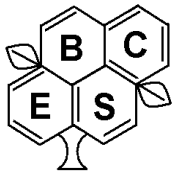

Journal

EFFECT OF DIFFERENT CONCENTRATIONS OF SALT ON CHEMICAL COMPOSITION OF TABLE OLIVES DURING FERMENTATION

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ABSTRACT

Table olives, as a manufactured food must be produced using appropriate, environmental acceptable technologies under safe conditions for consumers and workers. Three different varieties of table olives (Picual, Sennara, and Egizi Axi) were used for changes in their chemical composition during processing. The salt concentration in brine solution was found to be the most important factor for producing table olives. Other factors are the affected, chemical composition is the variety and degree of acidity in brine solution during fermentation. Thus, the traditional fermentation of green table olives could be effected by using different concentrations of salt being (zero, 4, 8, and 12%). chemical composition (Moisture, Protein, Fat, Ash , and Fiber contents) were determined , and . combined, the free acidity .These results were the respective responses to the treatments. Changes in pH value, were very similar for all treatments. Values of pH value decreased rapidly during the first 10 days. Salt concentration had the strongest effect .This effect was negative, as the low level of NaCL (Zero- and 4%, w/v) produced the highest titratable acidity. And when using a 6% NaCL, inoculation had no effect on the final titratable acidity. Fatty acid components of olive oils were analyzed by GlC before and after pickling.

Key wards: Table olive –Chemical composition- salt concentration - pickling

INTRODUCTION

Table olives (From olive tree *Olea Europoea L.)* are a traditional product one of the most important components of the Mediterranean diet. They are well known sources of phenolic compounds having important biological Properties **(**Basko, and Visioli, 2003**).**

According to statical data from Food Agriculture Organization FAO 1995, World production of table olives, mainly concentrated in the Mediterranean region, is increasing and amounted for (1,426,000 t) during the year (2001-2002) . Meanwhile, Egyptian production of olive is increased from 41 thousands tons in 1989 to 281 thousand tons in 2002 because of the great reclaimed areas of vast deserts which have been turned into green land and cultivated with olives .The Production of table olives for (2001-2002)reached about (1,456,000) tons , with world consumption of about the same amount (1.18 million tons).Around 70% of the world' s table olives are consumed by the populations living around the Mediterranean Sea and Middle Eastern countries (Anon,2000 and IOOC, 2000).

The olive fruits ,and oils well as the leaves of the olive tree have a myriad of medicinal and other uses .Primarily, olives are used for their oil or as table olives and are considered as important part of the Mediterranean diet .Because of their organoleptic characteristics, olive require processing prior to consumption(Romero *et,al.*,2004*)* .In both fruits and oil, the phenolics constitute a complex mixture, although there are some notable differences in composition between them being attributed to a series of chemical or enzymatic alterations of some phenols during oil extraction. These modifications include hydrolysis of glycosides by glycosidase (Angerosa et *al.,* 1996). oxidation of phenolic compounds by polyphone oxidizes and the polymerization of free phenols(Ryan *et al*., 1999**)** .

The natural bitterness of the fruits can be eliminated, or at least reduced, by processing to make the product acceptable for human consumption the brain may be acidified to PH value 4 with lactic and acetic acids then kept in anaerobic\aerobic conditions to prevent fermentation. To improve texture, calcium chloride could be added during this period. Fruits Pickling is one of the preservation methods applied to vegetables and fruits. Preservation is achieved by the combined effect of salt and organic acids formed through the activity of lactic acid bacteria. The growth and activity of such bacteria is

enhanced by the presence of some undesirable spoilage microorganisms (Georget *et al.,* 2003). At the beginning of pickling, the added salt causes the diffusion of juices from the raw vegetables or fruits. These juices contain minerals, nitrogen and sugars needed for the activity of normal flora, mainly the lactic acid bacteria which produce organic acids, leading to desirable changes in taste, aroma and texture. (Garrido Fernandez, *et al*, 1997).

The fruit firmness and biophenol content decreases during ripening and processing where as the triglycerol content increases. Phenolic substances are common to many plants and have evolved as an antioxidant defense to environmental stress resulting from a variety of oxidizing and potentially harmful free radicals. These antioxidant components in olives are also responsible for the stability of olive oil (Visiol *et al.,* 2004).Olive selected for consumption, supposed to oil production, are pickled green and unripe. However, the fruit cannot be consumed being unless further prepared and or processed. Preparation of edible olives involves pickling in a solution of lye to remove the bitter taste(rendered by *Oleuropein)*, and this practice has been in use since roman times .The traditional way of processing olives, which is still a standard practice, involves three steps: blanching ,salting and drying of mature olives The salt concentration in brines was found to be the most important factor for producing the highest acidity .

The aim of this work was to find the best initial conditions of brines to ensure the highest lactic acid formation and to study the physico –chemical profile of table olives and evaluation of changes on physico-chemical parameters during processing with using different concentration of salt

MATERIALS AND METHODS

material; Green table olive fruits of (Picual, Sennara ,and Egizi Axi) cultivars were obtained from olive trees planted in reclaimed land in the desert road (Cairo- Alx) Season 2006-2007).

Samples preparation:

Size of fruits /kg

Specific weight of each cultivation was determined according to A O C S (1989). By immersing, a specific weight of fruits in a specific unit volume of water and the specific weight were expressed as weight /unit volume.

(25 fruits) in graduated in a jar filled with water and the average volume per fruit was calculated.

Processing

The olives were washed with tap water to remove dust, placed in glass containers and brined with freshly prepared and sterile 7% (w/w) sodium chloride solution. Corrections of the concentration of sodium chloride were made at 5, 10, 15, 20, 30, 45, 60, days and afterwards at monthly intervals.

The tradition Spanish-style green olive brining procedure was followed (Garrido Feranadez *et al*., 1995).Green olives were treated for 6h in a NaOH solution 2% NaOH, w/v) to reach 2/3 of the flesh, Phenolphthalein was used as indicator to indicate the end of lye treatment. Washing the treated fruits several times by tap water to eliminate the reduce of lye in flesh.

Glass jars were filled with olives and the foom plate was put above olive fruits. Addition of the brine and paraffin oil to cover the brine. During the period of active fermentation, salt concentration was maintained at the levels fixed in the experimental design by periodical additions.

Evaluation of Chemical properties were determined as follows:

1- Moisture content: was determined according to the A O A C (1990).

2- Lipid content of fresh fruits was extracted using the chloroform /methanol 2:1 according to Folch method (A O C S 1989) .

3- Crude protein was determined according to (A O A C,1990) and Calculated by multiplying the total nitrogen by a factor of 6.25.

4- Reducing Sugar, were determined according to the Lane Eynon method as described by Fernandez Diez., (1990).

5- Determination of ash press was carried out in a muffle furnace by heating at 550C ^{o} until a constant weight was obtained (A O A C ,1990).

6- Determination of fiber : was determined according to the A O A C 1990).

7- The pH value: of olive fruits were measured with an orion model 901 pH meter.

Chromatographic analysis

Gas liquid chromatography was applied to identify the fatty acids components in olive oils:

Sample preparation for GLC analysis: Olive extraction was carried out by petroleum ether in Soxhlet.

The method recommended by A O A C (1990) was used for the preparation of fatty acid methyl esters. Approximate amount of 0.5g of oil samples were saponified with ethanolic potassium hydroxide. Solution (1N) for 2hours under reflux in boiling water bath. Ethanol was evaporated. The potassium salt of fatty acids and unsaponifiable matter were transferred quantitatively into separatory funnel using distilled water and diethyl- ether.

RESULTS AND DISCUSSION

The characteristics of each type of table olives are presented in Table (1). The percentage of flesh in table olives varies between 76% and 82% and for pit between 18% and 24%. The highest flesh/ pit ratio appeared in Egizi Axi type, 7:1 while the lower ratio in Sennara types 4:1. The Picual type showed similar flesh/ratios.

Table (1) Size (Cm^3) and Weight of different used olive varieties

Olive varieties	Size(Cm^3)	Weight
Picual	286	3.55
Sennara	217.4	3.41
Egizi Axi	370	4.75

Chemical Composition of the three different varieties of fresh olive fruits was studied, and the obtained results are shown in table (2).

Table (2) Chemical Composition of different fresh olive fruits

Olive cultivars / Constituents%	Picual	Sennara	Egizi Axi
Moisture	61.30	55.31	60.14
Fats	26.02	8.22	10.35
Crude protein	1.34	3.41	1.61
Ash	2.0	3.20	4.12
Fiber	2.12	3.23	3.63
Reducing sugar	4.37	4.62	4.20
Total sugars	6.44	5.61	7.85

The data of table (2) showed that Picual type contains the greatest percentage of fat in flesh as compared to the other flesh types . The percentage of moisture in pulp varies between 61.30 and 55.31% .Picual cultivar contains the highest percentage of moisture in pulp while sennara contains the lowest percentage. The other types Sennara and Egizi Axi had (55.31 and 60.14%) moisture content, respectively . Data also reveal that all cultivars had low crude protein contents which varied from 3.41% for Sennara cultivar to 1.34, and 1.61% for picual and Egizi Axi cultivar respectively . The lowest Ash content 2% was recorded in Picual cultivar, while Egizi Axi cultivar showed the highest content of ash (4.12%) . Egizi Axi cultivar had concerning crude fiber content the same data showed the highest content of fiber (3.63)%. However Picual cultivar had the lowest fiber content (2.1%) and Sennara had (3.23%). In general, reducing sugars are slightly varied among all cultivar Egizi Axi showed the lowest sugars content (4.2%), while Sennara cultivar had the highest contents were (4.62%).These results are in agreement with . (Sanchez Gomez and Fernandez Diez 1994).

Fermentation on pickled olives:

The three different varieties of table olives (Picual, Sennara, and Egizi Axi) were investigated for the changes of their chemical during Fermentation and the effect of use different concentrations of Sodium chloride. The obtained results are shown in table (3). Moisture content

of the final product is considered the important factor which cause improvement of firmness and other sensory properties. The moisture content of the fresh pickled olives (with different salt concentrations., (zero, 4%, 8%, and 12%)was and followed up during pickling periods and the obtained data are shown in table (3).These results indicated that moisture contents of three varieties were 61.30, 55.31%, and 60.14% in fresh fruits of picual, Sennara, and Egizi Axi, cultivars respectively. In general moisture content of the three varieties tended to increase gradually ranged (61.30 - 55.13%) during pickling period. The highest increase in moisture content was detected in picual cultivar after 90 days of pickling (65.83%) at zero concentration of sodium chloride. The lowest increase in moisture content (59.11%) was noticed in sennara cultivar Fermented without salt for 90 days. On contraries, the moisture content of sennara cultivar fermented in 4% salt for 90 days showed detectable decrement. During the storage period of (90 day), The results indicated that moisture content decreased sharply in all different sodium chloride concentrations .From the same table ,the results confirmed that moisture content began to be stable at the pickling periods of 45, 60, and 90, days in all varieties picual, Sennara, and Egizi Axi in all different sodium chloride concentrations .Generally the noticed increasing in moisture content during the all pickling periods agreed with those reported by Panagou *et al*.,(2003).They stated that both salt and water diffuse from the zone of higher concentration to the lower one , and the water concentration being less in a concentrated solution than in a diluted one (osmotic equilibrium). They also mentioned that the diffusion is continuous until the concentration of the diffusing substance became uniform.

Table(3) shows that moisture content of all varieties increased after pickling in all treatments .This increase in moisture content is in agreement with the data reported by (Panagou et al., 2003). They found that moisture content increased after pickling . On the other hand , moisture content after storage period of all varieties was high after pickling .The increase in moisture content could be attributed to the decrease in total soluble solids during the fermentation period in the all varieties .Besides the penetration of water inside the pickled olives is due to osmosis (Abd-Elwahed 1980).

Table (3) Effect of Salt Concentration on Moisture content (%) of different cultivars during fermentation.

Salt Concentrations %	Zero			4%			8%			12%		
Cultivars / Periods Fermentation (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	61.30	55.31	60.14	61.31	55.31	60.14	61.30	55.31	60.14	61.30	55.31	60.14
15	61.64	55.99	61.09	61.50	55.02	60.22	62.22	56.08	61.63	62.01	55.30	60.42
30	62.33	56.72	62.32	62.18	55.22	62.10	63.00	56.13	62.58	62.94	56.27	61.00
45	63.16	57.60	63.60	63.43	54.55	63.15	63.21	57.65	63.27	63.01	57.65	62.69
60	64.02	58.32	64.10	63.52	62.83	64.04	64.00	58.42	63.33	64.72	58.44	63.45
90	65.83	59.11	64.34	64.00	52.21	64.12	64.50	59.37	64.36	64.95	59.88	64.83

Varsities:
Picual=P
Sennara=S
Egizi Axi=E

Change in Oil Content during fermentation of pickled olives:

The results of oil extracted from pickled olive fruits during different storage periods (pickling) are indicated in Table (4).It can be observed that the total Fats content decreased with the increasing of sodium chloride concentration and the pickling periods of the fruits. It is clear also that oil content decreased slightly along storage periods, where it was 26.02% in fresh fruits in Picual variety and reached to 23.86 after 90 days at zero concentration of NaCL. When the salt concentration of salt solution was increased to 12% the fat content decreased slightly. Where it was 26.02% in fresh fruits and reached to 21.12% after 90 days. Also sennara variety the total fat content (8.22)was decreased with the increasing of sodium chloride concentration and pickling periods of the fruits it is clear also that after 90 days oil content (8.22)reached to (7.0) at zero concentration,

at 4% sodium chloride concentration the oil content decrease to 7.01%.

When the concentration of salt was 8% the oil content decreased to 6.42%. But the concentration of NaCl was 12%, the oil content at Sennara variety reached to 6.50%. The Egizi Axi content oil (9.35) at zero concentration of sodium chloride which decreased to 8.06), 8, 7.20, and 6.76 at the 4 different salt concentration as zero, 4%, 8%, and 12% after 90 days respectively. These results agree with those obtained by Enrico (1966), who found that the oil content decreased after pickling. Probably, this slight decreasing in oil content might be due to its hydrolysis and utilized by micro-organisms. So these results confirmed that the pickling process as storage method did not effect on the oil content of olive fruits.

Table (4) Effect of salt concentration on Fat content % of different olive cultivars during fermentation, on dry wet basis.

Salt Concentration %	Zero			4%			8%			12%		
Cultivars / Fermentation Time (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	26.02	8.22	9.35	26.0	8.22	9.35	26.02	8.22	9.35	26.02	8.22	9.35
15	25.82	8.12	9.14	25.66	8.10	9.12	25.41	8.00	9.00	25.91	7.25	8.92
30	25.54	7.92	9.02	25.21	8.00	9.00	24.42	7.93	8.86	24.01	6.93	8.67
45	25.14	7.80	8.96	24.90	7.82	8.24	24.04	7.64	8.12	23.78	6.79	8.01
60	24.05	7.43	8.34	24.43	7.73	8.11	23.92	7.01	7.75	22.00	6.99	7.00
90	23.86	7.00	8.06	23.49	7.01	8 .0	22.75	6.42	7.20	21.12	6.50	6.76

Varieties:
P-Picual
S-Sennara
E-Egizi Sham

Changes in Protein content during fermentation of pickled olives:

From the data in table (5) it could be noticed that protein content of fresh olive fruits varieties Picual, Sennara , and Egizi Axi were 1.34 , 4.41 , and 1.61,(g/100g. dry weight), respectively. This ratio decreased gradually until reaching to 1.0, 1.48 and 0.73% at zero

concentration of salt from picual, sennara, and Egizi Axi varieties respectively after 90 days when sodium concentration was 4% was used of the three varieties the protein reached 1.10, 3.00 and 0.80 .respectively after 90 days .The contents of protein contents decreased in all varieties after 90 days .This content decreased gradually until reaching to 1, 1.73% and 0.64% respectively in the three pickled olive fruits, respectively at the 8% concentration of sodium chloride and storage for 90 day . The rate of the decrement in protein content during pickling periods was noticed to be lower when 12% concentration of sodium chloride was used in comparison with the other three concentrations, since the protein content decreased after 90 day to 0.85, 2.22, and 0.55% respectively in variety picual , sennara , and egizi axi respectively . Generally this decreasing of protein may be attributed to the loss of soluble protein by diffusion from fruits to the brine. Morever , the loss in total protein, could also be attributed to the activity of proteolytic enzymes secretive by the microorganisms. These results are in agreement with those reported by Manouas *et al*.,(1973).

Table (5) Effect of Salt concentration on Protein content% of different olive cultivars during fermentation (on dry wt. basis)

Salt Concentration %	Zero			4%			8%			12%		
Cultivars / Fermentation Time (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	1.34	4.41	1.61	1.34	4.41	1.16	1.43	4.14	1.66	1.34	4.14	1.61
15	1.12	4.00	1.21	1.28	4.10	1.28	1.35	3.84	1.10	1.26	3.76	1.00
30	1.11	3.95	1.11	1.21	3.50	1.00	1.26	3.62	1.00	1.24	3.34	0.92
45	1.6	2.48	1.00	1.21	3.23	. 92	1.09	3.20	0.94	1.11	2.84	0.90
60	102	2.43	.0.9	1.08	3.12	0.85	1.02	2.18	0.77	0.99	2.39	0.82
90	1.0	1.48	0.8	1.1	3.00	.80	1.00	1.73	0.64	0.85	2.22	0.65

Varieties:
P-Picual
S-Sennara
E-Egizi Sham

Changes in Ash content during fermentation of pickled olives:

Ash contents of fresh olive fruits were 2.12, 2.23, and 3.63 on dry weight/ basis), on the three varieties: picual, sennara and egizi axi, respectively as shown in table (6). From the same table, it could be shown that a slight increase in ash content occurred with using 4%, 8% and 12%, sodium chloride concentrations with the three varieties, respectively. Generally it could an be noticed that the highest ash content of fresh fruit content 3.63%, was noticed in Egizi Axi variety, while the lowest content 2.12% was in picual fresh fruits which increased to 2.62% after pickling period of 90 day in 12 % sodium chloride concentration. This increase may be related to the excess of sodium element content with increasing of sodium chloride concentration during pickling periods.

Table (6) Effect of sodium chloride concentration on Ash content (%) of different olive cultivars during pickling process (on dry wt basis).

Salt Concentration %	Zero			4%			8%			12%		
Cultivars / Fermentation Time (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	2.12	2.23	3.63	2.12	2.23	3.63	2.12	3.23	3.63	2.12	3.23	3.63
15	2.4	1.85	3.22	2.70	2.00	3.36	2.60	3.15	3.25	2.01	3.03	3.28
30	2.2	1.76	3.14	2.00	1.82	3.18	2.00	3.00	3.16	1.88	2.92	3.07
45	1.98	1.72	3.00	1.91	1.76	3.00	1.86	2.86	3.00	1.72	2.65	2.81
60	1.80	1.54	3.56	1.72	1.84	2.84	1.71	2.28	2.76	1.51	2.34	2.12
90	2.12	2.23	3.63	2.12	2.23	3.63	2.12	3.23	3.63	2.12	3.23	3.63

Varieties:
P-Picual
S-Sennara
E-Egizi Sham

Changes in crude Fibers during fermentation of pickled olives:

Table (7) indicates that crude fibers of fresh olive fruits was 2.0, in picual variety and reached to 2.69 in pickled samples using 8% sodium chloride after 90 days. From these results, it is quite clear that crude fibers of fresh olive fruits was 3.20 in Sennara variety and increased to 3.66 in pickled samples using 12% sodium chloride after 90 days. From these results, it is quite clear that crude fibers of olive fruits are considered approximately stable, during the pickling periods. Crude fibers were affected by using the concentration of 8% sodium chloride more than the others, for all periods. It means that losses of crude fibers are higher in diluted solution of sodium chloride than the concentrated. The slight decrease in the content of crude fibers between the highest and lowest value is about 2.0% .This decrease may be due to the consumption of some fibers by some bacteria during the fermentation process.

Table (7) Effect of salt concentration on Fibers content% of different olive cultivars during fermentation:

Salt Concentration %	Zero			4%			8%			12%		
Cultivars / Fermentation Time (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	2.o	3.20	4.12	2.0	3.20	4.12	2.0	3.20	4.12	2.0	3.20	4.12
15	2.21	3.20	4.12	2.32	3.29	4.15	2.41	3.24	4.16	2.44	3.23	4.17
30	2.26	3.22	4.16	2.48	3.29	4.18	2.49	3.24	4.12	2.49	3.26	4.20
45	2.38	3.43	4.18	2.49	3.50	2.20	2.54	3.60	4.22	2.58	3.53	4.23
60	2.46	3.43	4.20	2.52	3.50	4.25	2.58	3.60	4.25	2.59	3.54	4.26
90	2.64	3.68	4.25	2.68	3.70	4.26	2.73	3.66	4.22	2.69	3.66	4.30

Varieties:
P-Picual
S-Sennara
E-Egizi Sham

Changes in Reducing Sugars content during fermentation of pickled olives:

Reducing sugars pass to the brine, and they are used by the microorganism. The most desired transformation is the formation of lactic acid. The yield, however, depends upon the microbial population and the type of lactic acid bacteria. The sugar content of olive fruits is extremely important. Since it represents the fermentable material used by lactic acid bacteria for producing lactic acid which is responsible to great extent for acceptability of the pickled product (soliman, 1981). As shown in table (8) it could be observed that the effect of fermentation period on the reduced sugars in brines of pickled olives.

Results revealed that all brines contained no reducing sugar at the beginning of fermentation process. After 30 days of fermentation the reducing sugars reached the maximum with all treatments once complete consumption of mannitol, malic and citric acid had occurred (Garrido Fernandez *et al*., 1997). By that time, 90 % of glucose and 93% of fructose had been used by microorganisms. Along storage periods, sugars in pickled olive fruits different varieties decreased gradually till reached to zero level after 45 days losses of sugars in pickled fruits were deleted in brine solution as proved by the preliminary qualitative analysis. (A O A C.,1990).The present results are in agreement with that obtained by Wafaa(1980).Who confirmed that reducing sugars were zero% after 84 days of pickling. From the same table the results indicated that the highest decrease for total sugars was recorded in pickled olive fruits in the 12% salt concentration after 30 days of fermentation periods. The reducing sugar content of fresh fruit were 4.37, and 4.62 in Picual and Sennara varieties respectively. Moreover, the reducing sugar in Egizi Axi (4.2) The reducing sugar in pickled olives decreased at the end of fermentation time(10 months)in all varieties the reducing sugar decreased as the fermentation period continued up to90 day.

Table (8): Effect of salt concentrations on reducing sugars content % of different olive cultivar during fermentation of olive fruits on dry weight basis.

Salt Concentration %	Zero			4%			8%			12%		
Cultivars / Fermentation Time (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	4.37	4.62	4.20	4.37	4.62	4.20	4.37	4.62	4.20	4.37	4.62	4.20
15	4.02	4.06	3.72	4.00	4.32	4.00	4.00	4.21	4.00	3.20	4.10	4.00
30	3.81	3.72	2.20	2.82	3.21	3.91	3.42	3.12	3.91	2.60	3.20	3.02
45	0.18	0.21	0.68	0.89	0.27	0.64	0.30	1.80	0.70	.0.11	0.50	0.20
60	.06	0.o8	0.30	0.06	0.01	0.03	0.06	1.45	0.30	1.00	0.11	0.40
90	0.08	0.09	0.02	---	--	--	---	---	-	---	--	--

Varieties:
P-Picual
S-Sennara
E-Egizi Sham

The result also indicated that the highest decrease for total soluble sugars was recorded in pickled olive fruits in 12% sodium chloride after 60 days while the lowest level was in pickled olive fruits in 8% sodium chloride for the same period, which represent 1.06 and 1.45 on the Picual, and Sennara, respectively. The same trends was observed for reducing sugars obtained after 60 days using 12% sodium chloride, while the lowest one (1.0) was found by using 8% sodium chloride for the same period.

Changes In pH values during fermentation of olive fruits :

Changes in pH value, expect for the initial value were very similar for all treatments of NaCL different concentration show the effect of lye concentration and time of storage during fermentation process for 180 days on the pH values of the pickled olives. Results

reveal that the pH values of the fresh fruits were approximately close and varied from 7.50 for Picual cultivar to 7.84 Sennara.

Table (9): Effect of salt concentration on pH values during fermentation of olives.

Salt Concentration %	Zero			4%			8%			12%		
Cultivars / Fermentation Time (days)	P	S	E	P	S	E	P	S	E	P	S	E
Zero	7.5	7.82	7.91	7.50	7.84	7.91	7.5	7.84	7.91	7.5	7.84	7.91
15	5.2	5.02	6.12	6.00	6.62	6.46	6.33	6.28	6.74	6.00	6.23	6.52
30	4.8	4.22	5.16	5.33	5.22	5.43	5.4	5.7	6.00	5.72	5.26	5.3
45	4.6	4.00	4.78	4.65	4.21	4.46	5.2	5.00	5.2	4.8	4.53	4.8
60	4.3	3.80	4.20	4.12	4.00	4.00	4.86	4.2	4.25	4.00	3.54	4.2
90	4.00	3.25	3.65	3.70	3.40	4.26	3.73	3.96	3.23	3.3	3.00	4.00
120	3.50	3.3	3.2	3.5	3.20	3.7	3.54	3.60	3.00	3.2	3.4	3.2
180	3.30	3.00	3.01	3.3	3.1	3.00	3.1	3.2	3.00	3.1	3.00	3.00

Varieties:
P-Picual
S-Sennara
E-Egizi Sham

Results also reveal that during the normal fermentation process the pH values of all samples were progressively decreased during the storage for (180) days. This decrease was sharp during the first 3 weeks of storage then steadily declined during the rest of the storage period. The reduction rates in the PH values were almost close and varied from for 3.30 in Picual to 3.01 for Egizi Axi cultivar after storage for (180days). However, Sennara cultivars had the lowest pH decline 3 followed by Picual and Egizi Axi cultivars. Sennara and

Egizi Axi had 3.0, and 3.1 pH values respectively. This final pH values depended on the acidity produced. Initially, brines contain only sodium chloride and some impurities such as Ca, Mg, Fe, etc. Thus at the beginning, these solutions were not adequate media for the growth of the microorganism currently found in olive fermentation, both desirable and undesirable (Sanchez *et al*., 2000).Its transformation into a suitable culture medium is a achieved by the extraction of the different nutrients from the olive fruits. This process occurs at different rates depending up on olive cultivar .In case of lye treated samples with 1.5% NaOH figures results reveal that the pH values of all pickled cultivars were alkaline and were around(7-8) due to the NaOH treatment . Results also revealed that the pH values of all cultivars sharply declined from around pH of 7.91 to about 3 after 3 weeks of fermentation period. During the following 150 days the pH values were steadily declined and the values were around (4-3). The pH values finally decreased to about 3.0 during the last three months.

Fatty acid Content

Fatty acids composition of olive oil extracted from fruits of the three studied varieties Picual, Sennara, and Egizi Axi were examined. The oil samples extracted from fresh and pickled olive fruits in different levels of sodium chloride concentrations for 90 days were subjected to analysis using the techniques of gas liquid chromatography (GLC). Data for fatty acids evaluation were graphically presented in Table (10). It can be notice that oleic acid is the predominant fatty acid in all oil sample , where it represent 76.0, 68.82, and 66.20% in the extracted oil from fresh olive fruits , Picual ,Sennara ,and Egizi Axi ,respectively. While, in the oil of pickled fruit after 90 days was 74.04, 68.10 and 64.30 % for the concentrations of (4%, 8%, and 12%) sodium chloride, respectively. The obtained result s approximately agreed with those found by international olive oil (IOOC., 1984) whereas ,the percentage of oleic acid ranged from 56-83. From the same table, it can be observed that the percentage of Palmitic acid ranged from 13.15 to19.50. The lowest level was in the extracted oil from pickled olive fruit in 4% sodium chloride, while the highest one was in the oil sample from pickled olive fruits in 8% sodium chloride.

Table (10) Fatty acids composition of the extracted oil from fresh and pickled olive fruits:

Fatty acids	Fatty acids of fresh olive			Fatty acids of olives after pickling		
	Picual	Sennara	Egizi Axi	Picual	Sennara	Egizi Axi
Palmitic $C_{(16:0)}$	11.04	18.96	19.1	13.86	18.82	19.50
Palmilioleic $C_{(16:1)}$	0.71	1.96	2.74	0.82	1.97	2.96
Heptad ecanoic $C_{(17:0)}$	-----	0.07	0.06	-----	0.09	0.09
Stearic $C_{(18:0)}$	4.95	5.08	6.91	4.11	4.69	5.95
Oleic $C_{(18:1)}$	76.0	68.82	66.20	74.04	68.10	64.30
Linoleic $C_{(18:2)}$	4.64	4.18	3.48	5.32	4.92	4.84
Linolenic $C_{(18:3)}$	0.73	0.77	0.32	0.73	o.79	0.42
Arachidic $C_{(20:0)}$	0.15	0.53	0.48	0.26	0.62	0.56
Total Saturated Fatty acids	18.1	24.37	26.89	19.25	25.01	27.36
Total unsaturated fatty acid	81.9	74.86	72.74	80.18	74.99	72.10

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تاثير تركيزات الملح المختلفة على التركيب الكيماوي لزيتون المائدة اثناء التخمر

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يعتبر زيتون المائدة غذاء هام يصنع بيئيا تحت ظروف امنة للمستهلكين ومن الاغذية المقبولة تكنولوجيا. ويوجد من زيتون المائدة اصناف عديدة و تم اختيار 3-اصناف منها للدراسة و هى (بيكوال- سنارة- عجيزى عاصى) وذلك بدراسة التركيب الكيماوى لهذه الاصناف وتاثرها اثناء عمليات التصنيع بتركيزات الملح المختلفة حيث تم التخليل فى تركيزات مختلفة من الملح وهى (صفر و4 و8 و12%). ثم دراسة تاثير هذه التركيزات على التركيب الكيميائي لزيتون المائدة (الرطوبة –البروتين- الدهون- الرماد –الالياف) و ايضا تم تقدير قيم الاس الهيدروجينى والسكريات الكلية ووجد ان النتائج متوافقة مع المعاملات حيث ان التغيرات فى درجة الحموضة (قيم pH) تقل اثناء الايام العشرة الاولى ووجد ان تركيز الملح له تاثيرايجابى وقوى على الزيتون اثناء التخليل على مستويات منخفضة من الملح (صفر و4%) و عند استخداح تركيز 8% من الملح وجد انه ليس له تاثير على الحموضة النهائية وتم تقدير السكريات وتم استخلاص الزيت و تقدير الاحماض الدهنية وتحليلها بواسطة جهاز (GLC) ومدى تاثرها بالتخليل.