Quality Characteristics of Black Olive Paste with Natural Flavors "Dried Basil and Tomatoes"

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ABSTRACT

Commercial pickled black olives were prepared into paste after pitting, washing, grinding and natural flavors (Dried Basil and Tomatoes) were added each at 10% of paste. Flavored paste was filled in glass jars covered with olive oil and stored for 180days at room temperature. Olive paste samples were analyzed for physicochemical properties and sensory evaluation.PH values of the pastes were ranged 3.20 to 4.30.There were significant difference between olive paste without addition and olive paste with basil after 180days of storage, on other hand the olive paste with dried tomatoes had no significant difference after storage. HPLC results show differences of phenolic compounds between pastes. The processing and storage time increased the chromaticity coordinate L, a* and b* in the samples. Texture analysis showed significant difference only of olive paste with dried tomatoes.Sensory evaluation appeared some of differences of samples, the odor of olive paste with basil andappearance of olive paste with tomatoeshad a highly pleasant, but the olive paste without addition had ahighly pleasant of taste and overall acceptability.*

***Key words**: Olive paste, Dried Basil, Sun-Dried tomatoes.*

Introduction

The olive fruit (Olea-europaea L.) was a small, thinner-fleshed drupe that is 1-2.5 cm long and grows on a small tree, which belongs to the family Oleaceae. It is native to tropical and warm temperate regions of the world **(Aka et al, 2014)**.Olive was cultivated in various parts of the world and the Mediterranean region was accounted for 98% of global cultivation **(Ryan et al, 1998)**. The consumption of freshly harvested olive fruit was not common due to the presence of Oleuropein and bitterness **(Vinhaa et al., 2002)**. There were two ways for consumptions of olive fruit (Olea europaea), firstly named olive oil and secondary the table olives **(Khan et al, 2015)**.

The Mediterranean diet appeared to be associated with a reduced risk of several chronic diseases including cancer and cardiovascular and Alzheimer's diseases. Olive products (mainly olive oil and table olives) were important components of the Mediterranean diet where Olives contained a range of phenolic compounds and these natural antioxidants might contribute to the prevention of these chronic diseases. Consequently, the consumption of table olives and olive oil continued to increase worldwide by health-conscious consumers **(Charoenprasertand Mitchell, 2012)**.

Table olives are a complete food from a nutritional point of view. The energy value of 100 g of edible portion olives was around 200-250 kilocalories (**Lanza, 2012**). The protein content is low (1.0-2.2 g), but the nutritional quality is high because of the presence of essential amino acids (**Young, 1994**).

Table olives were a good source of dietary fibre, which in addition, had a high digestibility rate (**López-López et al., 2007**).The olive fruit was rich in phenolic compounds and there was a growing interest in this group due to their antioxidant activity and health benefits (**Ryan et al., 2002**). Olive pastes were very popular with consumers, particularly in Italy and France,

and were used to spread on dry biscuits or bread as appetizers or as condiments for pasta, fish or meat dishes. They could be made from most olive varieties.

Pastes were prepared from processed green-ripe (green paste) to fully black-ripe olives (black paste) as reported by **(Kailis and Harris,2007).**

Tomatoes and tomato products are the major source of dietary lycopene; the health benefits of lycopene are attributed to its ability to protect cells against oxidative damage **(Al-Shatwi,2010)**.

Basil has been planted as a popular culinary and medicinal herb from ancient time until now; it contains a wide range of phenolic compounds displaying various antioxidant activities (**Pripdeevech et al, 2010**).

The aim of this study was to develop new olive paste products using different natural flavors and study the quality characteristics during storage.

MATERIALS &METHODS

Materials:

- Pickled olives were purchased from commercial company were pitted, washed and blended (the blending time depends on the granularity of olives).
- Three different types of pastes were prepared First mixture: olive paste without addition, second mixture: olive paste with dried basil (10/100g olive) and third mixture was olive paste with sun- dried tomatoes (10 /100g olive).

The prepared mixtures and samples were packed in glass jars and covered with 15 ml of virgin olive oil. The pastes were pasteurized at Tunnel equipment 80°c/ 10 min andstored at room temperature for 180 days.

Methods

- **Chemical analysis**

PH Determination

The pH was determined by apH meter (HANA instrument).

DPPH radical scavenging activity:

Antioxidant activity was determined by measuring the radical scavenging effect of methanolic extracts of the olives paste by using the 2, 2dipheny l-1-picrylhydracyl (DPPH) as reported by (**Singh et al. 2002**). Five milliliters of a 0.1 mM methanol solution of DPPH were added to 0.1 mL of methanol extracts of samples of olive pastes inside glass tubes. The tubes were allowed to stand at 27 °C for 20 min. The decrease in absorbance at 517 nm was recorded using a spectrophotometerlaboratory instrument.

Radical scavenging activity was expressed as inhibition percentage and was calculated using the following formula: (**Aromatic et al., 2013**).

Inhibition %=([Acontrol – A sample] /Acontrol)×100

where A control = absorbance of the control reaction (containing all reagents except samples); A sample = absorbance of the test compound.

Determination of Phenolic compounds

Phenolic compounds of olive samples were determined by HPLC system according to the method of **(Goupy et al., 1999)** as follows: 5 g of each sample was mixed with methanol and centrifuged at 10000 rpm for 10 min and the supernatant was filtered through 0.2 µm Millipore membrane filter, 1-3 ml was then collected in a vial for injection into HPLC HewlletPackared (series 1050) equipped with auto sampling injector, and solvent degasser and Ultraviolet (UV) detector that set at 280 nm using quaternary HP pump (series 1100). The temperature of column wasmaintained at 35º C.

- ***Physical analysis***

Color determination

The color of the olive samples were measured by Chroma-meter(Konica Minolta CR 410, Japan). The colorimeter was calibrated against a standard calibration plate of a white surface and set to CIE Standard D65 Illuminant C. The L*, a*, b*

values were the averages of ten readings. The color brightness coordinate L* measured the whiteness value of sample color (range from black at 0 to white at 100).The chromaticity coordinate a* measured (red when positive and green when negative).

The chromaticity coordinate b*measured (yellow when positive and blue when negative) and C* was calculated as (a*2 + b*2)1/2 as reported by (**Romero et al, 2002)**.

Texture analysis

The texture was carried out using the Sher Force (Universal Testing Machine).The distance travelled by the probe was with 37.55 mm diameter, the test speed was 60 mm/s under room temperature as described by **Bourne (1978)**.

Sensory evaluation

For Sensory evaluation the panel test was performed to obtain the degree of acceptance for 10 judges who evaluated the samples using criteria described by **(Marsilio et al.,2008)**. The proof sheet contained a list of sensory descriptors (appearance, texture, odor, taste, and overall acceptability), A testing chart was used 5 points, [1] representing highly unpleasant and [5] representing highly pleasant was used.

Statistical analysis

Data were analyzed using IBM SPSS software package version 20. Significance of the obtained results was judged at the 5% level. F-test ANOVA was used , Also Post Hoc test Tukey was used for pair wise comparisons (**Kotz et al., 2006**).

Results& Discussions

PH value is an important parameter for technological and safety terms. According to the codex standard of table olive, the PH value of pasteurized black olives should be less than 4.3. In this study the initial PH value of natural black olives was 4.20, after washing,blending and pasteurization the value decreased to 3.82.

PH values were ranged from 3.52 to 4.27 for all types during the 180 days of storage as shown in table (1). No significant difference was observed between the different treatments of black pastes.

Independently of the shelf life of the food product, consider to be safe if the PH does not exceed 4.5, Food with pH values greater than 4.5 are prone to spoilage due to the growth of bacterial spores **(Kailis and Harris, 2007)**. In the new olives products of this study olive paste without addition, olive paste containing 10% dried basil and olive paste containing 10% sun dried tomatoes the PH value was less than 4.3 which considered safe for human consumption.

Phenolic compounds are responsible for several important olive fruit characteristics: bitterness and browning. Their levels ranged from 1 to 3 %, of the weight of the fresh pulp **(Garrido et al, 1997).** The HPLC results in table (2) showed great differences between natural black olives and pastes. These changes could be due to the pasteurization process at 80^{o}C in addition, sun dried tomato and basil may also affect the phenolic content.

The phenolic acids that predominate in olive fruit include caffeic acid, chlorogenic acids (ferulic, vanillic, and coumaric) were clearly identified by HPLC analysis (table 2), the results are in agreement with others **(Pereira et al., 2006).**

Pyrogallol content was reduced to 48%, while the Oleuropein did not almost change in natural olive and olive paste without any addition. The Oleuropein range between 584.62-251.94 ppm as shown in table (2), Oleuropein is generally the most prominent phenolic compound in olive cultivars and it is an ester consisting of hydroxytyrosol and elenolic acid (**Charoenprasert and Mitchell, 2012**).

The olive paste with basil had the highest amount of Vanillic acid, cinnamic and Ellagic acid (compared to the other types) this result was in agreement with (**Javanmardi et al, 2002**) who

reported that the vanillic acid concentration of basil was in the range of 90-100 mg/g. Ellagic acid is an important compound that exerts potent preventive and therapeutic effects against several types of cancers as mentioned by (**Zhang, 2014**).

The antiradical activity (DPPH %) is used to maintain information on the radical scavenging activity. DPPH% of olive paste was from 79.75% to 59.13%, as shown in table (3). All examined olive pastes showed antioxidant capacity, due to total phenolic contents and their antioxidant capacity seems to be widely influenced by the anthocyanin concentration in the pigmented black olives.

Compounds such as pyrogallol, Gallic acid and oleuropein have been reported to possess antioxidant properties as well as anti- inflammatory activities (**Manpong et al. 2009 and Nicolis et al. 2008**), these compounds had been observed in all three types of pastes (table 3).

The results show no significant differences between the different treatments in DPPH% in zero time, but during storage(180 days) under room temperature, significant differences were found between samples due to storage except olive paste containg sun dried tomatoes. It decreases but the highest decreases were found in olive paste containing basil. Olive paste with sun-dried tomatoes shows the highest antioxidant activity, which confirms the findings of (**AL-Shtawi et al , 2010**) that tomatoes contain lycopene and vitamin (C) stable active antioxidants.

Table (4) showed the color parameters L*, a*, b* values. There were significant different between natural olives and olive pastes. L*value in all samples revealed a low brightness, that is an indication of the presence of anthocyanin pigment which is responsible of dark color in the olive. The surface color became brighter due to pasteurization at 80^{o} C. The stability of anthocyanins and all pigments decreased with increases in

temperature which is mainly the reason for bright. The values were significantly different from each other at 0 day of storage.

Color parameters had slightly increased after 180 days of storage that may be due to changes in anthocyanins(**Mazza,1995**)reporte d that anthocyanin molecules areunstable and highly susceptible to degradation during storage. However the chromaticity coordinate L*, a* and b* were increased in the three samples, and no significant differences were found.

Texture is an important attribute of food, largely determining its organoleptic quality (**Peleg, 1987**). Consumers products succeed in the marketplace in part because of their "textural characteristics" are pleasing customers (**Aguilera and Stanley, 1999**). However, texture integrates a set of mechanical, geometric and surface properties detectable by mechanical, tactile, visual and auditory receptors (**Szczesniak, 2002**).

Table (5) Shows results of olive paste types, hardness that defined as force required compressing a food between the molars, hardness value in the three types of black olive pastes were ranged between 2.15-2.45 N.S as shown in table (5).

Moreover, olives paste having sun- dried tomato showed maximal values of adhesiveness 0.70 N.S which defined as the maximum force required separating teeth after biting sample from other types .The consumer might or might not like the chewing of added dried tomatoes to the olive paste.

The cohesiveness was between 0.49 to 0.58.On other hand these results are completely different from (**Alvarenga et al , 2012**) their results showed lower values of hardness ranging from 0.62 to 0.36,adhesiveness from1.63 to 2.66 and cohesiveness was higher than 1.27, the results were due to the addition of a fatty substances.

The sensory evaluation of black olive pastes are given in Figure1.The taste, odor,appearance, and overall acceptability attributes show significant differences between the samples,the appearance was between 4.32 to 3.86, the taste was 4.84 in olive paste without addition , 4.5 in olive paste contains basil and 3.5 in olive paste with sun-dried tomatoes. The odor of the olive paste with basil was the best, which could be due to vanillic component.

CONCLUSIONS

There is a big market for olives not only in the Middle East but in Europe and other parts of the world, Consumers are more interested in pitted table olive either black or green whole olives because it's easier to use so introducing new flavors within easy to use paste could increase a market share of olive products.

Black olive paste with sun dried tomatoes and basil considered as a new products, that are; safe, nutritious, easy to use and can supply polyphenolic and antioxidant compounds which are important for human health.

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Table 1: Comparison between PH values of olive paste during storage at room temperature:

Storage time (Days)	Pickled olive	PH		
		S1	S2	S3
0	$4.20^{a}\pm$ 0.11	$3.82^{a}\pm$ 0.24	$4.04^{a}\pm$ 0.19	$3.52^{a}\pm$ 0.19
45	———	$4.03^{a}\pm$ 0.36	$4.17^{a}\pm$ 0.30	3.76^{a} ± 0.33
90		$4.27^{a}\pm$ 0.20	$4.20^{a}\pm$ 0.44	$3.90^{a}\pm$ 0.37
135		$3.73^{a}\pm$ 0.46	$4.09^{a}\pm$ 0.33	$3.81^{a}\pm$ 0.27
180		$3.87^{a}\pm$ 0.15	3.97^{a} ± 0.24	$3.83^{a}\pm$ 0.38

S1; black olive paste; S2: Black olive paste with 10% dried basil; S3: Black olive paste with 10% sun-dried tomatoes. Data was expressed by using mean ± SD.

Table2: Phenolic compounds of the different samples

phenolic compounds	Pickled olive	S1	S2	S3
Pyrogallol	1137.61	552.57	104.96	75.45
Protocatchuic	151.29	60.62	17.65	16.4
catechein	632.04	195.26	121.96	36.64
chlorogenic	101.85	116.61	154.75	219.5
catechol	325.59	159.5	69.71	78.36
caffeine	79.53	51.72	14.52	9.72
Caffeic	42.96	32.72	27.3	19.7
Vanillic	58.87	26.17	104.91	30.32
P-coumaric	57.61	15.79	10.09	6.3
Ferulic	92.07	78.98	57.76	36.11
Iso-Ferulic	7.26	8.28	21.17	12.42
Oleuropin	584.62	550.05	423.52	251.94
Ellagic	99.95	68.77	205.87	151.06
Coumarin	28.21	33.14	14.94	ND
Salycilic	128.84	66.25	ND	ND
Cinnamic	3.95	6.51	12.28	2.53

S1; black olive paste; S2: Black olive paste with 10% dried basil; S3: Black olive paste with 10% sun-dried tomatoes. ND: Not detected

Table 3: Radical scavenging activity of olive paste during storage at room temperature

Storage time (Days)		DPPH%		
	Pickled olive	S1	S2	S3
0	84.37 ^{a} ±13.06	79.75^{a}± 10.62	74.22^{a} ±8.79	72.20^{a} ±8.20
45	——	57.40^{b} ±3.69	58.96^{b}± 4.57	57.94^{b}± 3.26
90		55.41^{b}± 2.12	61.94^{ab} ±4.07	59.91^{ab} ±3.54
135		51.33^{b} ±3.53	50.36^{b}± 3.83	49.33^{b}± 2.73
180		59.13^{b}± 4.29	53.26^{b}± 1.68	60.19^{ab}± 3.53

DPPH value: Inhibition %=([A control – A sample] /A control) ×100

S1; black olive paste; S2: Black olive paste with 10% dried basil; S3: Black olive paste with 10% sun-dried tomatoes. Data was expressed by using mean ± SD.

Table 4: Color parameters of olive paste before and after storage 180 days at room temperature

Color	Pickled olive	S1	S2	S3
Initial				
L*	$23.86^{c}\pm$ 0.04	$30.02^{b}\pm$ 0.15	$30.02^{b}\pm$ 0.15	$31.34^{a}\pm$ 0.45
a*	$9.92^{b}\pm$ 0.15	$10.94^{a}\pm$ 0.09	$10.94^{a}\pm$ 0.09	6.15^{c} $\pm$ 0.05
b*	-0.15^{b} $\pm$ 0.06	-0.19^{b} $\pm$ 0.0	$-0.19^{b}\pm$ 0.0	$1.62^{a}\pm$ 0.0
C	9.92^{a} $\pm$ 0.15	$10.63^{a}\pm$ 0.48	$10.63^{a}\pm$ 0.48	$6.36^{b}\pm$ 0.04
Final				
L*	–	32.25^{a} $\pm$ 0.70	$32.25^{a}\pm$ 0.70	$32.03^{a}\pm$ 0.27
a*	–	$11.86^{a}\pm$ 2.46	$11.86^{a}\pm$ 2.46	$11.87^{a}\pm$ 2.40
b*	–	$4.08^{a}\pm$ 2.20	$4.08^{a}\pm$ 2.20	$4.05^{a}\pm$ 2.16
C	–	$12.66^{a}\pm$ 2.54	$12.66^{a}\pm$ 2.54	$12.64^{a}\pm$ 2.45

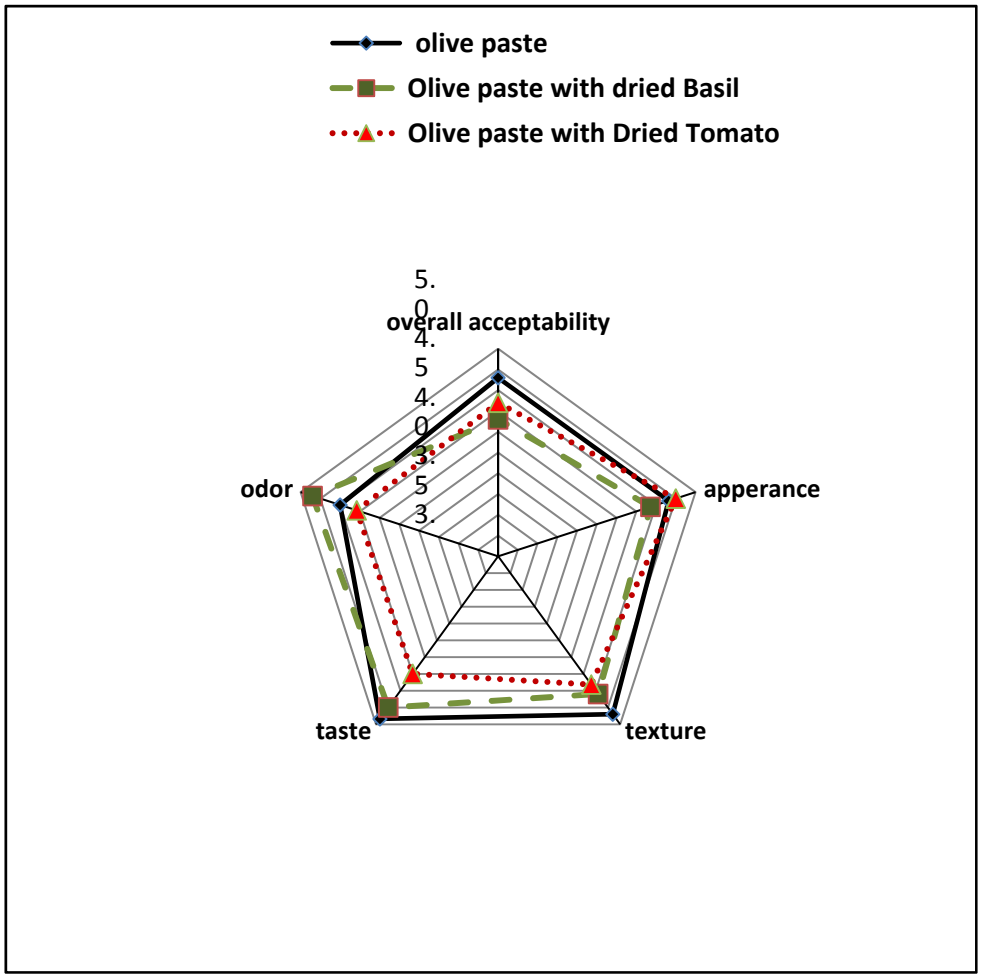
S1; black olive paste; S2: Black olive paste with 10% dried basil; S3: Black*olive paste with 10% sun-dried tomatoes. Data was expressed by using mean ± SD.*

Table 5: Texture values of olive pastes at 0 day of storage

	Texture		
	S1	**S2**	**S3**
Hardness (N.S)	2.15^{a} ± 0.63	2.20^{a}± 0.30	2.45^{a}± 0.18
Adhesive force (N.S)	-1.0^{b} ± 0.26	-0.80^{b}± 0.26	0.70^{a}± 0.11
Cohesiveness (Ratio)	0.50^{a}± 0.10	0.58^{a}± 0.14	0.49^{a}± 0.15

S1; black olive paste; S2: Black olive paste with 10% dried basil; S3: Black olive paste with 10% sun-dried tomatoes. Data was expressed by using mean ± SD.

Figure 1: Sensory evaluation of different black olive pastes



A testing chart using 5 points; where being 5 indicates, 1 indicates highly unpleasant and 5 highly pleasant, respectively.

خصائص الجودة لعجينة الزيتون الأسود المخلوطة بمنكهات طبيعية"الريحان والطماطم المجففة"

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الملخص العربي

*تم تحضير معجون الزيتون الأسود من الزيتون المخلل الطبيعى والذى تم تحضيرة داخل المعمل عن طريق أزالة البذرة والغسيل والفرم وأضافة النكهات الطبيعية (الريحان والطماطم المجففة) وتم إضافة كل منهما بنسبة 10٪ من المعجون، تم تعبئة المعجون في عبوات زجاجية مغطاة بزيت الزيتون ثم تحليلها من حيث الخصائص الفيزيائية والكيميائية والحسية والتخزين لمدة 180 يوما في درجة حرارة الغرفة وتراوحت درجة الحموضة من 2و3الى3و4.**النتائج**: أشارت النتائج إلى وجود فروق معنوية في قيم المركبات الفينولية بين معجون الزيتون بدون ومع المنكهات.وكان هناك فرق معنوي فى درجة نشاط مضادات الأكسدة بين عجينة الزيتون بدون إضافة ومعجون الزيتون بالريحان خلال 180 يوما من التخزين ، من ناحية أخرى لم يكن هناك فرقا معنوياً فى معجون الزيتون بالطماطم المجففة بعد التخزين، وكانت هناك فروق معنوية واضحة فى محتوى اللون والقوام والتقييم الحسى بين العينات الثلاث.*

***الكلمات المفتاحية** :معجون الزيتون الأسود ــ الريحان الجاف ـ الطماطم المجففةً*