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Research Article

SOME MEDICINAL PROPERTIES OF CRAB APPLE (*Eriolobus trilobatus*) GENOTYPES IN ANTALYA PROVINCE

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ABSTRACT. A wild fruit, erect crab (*Eriolobus trilobatus* (Labill. ex Poiret) M. Roem.), is one of the arboreal trees of our country which is resistant against draught, has edible flavored fruits and is compatible for landscape. The aim of this study is to determine some medicinal properties of the erect crab species that spread in Antalya province. The amount of phenolic/ flavonoid substances and antioxidant activity values were determined in flowers, leaves and fruits samples. Leaf and flower samples were extracted as dried, while fruit samples were extracted as fresh. The analyses have been repeated in the second year. Total phenolic substance (TPS)in the leave samples was found to be 50- 140 (GAE mg g^{-1}), in flowers 19- 65 (GAE mg g^{-1}) and in fruits 0.3- 22 (GAE mg g^{-1}), the amount of flavonoid substance (TFS) was found in leave samples as 7- 37 (mg CE g^{-1}), in flower samples as 6- 24 (mg CE g^{-1}), in fruit samples as 0.4- 10 (mg CE g^{-1}). Antioxidant activity (AA) was found to be 35 % in flower samples, 33 % in fruit samples and 74 % in leaf samples. As a result of the analysis, crab apple flowers, leaves and fruit samples are very valuable in terms of medical, their should be considered as natural phenolic and antioxidant source.

Keywords: *Eriolobus trilobatus, crabapple, leaf, phenolic, flavonoid, antioxidant*

INTRODUCTION

Our country has a great diversity with respect to plant diversity. It will be possible to transfer this abundancy from our time to the future through knowing our plants and sustainably protect them. The crab apple specie which is under the classification of rare and endangered species in the countries where it grows is among the plants which should be studied and protected. The specie is also known in the world as 'erect crab', 'bragania' or 'Lebanese crab apple [1]. The specie which is included in the Rosaceae family, is easily separated from other members of the family through its late flowering (May-June) and the large size of its white flowers (4 cm diameter) [2]. Although, Latin of the specie is also referred in some resources as as *Malus trilobata* [3], it is commonly known and accepted as *Eriolobus trilobatus* and it is separated from the *Malus* species through its lobed leaves [4-6].

Along with tendency towards natural products, studies on wild fruits have been increased and their use for medical purposes has become prevalent. In various studies, it has been determined that wild fruits such as blueberry, cranberry, hawthorn, myrtle, rosehip, strawberry and etc., contain phenolic compounds and they also have antioxidant, antimicrobial, antiviral, antinociceptive and cardiovascular effects [7-16]. Various studies conducted on wild fruits show that the amounts of phenolic/ flavonoid materials give different results in parts of the plants such as their leaves, flowers, fruits and etc., and the amounts of flower and leaf samples are higher than the amounts of fruits [17]. In addition,

different morphological and biochemical data obtained from the species grown in different regions indicate that it is necessary to conduct regional studies on these species [5, 18, 19].

Phenolic materials are one of the important factors of biochemical effects and consequently the medical characteristics of plants. Phenolic materials have an impact on important quality characteristics of nutrients such as taste, odor and color formation, they are also important with their functions as chelation of iron and copper, α-tocopherol regeneration, enzyme inhibition as well as a natural antioxidant [20-22]. It is known that free radicals damaging lipids, proteins and nucleic acids are influential in pathogenicity of several diseases and the antioxidant nutrients which neutralize these radicals draw special interest [22-24].

Some ethnobotany studies related with crab apple which have been conducted in our country, have shown that the specie is used for intestinal disorder, obesity, rheumatism and cardiac diseases and consumed by people as fresh fruit, dried fruit, leaf/fruit herbal tea, pickle and fruit stew [19, 25, 26]. However, there is not any scientific study on the medical effects of the specie such as amount of phenolic materials and antioxidant activity. Through this study, total amounts of phenolic/flavonoid materials and antioxidant activity values of fruit, leaf and flower samples of the crab apple genotypes naturally grown in Antalya have been determined and it is considered that the obtained from the study will constitute a basis for future studies in medical plants related with the specie.

MATERIALS AND METHODS

The material of the study is the crab apple (*E. trilobatus*) trees naturally spreading in Antalya. In the locations where there are more than one trees, positioning of the tree, means of access to the three, the preservation of its flower and fruit samples, fructification of the trees and ages of the trees were taken into consideration and the samples were taken according to these factors. Extraction processes were conducted on flower and fruit samples during the flowering and fructification periods and for leaf samples, 8-12 after flowering (during the first half of August), which is known as the leaf productivity time for pome fruits. The leaf and flower samples were dried by taking their general use into consideration and the fruit samples were freshly extracted. Analyses were repeated for two years under the same conditions.

Extraction

Extraction was carried out in accordance with the vortex method [27]. The dried leaf and flower samples were ground (Retsch GM200- at first 10.0 seconds at 10.0 speed and then 10 seconds at 06.0 speed) and the fruit samples were weighed 1 gram each while they were fresh and then subjected to vortex 1 minutes by adding 10 ml 70% ethanol and finally centrifuged at 4000 rpm for 15 minutes and the top phase was collected. The process was repeated for 3 times and the extracts were completed to 30 ml then filtered. The extracts were stored at -18 °C until the analysis time.

Total phenolic material analysis

Spectrophotometric method is used for determining the phenolic compounds [28]. 100 µl sample was put in a tube and 900 µl water was added in that tube, then 5 ml 0.2 N Folin- Ciocalteau (Merck 1.09001.0500) solution and 4 ml saturated sodium carbonate

solution (75 g l^{-1}) (Merck 1.06392.1000) were added and the tubes were stored in dark after mixed well through vortex. Sample amount was taken as 50 µl, due to phenolic material concentration of the leaf samples. The data read from the spectrophotometer (Shimadzu UV- 1800) at 765 nm wavelength and the amount of phenolic material was calculated by means of the curve prepared with gallic acid.

Determining the total amount of flavonoid

The spectrophotometric method, defined by [29], was used for determining the total amount of flavonoid. 1 ml sample was put in a 10 ml glass bottle, then 4 ml distilled water and 0.3 ml 5% $NaNO_2$ (Sigma- Aldrich 13447) were added into it and then they were mixed. 5 minutes after 0.6 ml 10% $AlCl_3.6\ H_2O$ (Merck 1.01084.1000) was added and 5 minutes after that, 2 ml 1 mol L^{-1} NaOH (Merck 1.06462.1000) was added and the total volume was completed up to 10 ml by adding distilled water. The data read from the spectrophotometer at 510 nm wavelength upon homogenization and the amount of flavonoid was calculated by means of the curve prepared from catechin.

Determining antioxidant activity

The effects of the extracts for cleaning the free radicals on DPPH were analyzed by means of the method modified [30]. DPPH solution (3.9 ml) prepared with methanol (25 mg L^{-1}) (Merck 1.06007.2500) was added on 0.1 ml of the sample solutions which were prepared also with methanol at different concentrations, then the solution was mixed for 30 seconds through the vortex and stored in dark in room temperature for 30 minutes. After incubation, absorbance of the samples was analyzed against methanol at 515 nm by using an UV spectrophotometer. The inhibition % values and concentration values obtained from sample extracts in different amounts were graphed and the effective concentration which decreases the effect of DPPH by 50% for each sample (EC50) was calculated.

Evaluation of the data

In order to determine the statistical differences of the analyses, a variance analysis in accordance with the 5% and 1% significance levels was implemented through General Linear Model Principle. Important differences were determined by comparing the data of two years and the averages were determined by means of Duncan multiple comparison test [31].

RESULTS AND DISCUSSION

In the study, sampling was carried out in 12 locations of 8 provenance and 19 flowers, 19 fruits and 27 leaves samples, which can be obtained every two years, were evaluated (Table 1).

Table 1. *Sampling locations*

Provenance	Location	Altitude (m)	GPS Value
Akseki	Cevizli- Çatal	1210- 1252	37° 12.853 N/ 31° 44.248 E
	Cevizli- Düdencik	1033- 1070	37° 11.114 N/ 31° 43.957 E
	Murtiçi	713- 725	37° 04.571 N/ 31° 37.892 E
İbradı	İbradı	764- 766	36° 56.085 N/ 31° 44.996 E
Manavgat	Manavgat	1055	37° 03.722 N/ 31° 25.251 E
Merkez	Çağlarca	770	36° 51.676 N/ 30° 28.304 E

Korkuteli	Güzle	1240- 1242	36° 56.228 N/ 30° 26.642 E
Kumluca	Üçoluk	949- 995	36° 41.700 N/ 30° 25.070 E
	Gölcük	1164- 1170	36° 40.534 N/ 30° 21.530 E
Elmalı	Yörenler	1257	36° 48.976 N/ 29° 50.382 E
	Yapraklı	1320	36° 49.948 N/ 29° 47.907 E
Kaş	Gömbe	1387-1390	36° 33.215 N/ 29° 38.251 E

If, the amount of total phenolic material, total flavonoid and antioxidant activity values conducted on the flower, fruit and leaf samples are evaluated for the term of two years, it was observed that all three values were found important at 1% with regards to years, genotypes and year x genotype interaction.

Total phenolic material (TPM) value of the flower samples changed around 19.99-70.83 GAE mg g^{-1} and the highest value was found on the 1st year Gömbe5 sample. Comparing the data of two years for genotypes, raise was only observed on the İbradı1 sample and it was seen that the amount decreased around 3.26- 35.96 GAE mg g^{-1} range for other 18 samples. Amount of total flavonoid material (TFM) changed in 6.11 and 27.32 mg CE g^{-1} range and again the highest value was obtained from the 1st year Gömbe5 sample. Comparing the data of two years for genotypes, it was observed that the İbradı1 sample was at the same value and it was seen that the amount decreased around 2.47-19.82 mg CE g^{-1} range for other 18 samples. The best result of antioxidant activity (AA) was obtained from the 1st year Gölcük2 sample (with 34.85%), the lowest result was obtained from the 2nd year Güzle1 (with 6.95%) sample. Comparing the data of two years for genotypes, it was observed that the antioxidant effect decreased in 1.23-20.91 range for 15 samples, increased 2.46-3.55 range for 3 samples and almost stayed the same for 1 sample (Table 2).

Table 2. *TPM, TFM and AA values of flower samples for two years*

Genotype	**TPM GAE mg g^{-1}**		**TFM CE g^{-1}**		**AA %**	
	1st year	**2nd year**	**1st year**	**2nd year**	**1st year**	**2nd year**
Murt1	44.45 ıp*	38.76 ls	15.86 fh*	11.87 gk	21.06 dm*	14.49 jp
Murt2	56.11 cı	20.15 tu	25.93 ac	6.11 m	28.10 ae	7.81 op
Ibr1	63.62 af	69.26 ab	24.02 ae	23.12 ae	22.68 ck	25.87 bf
Gol1	48.18 gm	33.93 ps	23.15 ae	10.11 jm	32.61 ab	12.92 lp
Gol2	52.54 fk	35.07 os	22.10 be	10.74 ıl	34.85 a	13.94 kp
Uco1	59.82 ag	47.39 hn	24.10 ae	15.14 gı	21.12 cm	16.08 go
Uco2	58.05 bh	47.26 ho	23.69 ae	14.43 gj	28.95 ad	15.15 ıp
Cag	31.42 ru	28.16 su	9.99 jm	7.52 km	11.22 np	13.68 lp
Guz1	55.28 dj	19.99 u	21.07 de	6.31 lm	21.61 cl	6.95 p
Guz2	53.59 ej	32.24 qt	20.10 ef	10.40 jm	21.74 cl	12.19 mp
Guz3	67.97 ac	37.32 ls	26.96 a	11.62 gk	30.03 ac	12.81 lp
Yor	64.63 af	37.25 ls	24.23 ae	11.74 gk	27.69 ae	15.62 hp
Yap	67.48 ad	35.50 ns	26.38 ab	11.54 gk	28.40 ad	14.05 kp
Gom1	65.63 ae	58.70 ah	25.23 ad	21.71 ce	24.61 bg	23.38 cj
Gom2	63.47 af	49.27 gl	23.51 ae	16.08 fg	23.75 bı	17.84 fn
Gom3	57.31 bh	40.46 kr	22.25 be	13.73 gj	23.24 cj	24.21 bh
Gom4	54.46 ej	43.82 jq	23.34 ae	15.95 fh	27.10 ae	19.33 en
Gom5	70.83 a	66.71 ad	27.32 a	21.96 be	25.92 af	29.47 ad
Man	56.24 cı	36.35 ms	22.28 be	11.40 hk	23.87 bı	17.16 fn

Based on analysis there is no statistically significant difference between the averages indicated by the same letter in each row and column at the level of 0.05

Amount of total phenolic material (TPM), total flavonoid material (TFM) and the anxioxidant activity (AA) % values of fruit samples are given in Table 3. The results indicate that amount of total phenolic material varies around 1.76-22.27 GAE mg g^{-1} and the 2nd year İbradı1 was the sample with the highest amount. Comparing the data of two years, an increase around 1.47-8.82 was observed on 11 samples while, the amount of TPM of 4 samples decreased around 1.29-4.53. Amount of total flavonoid varied around 0.12 and 10.18 mg CE g^{-1} and the 2nd year İbradı3 was the sample with the highest value. Comparing the data of two years, it was observed that the value increased around 1.39-7.65 range for 13 samples, decreased around 1.32-1.36 for 2 samples and almost stayed the same for 3 samples. It was seen that the antioxidant activity value varied around 0.53-32.58% and the 1st year İbradı1 sample had the highest value. Comparing the data of two years with regards to antioxidant effect %, it was observed that the value increased around 1.34-11.78% for 9 samples, decreased around 1-6.77% for 6 samples and almost stayed the same for 4 samples.

Table 3. *TPM, TFM and AA values of fruit samples for two years*

Genotype	TPM GAE mg g^{-1}		TFM CE g^{-1}		AA %	
	1st year	2nd year	1st year	2nd year	1st year	2nd year
Murt1	6.72 ıl*	6.98 ıl	1.83 mq*	4.68 gı	2.62 ım*	6.14 gm
Murt2	15.21 ce	19.00 ac	2.90 jm	5.04 fh	3.81 ım	7.66 gm
Ibr1	20.30 ab	22.27 a	3.10 jm	6.11 dg	32.58 a	25.81 ab
Ibr2	8.35 ık	8.62 hj	5.14 eh	5.90 dg	9.99 ej	9.06 fl
Ibr3	20.13 ab	15.62 ce	2.53 jn	10.18 a	15.61 df	17.49 ce
Gol2	-0.26 np	0.22 np	1.18 nr	0.94 or	2.12 jm	0.53 m
Gol4	1.27 np	10.09 gj	2.82 jm	6.16 cg	4.39 hm	6.47 gm
Uco2	5.73 jm	14.26 dg	4.00 hj	7.67 bc	7.08 gm	12.19 dh
Cag	10.40 gı	10.77 fı	4.78 fı	6.17 cg	8.94 fl	9.37 fk
Guz1	0.07 np	4.03 kn	0.74 or	2.47 kn	1.62 km	2.96 ım
Guz2	1.06 np	1.38 mp	2.14 lp	0.78 or	3.74 ım	0.73 m
Guz3	-1.76 p	0.88 np	0.12 r	0.50 qr	0.72 m	0.81 m
Yor	15.05 cf	10.52 gı	2.60 jn	6.20 cf	12.07 eh	8.94 fl
Yap	-0.73 op	3.51 lo	0.68 or	2.17 ko	1.22 lm	1.63 km
Gom1	17.12 be	14.05 dg	3.51 ıl	7.96 b	10.32 eı	20.10 bd
Gom2	-0.50 op	0.97 np	0.65 pr	0.66 or	1.58 km	0.58 m
Gom3	7.03 ıl	5.74 jm	4.98 fı	3.66 hk	10.29 eı	8.94 fl
Gom4	12.96 eh	18.01 ad	6.64 be	9.61 a	12.66 dg	24.44 bc
Gom5	7.16 ıl	10.69 fı	4.85 fı	6.70 bd	8.24 fm	12.01 eh

Based on analysis there is no statistically significant difference between the averages indicated by the same letter in each row and column at the level of 0.05

It was seen that the results of total phenolic material (TPM) value of the leaf samples changed around 54.48- 139.13 GAE mg g^{-1} and the highest value was found on the 1st year İbradı2 sample (Table 4). Comparing the data of two years, it was observed in the 2nd year that the amount of phenolic material decreased around 1.12-52.06 GAE mg g^{-1} range for 20 samples, increased around 5.59- 23.87 GAE mg g^{-1} for 5 samples and almost stayed the same for 2 samples. Comparing the amount of total flavonoid material (TFM) of two years, it was seen in the 2nd year that it increased around 1.19-15.06 mg CE g^{-1} for 24 samples, decreased 1.43 CE g^{-1} for the İbradı2 sample and almost stayed the same for

2 samples. Considering the results of amount of total flavonoid material (TFM), it was observed that the amount changed around 7.41- 37.08 mg CE g^{-1} and the 2nd year Gömbe1 was the sample with the highest value. In the antioxidant activity (AA) results, it was seen that the value changed around 10.35-73.72% and the 2nd year Gömbe4 was the sample with the highest value. The antioxidant effect decreased around 2.97-4.26% for 3 samples, increased 4.05- 52.27% for 22 samples and almost stayed the same for 2 samples.

Table 4. *TPM, TFM and AA values of leaf samples for two years*

Genotype	TPM GAE mg g^{-1}		TFM CE g^{-1}		AA %	
	1st year	2nd year	1st year	2nd year	1st year	2nd year
Murt1	88.00 bm*	95.55 bm	11.60 vx*	18.28 g-n	21.47 hp*	27.62 eo
Murt2	96.97 am	91.82 bm	9.78 xz	19.37 f-k	15.79 mp	33.46 bk
Ibr1	105.50 ak	104.26 ak	17.42 ıo	23.12 b-d	25.70 eo	43.59 bc
Ibr2	139.13 a	107.67 aj	20.64 eg	19.21 f-l	26.67 eo	34.54 bj
Gol1	60.47 lm	66.06 jm	7.42 z	12.60 tw	13.43 op	19.42 kp
Gol2	63.06 km	54.48 m	7.41 z	13.89 rv	16.43 mp	21.87 gp
Uco1	84.41 cm	69.40 ım	9.09 yz	19.32 fl	16.08 mp	35.22 bı
Uco2	81.98 dm	82.68 dm	11.03 wy	20.65 eg	17.67 lp	36.90 bf
Cag	75.14 fm	55.62 m	10.35 wy	10.60 wy	18.25 lp	15.18 mp
Guz1	126.32 ac	96.31 am	16.27 nr	19.82 eı	17.49 mp	36.27 bg
Guz2	94.06 bm	72.95 hm	17.98 ho	20.06 eh	10.35 p	35.88 bh
Guz3	110.11 aı	109.31 aı	18.27 gn	23.84 bc	13.61 np	47.84 b
Yor	67.14 ım	74.03 gm	14.43 qt	16.75 mq	23.84 fp	27.89 dn
Yap	87.23 bm	70.13 ım	13.76 sv	14.03 ru	21.89 gp	22.54 fp
Gom1	102.22 al	115.06 ah	22.02 ce	37.08 a	20.62 jp	72.89 a
Gom2	99.75 al	91.94 bm	19.06 fm	20.43 eg	22.27 gp	42.17 bd
Gom3	94.87 bm	93.39 bm	19.66 ej	20.85 df	24.09 fp	47.89 b
Gom4	126.18 ac	116.48 ag	25.14 b	35.51 a	25.74 eo	73.72 a
Gom5	121.47 ad	91.71 bm	17.31 jo	18.99 fm	17.72 lp	39.92 be
Cat1	117.54 af	65.48 jm	12.57 tw	15.61 os	22.94 fp	19.97 kp
Cat2	101.86 al	92.56 bm	11.32 wy	15.77 os	17.12 mp	22.49 fp
Cat3	128.79 ab	127.59 ab	9.91 xy	20.73 df	16.20 mp	27.36 eo
Cat4	103.84 ak	71.98 ım	11.80 ux	16.93 lp	21.72 hp	25.96 eo
Dud1	102.56 al	88.57 bm	10.92 wy	17.81 ho	15.44 mp	28.98 dm
Dud2	91.17 bm	115.04 ah	10.88 wy	21.35 df	19.93 kp	35.05 bj
Dud3	119.50 ae	77.66 em	11.74 ux	14.87 pt	20.99 ıp	20.98 ıp
Man	106.81 aj	74.77 fm	17.05 kp	21.39 df	36.30 bg	32.04 cl

Based on analysis there is no statistically significant difference between the averages indicated by the same letter in each row and column at the level of 0.05

RESULTS AND DISCUSSION

In the study, amount of total phenolic material, total flavonoid material and antioxidant activity analyses were conducted on flower, leaf and fruit samples and two years of data was evaluated. According to our results, the amount of total phenolic material was high in leaf samples, while amount of total flavonoid material and antioxidant activity were higher in flower samples. However, in the results of antioxidant activity, İbradı1 fruit sample showed the highest 2nd effect (32%) among all samples. While, the amount of

total phenolic material value of the flower and leaf samples was lower in the second year analyses than the first year, it was found to be higher in fruit samples. It is considered that the increasing values of the fruit analyses in the 2nd year are related with 10 days earlier harvest of them compared to the previous year. It is estimated that the changes on the flower and leaf samples are related with potential temperature changes and precipitations.

While, results for the amount of total flavonoid decreased for the flower samples of the 2nd year (4.57 and 23.12 mg CE g^{-1}), they increased for the fruit and leaf samples (respectively around 0.5 - 11.55 mg CE g^{-1}, 10 - 37 mg CE g^{-1}). The antioxidant activity value also decreased in accordance with the flavonoid amount and found as (5-29%) for flower samples and (0.41-25%) for the fruit samples, while increased (15-73%) for the leaf samples. The flower and leaf samples gave higher results than the fruit samples for both years. It is known that the phenolic matter content of the wild fruit plants is higher in leaves and flowers than fruits [11,16,17]. In this study, this difference was found more than that, as the leaf and flower extracts were prepared from dried materials while fruit extracts were prepared from fresh materials.

Assessing the analyses in general, it was observed instead of a few exceptions that amount of total flavonoid amount and antioxidant activity results of the samples with high phenolic material content were also high. While, adaptation was higher for the flower samples, exceptions increased for the leaf and fruit samples, even so, 3 leaf samples showing the highest antioxidant activity effect also gave high results with regards to amount of total phenolic material. It was observed that within the first 5 samples and 6 samples showing the highest antioxidant activity effect among the fruit samples were among the first 8 samples giving high results with regards to amount of total phenolic material.

Evaluating the difference between years, it was seen that the results of fruit samples were more stable, while the results of flower and leaf samples were more changeable. Although, the change of climatic and sampling factor which may influence the analysis results, same genotypes gave the best results in both years. İbradı, Güzle, Gömbe, Cevizli, Çatal and Düden samples among the leaf samples, İbradı, Gömbe and Üçoluk samples among the flower samples and Murtiçi, İbradı and Gömbe samples among the fruit samples were the genotypes which provided the highest results with respect to analyzed properties. With regard to phenolic materials, it was observed that the best results of all three parts of the plant were obtained from the samples from İbradı and Gömbe location. It is known that these two locations are cool and wet areas with microclimate characteristics appropriate with wildlife of the specie and the trees in these locations are more fruitful [26].

No study related with phenolic/ flavonoid material and antioxidant activity analyses of *Eriolobus trilobatus* fruits could be found, while there are studies on *Malus* specie and different wild fruits. In a study conducted by [32], amount of total phenolic material in juices of 3 different samples of apple varieties (Amasya, Golden and Starking) was found by Folin-Ciocalteu method around 0.36- 1.13 mg ml^{-1} and the average value was given as 0.67 mg ml^{-1}. In this study, amount of total phenolic material was found between 0 and 22.3 GAE mg g^{-1} and it was seen that the amount of phenolic material was higher in crab apple samples.In a study conducted by [33], where the phenolic value of crab apple samples was (*Malus sylvestris* (L.) Mill.), amount of total phenolic material in dry weight was around 1. 73- 15.57 mg GAE g^{-1}, amount of total flavonoid around 0. 04-1. 82 mg RE 1 g^{-1} (routine equivalent) and the antioxidant activity (DPPH) changed around 8.12-78.43%. In the results of this study, amount of total phenolic material of extracts at fresh

weight was found around 0-22.3 GAE mg g^{-1}, amount of total flavonoid material was found around 0.1-11.55 mg CE g^{-1} (catechin equivalent) and the antioxidant activity determined by DPPH was found around 0.4% and 32%. Although, the analyses on crab apple were done on fresh weight, it was seen that the results were higher than the ones obtained from the crab apple samples at dry weight.

In the study conducted by Çınar et al. (2017) on *Crataegus* species (hawthorn) located in the Western Mediterranean Region [16]; amount of total phenolic material in flower samples was found around 42.37- 83.75 GAE mg g^{-1}, on leaf samples around 42.91-88.82 GAE mg g^{-1}, fruit samples 2.83-14.48 GAE mg g^{-1} and amount of total flavonoid material in flower samples was found around 16.29-42.89 mg CE g^{-1}, leaf samples around 13.80-45.40 mg CE g^{-1} and fruit samples around 0.56- .78 mg CE g^{-1}. Antioxidant activity was determined for flower samples as 28.36-70.76%, leaf samples as 25.73-84.95% and fruit samples as 0.66-19.62%. When, the results were compared with the samples of crab apple, it was observed that amount of total phenolic and flavonoid material contents of flower samples were around same values and antioxidant activity effect was higher in *Crataegus* flowers. While, amount of total phenolic material in leaf samples was quite higher compared to the leaves of *Crataegus,* amount of flavonoid material and antioxidant activity effect were approximately around the same values. With regards to the fruit samples, it was determined that the fruits of crab apple gave higher results than different specie, *Crataegus* fruits in all three analyses.

The results showed that the fruits and leaves of crabapple known to be used ethno-botanically have natural antioxidant properties and they are also valuable with respect to phenolic and flavonoid material content. In addition, it is considered that the samples of flowers which are not medically used contain equal amounts of phenolic material of commonly used *Crataegus* flowers and they should be used for medical purposes. Using different extraction solutes and methods in analyses and supporting their results with chromatographic analyses will provide contribution for efficient use of the specie in medical plants sector.

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