</sup> ±0.19	11.55 <sup>b</sup> ±0.48	15.09 <sup>c</sup> ±0.47
<b>NZ</b>	53.48 <sup>b</sup> ±1.2	15.45 <sup>a</sup> ±0.43	18.94 <sup>b</sup> ±0.24
<b>C7</b>	48.71 <sup>b</sup> ±0.15	16.02 <sup>a</sup> ±0.17	16.22 <sup>a</sup> ±0.20
<b>B7</b>	46.45 <sup>c</sup> ±0.27	10.92 <sup>c</sup> ±0.15	15.67 <sup>b</sup> ±0.17
<b>N7</b>	50.29 <sup>a</sup> ±0.24	11.28 <sup>b</sup> ±0.01	14.69 <sup>c</sup> ±0.01
<b>C14</b>	45.66 <sup>a</sup> ±0.23	14.09 <sup>a</sup> ±0.12	14.91 <sup>c</sup> ±0.11
<b>B14</b>	41.34 <sup>c</sup> ±0.32	11.21 <sup>c</sup> ±0.12	16.05 <sup>a</sup> ±0.11
<b>N14</b>	46.37 <sup>b</sup> ±0.37	11.58 <sup>b</sup> ±0.03	15.15 <sup>b</sup> ±0.08

(CZ) control green fig pickle at zero day, (BZ) blanching green fig pickle at zero day, (NZ) green fig pickle treated with NaOH at zero day. (C7) control green fig pickle, (B7) blanching green fig pickle after 7 days, (N7) green fig pickle treated with NaOH after 7 days. (C14) control green fig pickle after 14 days, (B14) blanching green fig pickle after 14 days, (N14) green fig pickle treated with NaOH after 14 days. Mean value ± Standard deviation of three replicates, means sharing the same letter in a column (between treatments within pickling days) are not significantly different at  $p \geq 0.05$ .

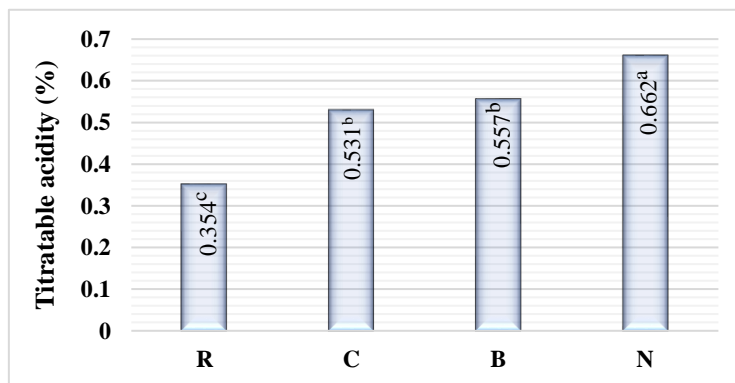
**Table 4. Hardness of fig pickle during pickling days.**

Treatments	Hardness of fig pickle (N)		
	Zero time	After 7 days	After 14 days
<b>C</b>	59.43Ab±0.05	54.03Bb±1.19	36.19Cb±0.18
<b>B</b>	20.00Ac±0.62	17.50Bc±0.07	17.70Bc±0.17
<b>N</b>	91.88Aa±0.61	55.90Ba±0.42	54.33Ca±0.89

(C) control green fig pickle, (B) blanching green fig pickle, (N) green fig pickle treated with NaOH. (C7). Mean value ± Standard deviation of three replicates, means sharing the same capital letter in a row and means sharing the same small letter in a column are not significantly different at  $p \geq 0.05$ .



**Figure 1. Total phenolic content of fig pickle treatments.**



**Figure 2. Titratable acidity of fig pickle treatments.**

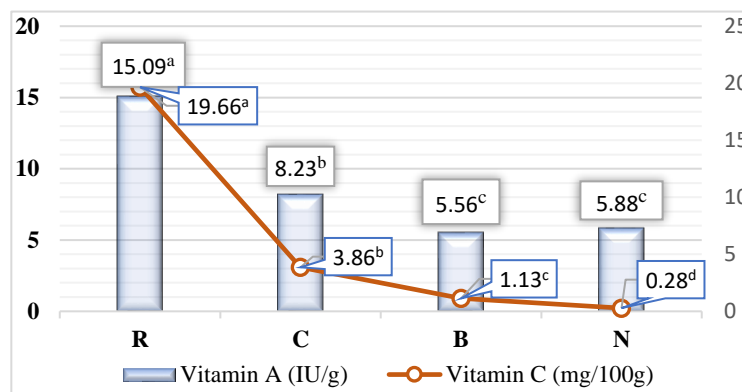


Figure 3. Vitamin A and vitamin C of fig pickle treatments.

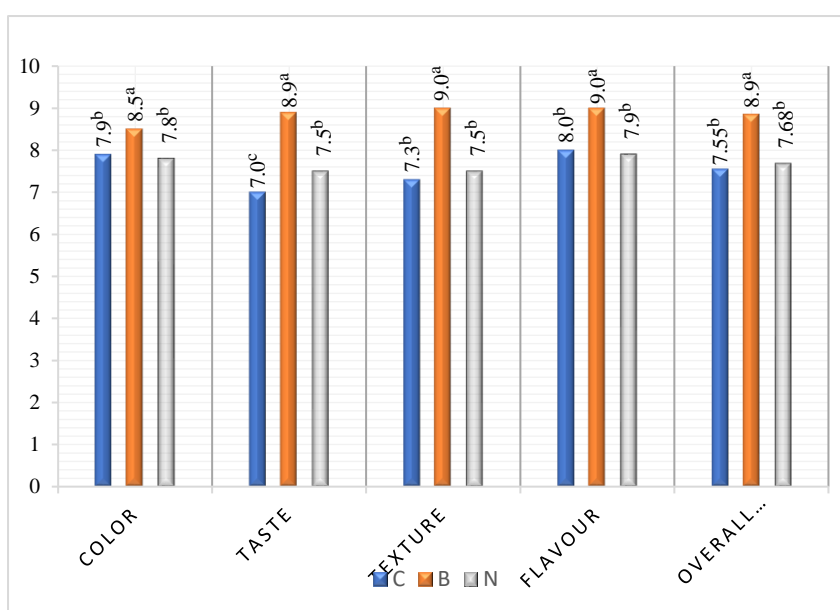


Figure 4. Sensory characteristics of fig pickle treatments.

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## تأثير المعاملات الأولية على الخصائص الطبيعية والحسية لمخلل التين

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### الملخص العربي

تم إجراء هذا البحث لتقييم التركيب الكيميائي، محتوى الفينولات الكلية، محتوى فيتامينات A و C لثمار تين البريبا الخام (R). تم دراسة تأثير كل من السلق (B) والنقع في هيدروكسيد الصوديوم (N) كمعاملة أولية على كل من اللون، الصلابة، محتوى الفينولات الكلية، الحموضة ومحتوى فيتامينات A و C في معاملات مخلل التين البريبا تحت الدراسة. كذلك تم عمل تقييم حسي لجميع المعاملات تحت الدراسة بعد 14 يوما من عملية التخليل. أيضا تم عمل عينة كونترول (C) بدون أى معاملة أولية. أظهرت النتائج أن القيم الغذائية لعينة R كانت 76.30، 2.00، 0.30، 0.30 و 13.97% للرطوبة، البروتين الخام، الرماد، مستخلص الأثير، ومحتوى الألياف الخام، على التوالي. أيضا كان إجمالي المحتوى الكلي من الفينولات ومحتوى الفيتامينات A و C في العينة R يساوى 38.46 مجم/GAE، 15.06 وحدة دولية/جم، 19.66 مجم/100 جم، على التوالي. كان هناك توازن لوني يحدث لكل من لون القشرة واللحم لجميع معاملات المخلل. أظهرت المعاملة الأولية للسلق سلوكا جيدا للصلابة في نهاية عملية التخليل. علاوة على ذلك، كان هناك إنخفاض في المحتوى الكلي للفينولات ومحتوى الفيتامينات A و C لجميع معاملات المخلل بالمقارنة مع المعاملة R. سجلت كل من المعاملات C و B أعلى محتوى كلي من الفينولات ونفس قيم الحموضة. أعلى قيمة لفيتامين A وجدت في المعاملة C متبوعة بمعاملة N و B بنفس القيمة، في حين وجد أن المعاملة C سجلت أعلى قيمة لفيتامين C تليها المعاملة B ثم المعاملة N. فيما يتعلق بالتقييم الحسي، أظهرت المعاملة B قبولاً عاماً ممتازاً.

**الكلمات المفتاحية:** المعالجة بالسلق، تين البريبا، عملية التخليل، الحموضة، الفينولات الكلية.