Quality indices and sensory evaluation of olive oil extracted from some olive varieties growing in St. Catherin region

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ABSTRACT

This investigation carried out to study the caraters fruit, moisture content and oil percentage for three olive oil grown at St. Catherine i.e Wadi Alarbaine, Wadi Eltalaa and Picual.at 2014 seasone.Also studied physiochemical,sensory,phenols content and fatty acids composition of oil extracted from this varieties.

-The obtained results showed that picual olive oil variety gave the highest values of weight of 100friut ,flesh / stone ration,oil%,content of Unsaponifiable matter% andoxidative stability, the corresponding values were 406.96,4.96%,2.26%,1.45%,and50.79 house respeactively sa compared with other varieties. Therefore,oil extracted from this variety had the hight quality depending on the highest oxidative stability of olive picual variety.

-The results exhibited from fatty acids analysis that the content of oleic fatty acid was 74.62,71.04 and62.91%for oil extracted from Picual, Wadi Eltalaa and Wadi Alarbaine, olive varieties, respectively,as well as the content of linoleic fatty acids was 6.882,14.72 and 14.47%,respictivaly . This results indicated that the oil extracted from picual variety was hight quality compared to other studied varieties.

-The oil extracted from Wadi Alarbaine variety had the highest content from phenolic component and o-diphenol ,whereas recorded 489.70 and

133.19 ppm ,respectively compared to other studied varieties, which affected positively on sensory traits for this oil

-The obtained results indicated that sensory evaluation on oil extracted from Wadi Alarbaine olive variety was higher of sensory evaluation than other varieties.whever, the oil extracted from Picual olive variety have the highest quality characters owing to the lowest value of oil pungent.

Key words: olive, oil, quality, sensory evaluation, St. Catherin.

INTRODUCTION

Olive (*Olea euroen L.*) is a widely distributed tree grown healthy in many zone of the world. The olive tree is one of the most important plants which have greeted economic value in new reclaimed land in Egypt. The great importance of olive trees is not only from it is ability to grown in newly reclaimed areas as an economic crop,but also for production higher oil under these conditions as compared with other oil crops .Recently, the Egyptian government encourage cultivated olive trees to bridge the gap between oil production and consumption.. Since the production of olive oil is far below demand, there is a need to increase the cultivation of olive trees, both to produce more oil and to enhance its quality, particularly with regard to components beneficial to the human health, such as natural antioxidants and sterols (**Cercaci *et al.*, 2007**).Olive oil is a valuable vegetable oil often used without any preliminary refining process .olive oil represents an important commodity in terms of health and economy, thus, this product has a great importance in the sustainable economy of important regions. The increase in oil production is likely to be achieved by cultivation the higher olive oil cultivars.

Charalampous and Inglet (1978) and **Angerosa *et al.*, (2001)** reported that extra virgin olive oils are highly appreciated for their excellent and

distinctive flavor that result from a great number of chemical compounds of different chemical classes such as hydrocarbons ,aldehydes , alcohols ,esters and other compounds. **Angerosa *et al* (2004)** found that chemical compounds of olive oils are dependent on fruit tree species and their cultivars.

Virgin olive oil has stronger oxidation stability because of high monounsaturated and low unsaturated fatty acids composition and main components such as phenolic compounds ,tocopherols and sterols .Oils obtained from different cultivars have characteristics depend their chemical composition (**Ranalli *et al* .,1977and Servili *et al* .,2004**).

Polyphenols also present an important technological value due to their influence on sensory characteristics and the shelf life of virgin olive oil.(**Benduni *et al* .2007** and **Baccouri *et al* .2008).**

Kiralan *et al* (2009) found that the highest induction period (IP) and strong radical scavenging activity was recorded with halhali cultivar were 495.42 and 76.89 mg caffeic acid /kg oil, respectively .The oxidation stability and antiradical activity of the Kilis Yaghk cultivar was very poor compared to other cultivars

Desouky *et al* (2010) reported that oil production, quantity and quality is greatly affected by many factors i.e. cultivars and oil accumulation .Olive oil cultivars differed in fruit weight ,moisture content ,dry matter content and oil content. **Guerfel *et al* (2012)** showed that the olive cultivars had different mean values for oleic acid and another characteristic in their oil.

Saint Catherine area had been declared as protected area in 1996 with approximately 4,350 km^2 of largely mountainous terrain in South Sinai. It lies in the arid North African belt; it is characterized by a Saharo-Mediterranean climate. Although the altitude moderates the temperature

regime, summers are relatively hot, with a mean maximum temperature of 36° C (August) while, winters are relatively cool with a mean minimum of -7.8° C (February) in St. Catherine Town. Precipitation is less than 50 mm/year, supplemented by occasional winter snow (Fig.1). The relative humidity is low, normally between 10 and 20 % and rarely exceeding 50% , so potential evaporation rates are very high, in excess of 20mm/day in August

The present study aimed to evaluate the olive oil quality characteristics produced from three olive oil varieties grown at North Sinai (St. Catherine), Egypt.

MATERIALS AND METHODS

This investigation was carried out at St. Catherine in 2014 season to evaluate physic-chemical properties of oil extraction from three varieties olive oil i.e. Wadi Alarbaine, Wadi Eltalaa and Picual.

The mechanical and chemical properties of the experimental soil at St. Catherine in 2014 season are shown in Table (1).

Table (1). Mechanical and chemical properties of the experimental soil at St. Catherine in 2014 season

Mechanical															
Location	Depth(cm	$Caco_3$%	Particale size distribution										Class texture		
Saint Catherine	0-30	36.1	Coarse sand(1-0.5)			Fine sand(0.25-0.1)			Clay>(0.002)				Sandy loamy		
Chemecal															
location	Depth(cm	ph	e.c.ds/m^3	Saturation soluble extract								Organic matter%	Mgkg-1(ppm)		
				Soluble anions(meq/100gm)				Soluble cations(meq/100gm)							
				Co_3^-	Hco_3^-	So_4^-	cl^-	Ca^{++}	Mg^{++}	Na^+	K^+		N	p	k
Saint catherine	0-30	7.9	0.33	Nil	4.5	4.43	2.67	2.86	1.2	6.88	1.01	1.03	63.4	8.11	752.12

Chemical analysis of irrigation water at the experimental field at St. Catherine in 2014 season are tabulated in Table (2).

Table(2) Chemical analysis of irrigation water at the experimental field at St.ctherine in 2014 season

Location	ph		E.C.	Soluble anions(meq.1^{-1}							
				Catioms				Anions			
Sant Catherine	7.45	Ds/m^3	ppm	Ca^{++}	Mg^{++}	Na^{++}	K^+	Co_3^+	Hco_3^-	So_4^-	Cl^-
		1.02	652.8	5.5	2.7	3.45	4.11	Nil	2.75	3.75	4.81

EC : electrical conductivity of irrigation water

Air temperature (Monthly Mean, High and Low) in St. Catherine region, reported from St. Catherine Protected area' meteorological station at 2008 to 2011 years are presented in Table (3).

Table (3): Monthly Mean, High and Low temperatures; recorded from St. Catherine protected area' meteorological station in 2008 to 2011 years.

Month	Temperature 2008			Temperature 2009			Temperature 2010			Temperature 2011		
	Mean	High	Low	Mean	High	Low	Mean	High	Low	Mean	High	Low
January	5.7	15.7	-8.5	8.6	20.3	-3.4	11.3	21.6	-1.9	7.1	16.9	-19.4
February	8.9	19.3	-3.3	10.4	22.9	-1.0	12.6	23.7	-6.7	10.2	19.9	-1.7
March	16.2	27.4	-4.6	11.5	23.4	0.1	15.6	26.4	-4.3	12.3	23.2	0.7
April	19.8	30.1	4.7	17.9	26.7	7.2	18.3	26.4	6.3	15.0	26.2	5.4
May	20.1	28.2	9.8	19.8	28.8	9.6	21.6	31.8	8.9	19.5	29.4	7.7
June	23.9	30.2	2.7	23.9	33.3	16.3	24.3	33.1	14.2	22.8	30.8	14.3
July	24.6	32.3	16.6	24.4	34.1	15.2	26.4	37.1	16.7	25.9	31.0	16.0
August	25.2	34.2	18.2	24.7	34.4	1.8	27.5	36.0	16.5	24.3	43.4	15.4
September	24.1	34.1	14.6	21.0	29.4	15.8	24.5	30.9	16.7	21.8	29.6	14.0
October	17.5	28.6	2.4	14.8	24.7	12.5	22.7	29.8	13.6	18.8	27.9	0.6
November	13.1	19.8	6.1	14.0	25.4	6.2	17.0	23.8	10.9	9.9	19.8	0.8
December	10.3	21.2	0.3	9.8	19.9	0.9	11.4	22.9	-1.0	10.1	19.4	-2.3

Latitude: 28° 41' 7" N (deg min sec), 28.6853° (decimal), 2841.12N (LORAN) .Longitude: 34° 3' 45" E (deg min sec), 34.0625° (decimal), 03403.75E(LORAN). Elevation: 1331 meters (4367 feet) -- validated against 1332 meters (4370 feet) from SRTM.C_20TO43_3.

A- Materials :

Source of olive fruits:-

The fruit of the three studied olive varieties were collected from St. Catherine .

- Reagents, solvents and standards: All solvents in this study were purified and distilled before use. Folin-Ciocalteau reagent was obtained from Gerbsaure Chemical Co. Ltd., Germany. α- tocopherol and Gallic acid standards were obtained from Koch Light Laboratories Ltd. England.

B- Methods

1- Oil extraction: After harvest, fresh olives (1.5-2.0 kg) were washed and deleafed, crushed with mill and pressed using hydraulic laboratory (Carver) press. Oil produced from each extraction was 200-250 (ml/kg), filtered and

then transferred into dark glass bottles and stored in the dark at 4°C until analysis.

2-**Analytical procedures**

Quality parameters: Refractive index, color index, acidity, peroxide value and UV absorption characteristics, K_{232nm} (conjugated dienes) and K_{270nm} (conjugated trienes) were carried out according to the analytical methods described by **IOOC (2009)**. ΔK values were calculated according to the followed equation:

$$\Delta K = K_{270} - K_{266}+K_{274}/2 \quad (1)$$

Chemical composition of fruits:

Moisture and oil contents of olive fruits were determined according to **A. O. A. C. (2005).**

Oil stability: Oxidative stability was evaluated by the Rancimat method **(Gutierrez, 1989)**. Stability was expressed as the oxidation induction time (h), measured with the Rancimat 679 apparatus (Metrohm Co., Herisou, Switzerland), using an oil sample of 5.00 g heated to 100°C ± 2°C with an air flow of 20 l/hr^{-1}.

Total phenolic content: Phenolic compounds were isolated by triple extraction of a solution of oil (10g) in hexane (20 ml) with 30 ml of a methanol-water mixture (60:40, v/v). The Folin-Ciocalteau reagent was added to a suitable aliquot of the combined extracts, and the absorption of the solution at 725nm was measured. Values are given as milligrams of Gallic acid per kilogram of oil **(Gutfinger, 1981).**

Total tocopherol content: The total tocopherol content in oils was determined according to the method describd by **Wong *et al.*, (1988).**

Fatty acids composition: The fatty acid methyl esters were prepared as described in the International Olive Oil Council (**IOOC, 2009**). Methyl

esters were prepared from olive oil, after saponification and analyzed by gas chromatography (Pye-Unicam model 104) equipped with flame ionization detector and glass coiled column (1.6 X 4 mm) supported on chromosorb W-AW 100-200 mesh, was used. The samples (µl) were injected into the column using a Hamilton microsiringe. The gas chromatographic conditions for isothermal analysis were: temperatures: column 170°C detector 300°C and injector 250°C, flow rate: hydrogen 33 ml/ min., nitrogen 30 ml/ min and air 330 ml/ min. Peak areas were measured using a spectra physics chronjet integrator according to the method of **Farag *et al* (1984).**

Sensory evalution of oil: The organoleptic test was determined for the extracted oil according to the International Olive Oil Council (IOOC, 2009). The oil samples (15 ml) were presented in covered blue glasses (diameter, 70 mm, capacity, 130 ml) at 28°C ± 2°C. The glass warmed and after removing the cover, the samples were smelled and then tested by the panelist to judge its flavor. The different attributes of the oils were assessed and their intensities were evaluated as a mean value of the panelists score.

RESULTS AND DISCUSSION

Results recorded in Table 4 show clearly that the olive varieties were differed in weight of 100 fruit (g), fruit flash weight (g) ,stone weight (g) ,moisture and oil %. The results indicateted that the olive picual variety gave the highest values of weight of 100 fruits 561.56 (g),fruit flesh weight 4.27(g) , flesh stone ratio 4.9 % and oil %,while olive Wadi Alarbaine gave the hightest moisture 50.93%.

From these results it could be seen that olive picual variety was the best variety that both used varieties under study because it surpassed the other varieties in quality characters .These results are in harmony with those of **EL-Desouky *et al* (2010)**.

Table(4): Some characteristics of fruits, and moisture and oil contents (%) of three varieties olive fruits.

Parameters	Olive Varieties		
	Wadi Alarbaine	Wadi Eltalaa	Picual
Weight 100 fruits (g)	406.96	435.66	561.56
Flesh weight (g)	3.32	3.54	4.27
Stone weight (g)	0.76	0.87	0.86
Flesh/stone ratio (%)	4.36	4.06	4.96
Moisture (%)	50.93	42.48	45.75
Oil (% dry)	37.31	38.15	47.26

Results presented in Table 5 illustrate that olive oil extracted from picual variety gave the highest value of unsaponifiable matter (%) 1.45, oxidative stability 50.79 h,but the lowest value of free fatty acids 0.25 recorded with olive oil variety wadi Eltalaa and it gave the highest peroxide value 5.52 .All studied olive oil varieties were had the same value ofΔ K.

These results showed that olive oil extracted from picual variety was more quality than the two varieties studied because it gave the highest oxidative stability (h).These results are in agreement with those of **Ranalli *et al* (1977)and Servili *et al* (2004)**.

Table(5) some physico-chemical properties of oil extracted from three varieties olive .

Parameters	Olive Varieties		
	Wadi Alarbaine	Wadi Eltalaa	Picual
Free fatty acids	0.28	0.25	0.26
Peroxide value	4.60	5.52	4.97
Absorbance at 232nm	0.96	1.01	0.98
Absorbance at 270	0.003	0..004	0.004
Δ K	-0.01	-0.01	-0.01
Unsaponifiable matter (%)	0.98	1.01	1.45
Oxidative stability (h)	33.13	46.30	50.79

Data in Table (6) exhibited that olive oil wadi ELtalaa variety gave the heighest value of fruity taste 8.7 ,while olive oil variety Picual gave the lowest value of bitter 2.00 compared to other the two used varieties .Olive oil variety wadi Elarbaine gave the highest pungent 4.00.

Table (6): Mean values of sensory evaluation oil olive oil extracted from three varieties of oliv growing in St. Catherine.

Attributes	Olive oil varieties		
	Wadi Elarbaine	Wadi Eltalaa	Picual
Fruity	8.00	8.70	6.50
Bitter	5.50	5.50	2.00
Pungent	4.00	3.00	2.50

These results are in the same line with those obtained by **Bendini *et al*(2007) and Baccouri *et al* 2008).**

Table 7: Fatty acids composition of olive oil extracted from three olive varieties under study.

Fatty acids	Olive Varieties		
	Wadi Alarbaine	Wadi Eltalaa	Picual
C14:0	0.12	0.05	0.00
C16:0	17.77	8.72	12.59
C16:1	1.18	0.41	1.60
C17:0	0.10	0.09	0.03
C17:1	0.25	0.18	0.07
C18:0	1.85	2.46	2.36
C18:1	62.91	71.04	74.62
C18:2	14.47	14.72	6.82
C18:3	0.84	0.84	0.94
C20:0	0.23	0.47	0.48
C22:0	0.00	0.03	0.09

Data presented in Table (7) indicate that olive oil picual variety exceeded the two varieties in oleic acid 74.62 %,on the other hand ,it gave the lowest value of linoleic acid 6.82 %. Therefore , this variety had the highest oil

quality because the ratio between the oleic acid and linoleic acid was higher compared to these of the two used varieties. Extra virgin olive oil is the principal source of fat in the Mediterranean diet, with important nutraceutic effects due to its abundance of oleic acid, phenolic compounds and an adequate content of linoleic and linolenic acids, two important essential fatty acids. All these chemicals contribute to lower the risk of coronary heart diseases and cancers (**Bandelj *et al.*, 2002**). The increase in oleic fatty acid in oil extracted from picual olive variety may be attributed to the lowest temperature (-19.4c^0) as recorded in Table 3 , hence increasing oil technological, quality and nutrition traits . These results are in agreement with those of **Angerosa *et al* (2001)**.

Table 8: Minor components in olive oil extracted from three varieties under investigation (ppm).

Components	Olive Varieties		
	Wadi Alarbaine	Wadi Eltalaa	Picual
Total polyphenols (ppm)	489.70	308.80	130.74
Total tocopherol (ppm)	198.00	217.00	276.00
o-diphenol (ppm)	133.19	111.34	69.56

Result s recorded in Table (8) show clearly that the highest values of total Poly phenols 489.70 and o-diphenol 133.34 ppm were found with olive oil variety Wadi ALarbaine ,on the same line, the highest of total tocopherol 276.00 were recorded with olive oil variety Picual.From the previously data it could be seen that the oil produced from Wadi ALarbaine variety was the good quality because it have the highest total polyphenols which important to technological value due to in influence on sensory characteristics.These results are in same line with those obtained by **Baccouri *et al* (2008).**

Table 9: Phenolic compounds (μg/100gm) of olive oil extracted from three varieties growing in St. Catherine.

No. of compound	Phenolic compounds	Olive oil varieties		
		Picual	Wadi Eltalaa	Wadi Elarbaine
1	Gallic	0.462	8.561	4.263
2	Pyrogallol	21.363	69.588	25.632
3	4-Aminobenzoic	1.703	1.052	0.555
4	3-OH-Tyrosol	26.000	258.957	189.108
5	Protocatechuic	4.406	1.529	5.303
6	Catechein	47.857	18.680	32.841
7	Chlorogenic	25.554	23.991	32.426
8	Catechol	0.384	5.508	7.887
9	Epicatechein	9.367	10.930	10.323
10	Caffeine	9.112	11.714	18.827
11	P.OH-benzoic	14.838	38.528	34.460
12	Caffeic	4.517	5.797	5.757
13	Vanillic	44.411	12.606	50.180
14	Ferulic	2.917	3.795	27.319
15	Iso-ferulic	2.046	5.500	2.154
16	Reversetrol	6.474	58.457	22.271
17	Oleuropein	76.975	410.954	282.753
18	e-vanillic	88.114	777.316	121.772
19	α-coumaric	1.008	9.784	9.264
20	Benzoic	155.610	153.476	62.529
21	3,4,5Methoxy cinnamic	8.477	98.716	16.513
22	Coumarin	4.579	32.973	24.046
23	Salysilic	36.219	384.940	213.346
24	P-coumaric	5.605	101.185	70.255
25	Cinnamic	43.416	683.065	791.873

Results presented in Table 9 exhibited that olive oil varieties were differed in phenolic compounds.Olive oil have specific 3-oh-tyrosol and oleuropein content than the other oils.Wadi ELtalaa olive variety gave the highest value of phenolic compound of gallic 8.51 ug/100g,purogallol 9.588

ug/100g, 3-oh-tyrosol 258.957 ug/100g,p-oh-benzoic 38.528 ug/100g,oleuropein 410.954 ug/100g,e-vanillic 777.316 ug/100g ,3,4,5methoxy cinnamic 98.71 ug/100g and salysilic 384.940 ug/100g compared to the other studied varieties. While ,Wadi ALarbaein variety gave the highest phenolic compounds of protocatechuic 5.30 ug/100g,chlorogenic32.426ug/100g,catechol7.88ug/100g.caffeine18.82ug/100g,vanillic50.180ug/100g,ferulic27.319ug/100g and cinnamic 719.873 ug/100g.Im this connection, olive oil picual variety gave the highest phenolic compound of 4-aminobenzoic 1.703 ug/100g,catechein 47.857 ug/100g and benzoic 155.10 ug/100g compared to other varieties.

The increases of phynolic contents of oil raising oxidative stability of oil , therefore increased oil technological and high quality characters .These are in same line with those obtain by **Benduni *et al* (2007)** and **Baccouri *et al* (2008)**

Table 10: Flavonoids compounds (*μ*g/100g) in olive oil extracted from three varieties growing in St. Catherine.

No. of compounds	Flavonoids compounds	Olive oil varieties		
		Picual	Wadi Eltalaa	Wadi Elarbaine
1	Naringin	46.390	35.281	53.446
2	Rutin	7.710	16.070	15.088
3	Hisperdin	122.094	95.638	148.811
4	Rosmarinic	4.592	18.631	22.163
5	Quercetrin	18.177	32.649	33.245
6	Quercetin	3.713	2.554	3.138
7	Narengenin	1.112	1.705	3.449
8	Kampherol	4.016	62.987	6.103
9	Hespertin	1.539	39.354	57.343
10	Apegenin	0.530	20.224	45.582
11	7-OH-flavone	0.242	1.370	4.119
12	Total flavonoids compounds			

Results presented in Table 10 indicate that olive oil variety Wadi ALarbaein gave the highest value of flavonoids compounds i.e –Naringin 53.446 ug/100g,Hisperdin 148.81, ug/100g,Quercetrin 33.245 ug/100g,Naregenin 3.449ug/100g,Hispertin 57.343ug/100g,Apegenin 45.582 ug/100g and 7-oh-Flavone 4.119 ug/100g.Im this trend.Wadi ELtalaa gave the highest value of Kampherol 62.987 ug/100g,but olive variety Picual gave the highest value of Quercetin 3.713 ug/100g. From these results it could be found differences among olive oil varieties in phenolic compounds and flavonoids .These results are in harmony with those of **Ranalli *et al* (1977) and Servili *et al* (2004)**.

Conclusion

It could recommended that the best quality characters of extracted oil from different olive varieties may be attributed to the low temperature which led to raising value of oleic acid in oil as well as increasing the total phenol which increased oxidative stability , therefore increasing technological , sensory and quality of olive oil extraction from varieties under studies as well as adaption and increasing cultivation areas .

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خصائص الجودة والتقييم الحسى لزيت الزيتون المستخلص من بعض اصناف الزيتون النامية فى منطقة سانت كاترين

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الملخص العربى

يهدف البحث الى دراسه خصائص الثمار والمحتوى الرطوبى ونسبه الزيت لثلاثه اصناف من الزيتون المنزرعه فى سانت كاترين وهى وادى الاربعين ، وادى التلاء بالاضافه الى صنف البكوال .

وكذا دراسه الصفات الفيزيوكيميائيه والحسيه والمحتوى من المواد الفينوليه والفلافونويدات وتركيب الاحماض الدهنيه للزيوت المستخلصه منها

-اشارت النتائج الى ان صنف بيكوال اعطى اعلى قيم لوزن ال١٠٠ثمره ونسبه اللحم الى النواه والنسبه المئويه للزيت والمحتوى من المواد الغير متصبنه والثبات الاوكسيدى حيث كانت ٤٠٦,٩٦% ، ٤,٩٦ %، ٢,٢٦% ، ١,٤٥%، ٥٠,٧٩ ساعه على الترتيب مقارنه بالاصناف الاخرى .مما يعنى ان الزيت المستخلص من هذا الصنف يتميز بالجوده العاليه نتيجه ارتفاع الثبات الاكسيدى له.

-اظهرت نتائج تحليل الاحماض الدهنيه ان المحتوى من حمض الاوليك كان ٧٤,٦٢ ، ٧١,٠٤ ، ٦٢,٩١ % للزيت المستخلص من اصناف البيكوال ، وادى التلاء ، وادي الاربعين على التوالى وكذا نسبه حمض اللينولييك كانت ٦,٨٢ ، ١٤,٧٢ ، ١٤,٤٧ % على التوالى مما يعنى ارتفاع جوده الزيت المستخلص من صنف البيكوال مقارنه بالاصناف الاخرى.

- تميزالزيت المستخلص من صنف وادى الاربعين بارتفاع محتواه من المركبات الفينوليه والارثو فينول حيث سجلت القيم ٤٨٩,٧ ، ١٣٣,١٩ جزء فى المليون على التوالى مقارنه بالاصناف الاخرى مما يؤثر بالايجاب على الصفات الحسيه لهذا الزيت.

- دلت نتائج التقييم الحسى على ان الزيت المستخلص من صنف وادى الاربعين كان مرتفعا فى الجوده الحسيه مقارنه بالاصناف الاخرى ، بينما اظهر المستخلص من صنف البيكوال صفات جيده من حيث انخفاض الطعم المر للزيت.

- لذا توصى الدراسه بالتوسع فى زراعه الاصناف مجال البحث والدراسه لما للزيت المستخلص منها من صفات جوده تكنولوجيه وحسيه عاليه .