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DETERMINATION OF SOME PHENOLIC COMPOUNDS IN THE LEAVES OF SOME OLIVE CULTIVARS GROWN IN IRAQ

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Abstract

Samples of leaves of the olive varieties (Sorani, Ashrasi, Nebali and Khudiri) were collected form olive transplants grown in College of Agriculture – University of Baghdad. The following phenolic compounds in the leaves of olive cultivars have been determined using HPLC analysis during November and December 2017, January and February 2018: Oleuropein, Caffeic acid, Gallic acid and Vanillic Acid). The results showed that the mean values of in Oleuropein olive leaf extracts ranged from 4.90mg.g^{-1} for Khudiri cultivar at January to 9.80 mg.g^{-1} for Ashrasi cultivar in February. Also the mean values of in Gallic acid olive leaf extracts ranged from 7.10mg.g^{-1} for Khudiri cultivar at January to 10.50 mg.g^{-1} for Sorani cultivar in February. The highest leaves Caffeic acidcontent was in Khudiri cultivar at February at 13.16 mg.g^{-1}, while the lowest value it was in Ashrasi cultivar at January of 11.20 mg.g^{-1} and the highest leaves Vanillic Acidcontent was in Ashrasi cultivar at February at 17.40 mg.g^{-1}, while the lowest value it was in Khudiri cultivar at January of 12.54 mg.g^{-1}.

Introduction

Olive is the fruit tree, which is economically important in the Oleaceae family. It was and still with economic importance especially in the life of peoples. Most scientists agree that the olive tree originated in the eastern Mediterranean. Its fruits are used as food and its leaves are extracted for medical preparations and its oil are used in cooking, making soap and cosmetics. Olive oil is one of the best vegetable oils because it protects against atherosclerosis, heart disease and gall bladderactivity. It contains high levels of Oleic acid, Linoleic acid and vitamin K (Kailis and Harris; Preedy and Watson, 2010). In 2017, the acreage of olive in the world reached about 10804517 hectare, with production of 20872788 tons. The main producing countries are Spain then Greece, Italy, Turkey and Morocco (FAO, 2017). In same year (2017), the estimated number of olive fruit trees in Iraq, including nearly 487458 tree produces up to 10203 tons, and the average production per tree about 20.93kg (PCBS, 2017).

Olive leaf is one of the medicinal plants, which is considered as a good source of natural antioxidants. Among the different parts of the olive tree, the olive leaf is one of the richest sources of the phenolic compounds (Rahmanian *et al.*, 2015). Although the nature of phenolic metabolism in higher plants is complex and not well understood, the phenolic compounds in plant leaves are known to be involved in several physiological mechanisms (Mert *et al.*, 2013). Phenolic compounds in olive leaves are highly beneficial for human health (Benavente-Garcia *et al.,* 2000). The phenolic content of olive leaves can be affected by several factors, such as type of cultivar, geographical origin, sampling conditions, moisture content, degree of contamination with soil, cultivation methods and industrial processes employed for extraction (Papoti and Tsimidou, 2009; Sabry, 2014). Several studies have investigated the phenolic composition of olive leaves (Stamatopoulos *et al.,* 2014; Blasi *et al.,* 2016). Talhaoui *et al.,* (2015) analyzed by (HPLC-DAD-TOF-MS) leaves from six olive cultivars collected at four different times. Several studies have been conducted to investigate the variations in the phenol content of olive trees leaves; Leaves from twenty olive "Arbequina" cultivars grown in Texas were analyzed to evaluate the influence of their genetic makeup and their interactions with environmental conditions on polyphenol contents (oleuropein, verboscoside, luteolin 7-O-glucoside, luteolin-42 -O-

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glucoside) in February and June, the results showed the levels of polyphenols in June samples were lower than in February samples which follows the trend discussed earlier that polyphenols tend to decrease in hot summers ([a]ahin *et al.,* 2012); Mert *et al.*, (2013) study the seasonal changes in the phenolic compound content (oleuropein, chlorogenic acid, caffeic acid, 3-hydroxycinnamic acid, scopolin, and p-coumaric acid) of the leaves of the Gemlik olive cultivar and the collection of the leaf samples began at beginning of January 2008 and continued until the end of December 2009, its found The concentrations and variation in the accumulation of these phenolics in the leaves showed different fluctuations in both study years. Brahmi *et al.,* (2015) study the effect of growth stage on the physicochemical composition of Chemlali olive leaves at two different stages October and February; they have found the lowest level of phenols was detected in the first vegetative stage whereas the highest content was unregistered during the second vegetative stage. Mitsopoulos *et al.,* (2016) determined total phenolic content for leaves of the major Greek olive varieties 'Koroneiki', 'Lianolia Kerkyras', 'Mastoidis', 'Adramytini', 'Megaritiki', 'Gaidourelia', 'Kalamata', 'Konservolia', 'Chalkidiki' and the Spanish variety 'Arbequina'. Leaves were collected in April, September and December, The data obtained from this work showed that the total phenolic content have varied significantly, new season leaves on April showed the highest total phenolic content than the leaves of September and December of the same year. In the present study the some of phenolic compound content were studied for olive leaves of four olive varieties cultivated in Iraq during various months.

Materials and methods

Plant material

Samples of leaves of the olive varieties (Sorani, Ashrasi, Nebali and Khudiri) were collected form olive transplants grown in lath house belong to department of horticulture and Landscape - College of Agriculture – University of Baghdad. The following phenolic compounds in the leaves of olive cultivars have been determined using HPL Canalysis during November and December 2017, January and February 2018: Oleuropein, Caffeic acid, Gallic acid and Vanillic Acid). The leaf samples were collected from the middle of the previous year's shoots; approximately 50 g of leaf samples was collected from each transplants. All of the samples were immediately frozen and stored until used for the analysis.

Quantitative Analysis

After extraction the phenolic compounds in the hydrolyzed extracts were determined using a Schimadzu 10 Series HPLC equipped with a UV detector, According to (Montedoro *et al.,* 1996). Three replications were used. The obtained results were subjected to analysis of variance according to (Elsahookie and Wuhaib, 1990) using L.S.D 0.05 for comparing differences between various cultivars and various months.

Results and Discussion

Oleuropein (mg.g^{-1}):

Fig. 1 and table 1 reports the amount of Oleuropein content of some olive cultivars for four months, the highest

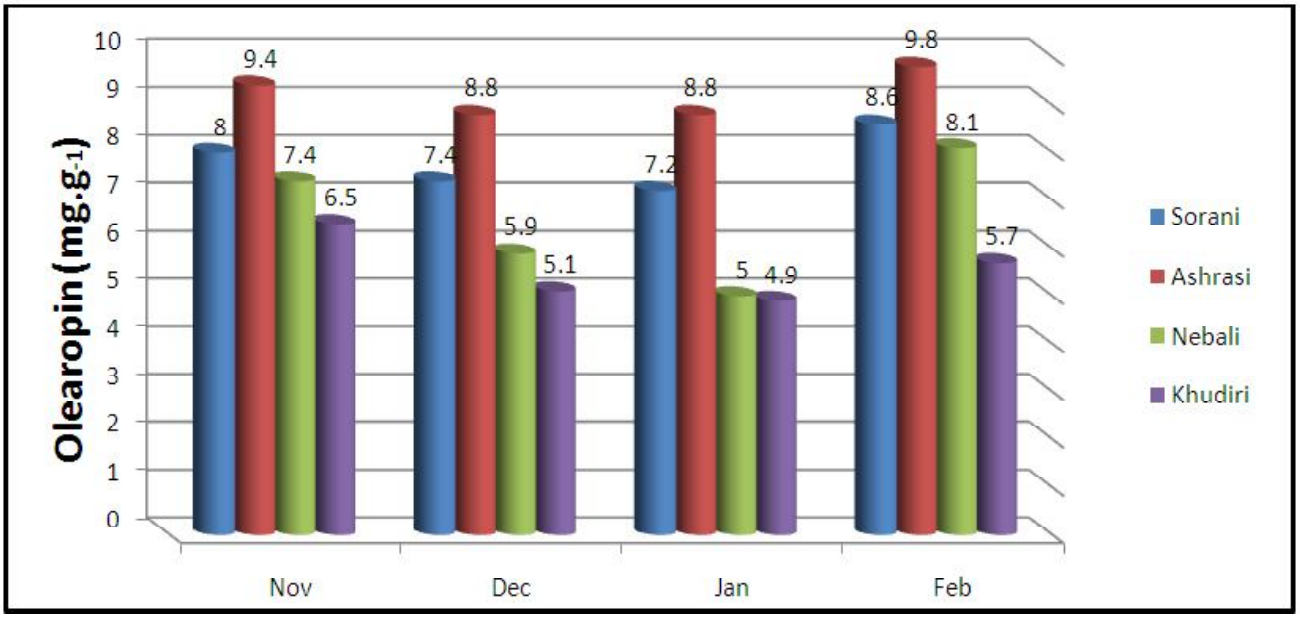

Fig. 1: Oleuropein content (mg.g^{-1}) in Sorani, Ashrasi, Nebali and Khudiri olive cultivars at November and December 2017, January and February 2018.

concentration of Oleuropein was observed in leaves of February, followed by leaves of November. The mean values of in Oleuropein olive leaf extracts ranged from 5.55mg.g^{-1} for Khudiri cultivar to 9.20mg.g^{-1} for Ashrasi cultivar. The mean values of in Oleuropein olive leaf extracts ranged from 4.90mg.g^{-1} for Khudiri cultivar at January to 9.80mg.g^{-1} for Ashrasi cultivar in February. These results are in agreement with those obtained by, Tayoub *et al.,* (2012).

Caffeic acid(mg.g^{-1}):

Data concerning the effect of cultivars and analysis month on leaves Caffeic acid content is listed in table 1 and Fig. 2. The data cleared that, the Khudiri cultivar significantly increased leaves Caffeic acid content of 13.05mg.g^{-1}, while lower values of these compounds was in Ashrasi cultivar at 11.26mg.g^{-1}. Table 1 and Fig. 2 shows that analysis month did not affect on Caffeic acid content. The interactions between cultivars and analysis month significantly affected in leaves Caffeic acid content. The highest leaves Caffeic acid content was in Khudiri cultivar at February at 13.16mg.g^{-1}, while the lowest value it was in Ashrasi cultivar at January of 11.20 mg.g^{-1}.

Gallic acid (mg.g^{-1}):

Fig. 3 and table 1 reports the amount of Gallic acid content of some olive cultivars for four months, the highest concentration of Gallic acid was observed in leaves of February, followed by leaves of November. The mean values of in Gallic acid olive leaf extracts ranged from

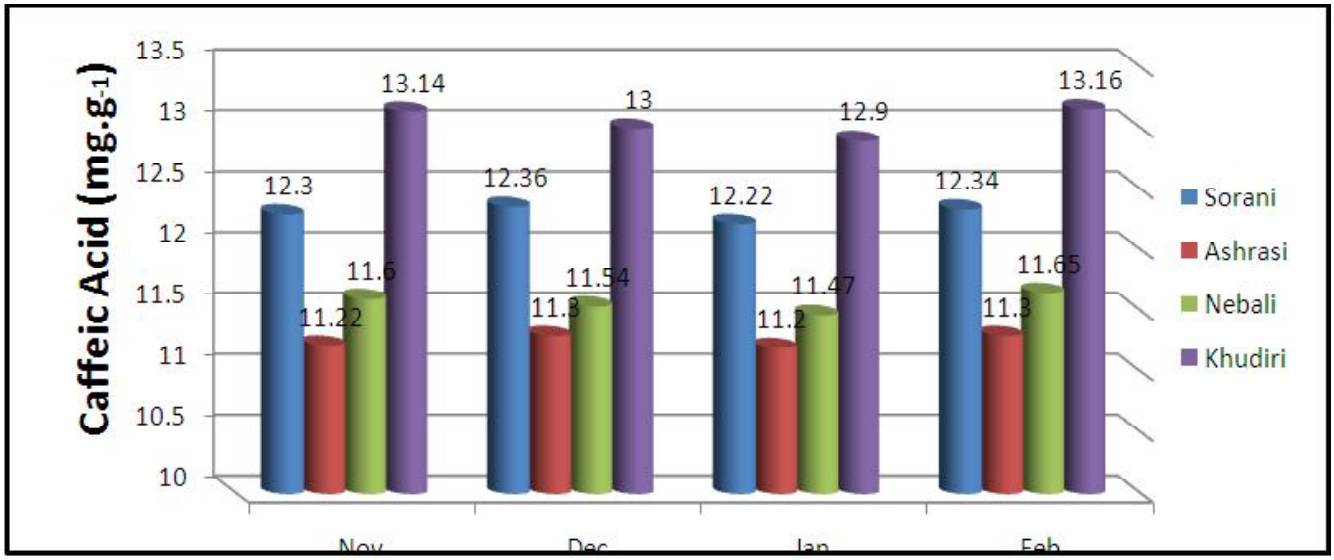

Fig. 2: Caffeic acid (mg.g^{-1}) in Sorani, Ashrasi, Nebali and Khudiri olive cultivars at November and December 2017, January and February 2018.

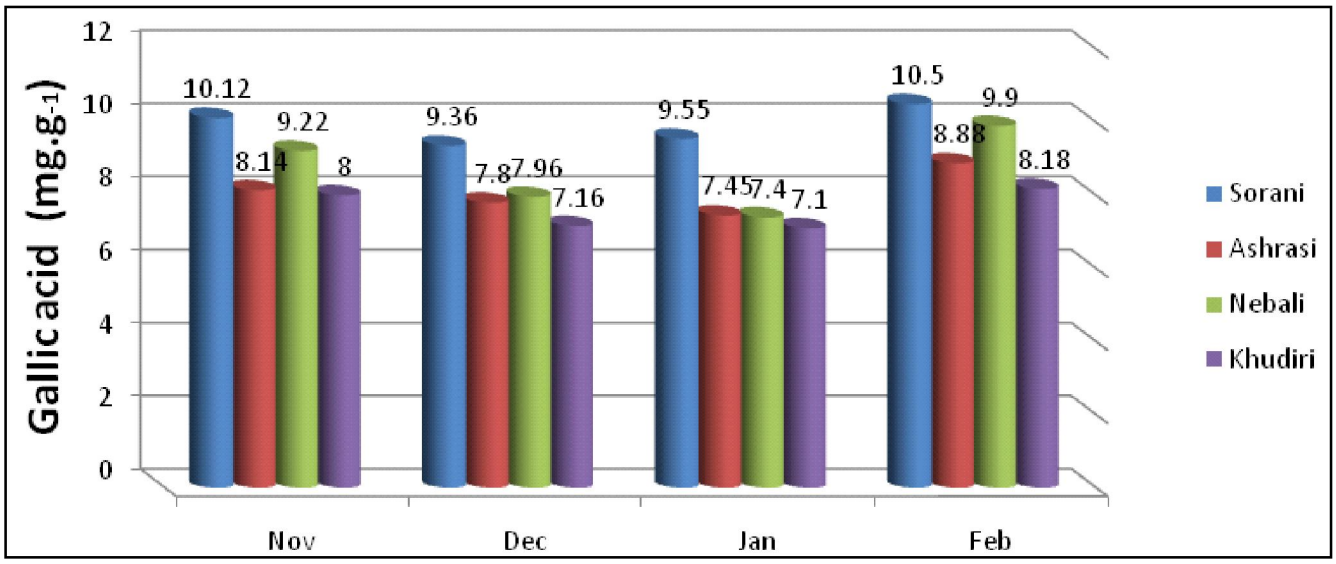

Fig. 3: Gallic acid content (mg.g^{-1}) in Sorani, Ashrasi, Nebali and Khudiri olive cultivars at November and December 2017, January and February 2018.

7.61mg.g^{-1} for Khudiri cultivar to 9.88mg.g^{-1} for Sorani cultivar. The mean values of in Gallic acid olive leaf extracts ranged from 7.10mg.g^{-1} for Khudiri cultivar at January to 10.50 mg.g^{-1} for Sorani cultivar in February.

Vanillic Acid(mg.g^{-1}):

Data concerning the effect of cultivars and analysis month on leaves Vanillic Acid content is listed in table 1 and Fig. 4. The data cleared that, the Ashrasi cultivar significantly increased leaves Vanillic Acid content of 17.01mg.g^{-1}, while lower values of these compounds was in Khudiri cultivar at 12.80mg.g^{-1}. Table 1 and Fig. 2 also shows that analysis month affect on Vanillic Acid content, the highest value was at February at 14.51mg.g^{-1}. The interactions between cultivars and analysis month significantly affected in leaves Vanillic Acid content. The highest leaves Vanillic Acid content was in Ashrasi cultivar at February at 17.40mg.g^{-1}, while the lowest value it was in Khudiri cultivar at January of 12.54mg.g^{-1}.

The present work presented the some phenolic content of leaves of four olive varieties collected at four

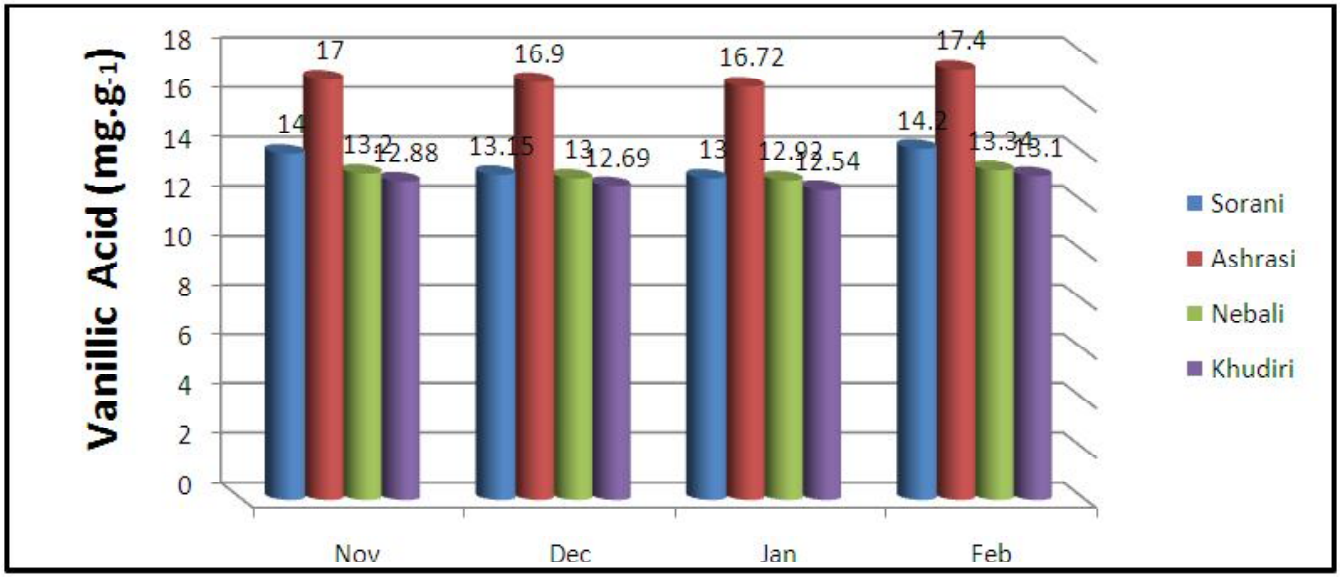

Fig. 4: Vanillic acid content (mg.g^{-1}) in Sorani, Ashrasi, Nebali and Khudiri olive cultivars at November and December 2017, January and February 2018.

Table 1: Effect of Cultivars and Analysis month and their interaction on Oleuropein, Caffeic acid, Gallic acid and Vanillic Acid leaves content.

Oleuropein (mg.g^{-1})						Caffeic acid (mg.g^{-1})				
cultivar	Months					Months				
	Nov	Dec	Jan	Feb	mean	Nov	Dec	Jan	Feb	mean
Sorani	8.00	7.40	7.20	8.60	7.80	12.30	12.36	12.22	12.34	12.31
Ashrasi	9.40	8.80	8.80	9.80	9.20	11.22	11.30	11.20	11.30	11.26
Nebali	7.40	5.90	5.00	8.10	6.60	11.60	11.54	11.47	11.65	11.57
Khudiri	6.50	5.10	4.90	5.70	5.55	13.14	13.00	12.90	13.16	13.05
mean	7.83	6.80	6.48	8.05		12.07	12.05	11.95	12.09	
L.S.D 5%	Cult	month	Int.		Cult	month	Int.			
	0.44	0.44	0.87		0.56	N.S	1.12			
Gallic acid(mg.g^{-1})						Vanillic Acid (mg.g^{-1})				
Sorani	10.12	9.36	9.55	10.50	9.88	14.00	13.15	13.00	14.20	13.59
Ashrasi	8.14	7.80	7.45	8.88	8.07	17.00	16.90	16.72	17.40	17.01
Nebali	9.22	7.96	7.40	9.90	8.62	13.20	13.00	12.92	13.34	13.12
Khudiri	8.00	7.16	7.10	8.18	7.61	12.88	12.69	12.54	13.10	12.80
mean	8.87	8.07	7.88	9.37		14.27	13.94	13.80	14.51	
L.S.D 5%	Cult	month	Int.			Cult	month	Int.		
	0.81	0.81	1.62			0.72	0.72	1.44		

months. The data obtained from this work showed that the phenolic content of all varieties have varied significantly since different varieties exhibited statistically significant different values. For the varieties studied, leaves on February showed the highest phenolic compound content.

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