THE TOTAL PHENOL, FLAVONOL AMOUNTS, ANTIOXIDANT CAPACITY AND ANTIRADICAL ACTIVITY OF SOME THYME SPECIES GROWING IN TURKEY

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ABSTRACT

Total phenolic substance, flavonol amounts, antioxidant capacity and antiradical activity values of Karabaş thyme extract were determined as 74.52-163.10mg GAE/g,773.62-1006.69 µg RE /g, IC50=572.60-1035.6 µg/ml and 42.31-101.52mg/ g AAE, respectively.Total phenolic contents and amounts of flavonols of *S.cuneifolia* were found between 121.17 and 198.93mg GAE/g and 1050.17-1562.21 µg RE/g found and maximum amounts was obtained with U3 application. The total phenolic substance, flavonoid amounts, antioxidant capacity and antiradical activity of black thyme extracts values were found between 82.97 and 115.09mgGAE/g,657.68-999.44 µgRE /g,IC50=388.24-701.23µg / mland91.14-123.34mg AAE/ g, respectively. Total amount of phenolic substance of *S.hortensis* was found low quantities in all extracts, highest amount obtained with U3 application71.13mgGAE/g.The highest total phenolic and total flavonoid amounts of *C.capitatus* were found between 104.94 mgGAE/ g and 568.32 µgRE /g, respectively.

Key words: Thyme, Total phenol, Flavonol, Antioxidant capacity, Antiradical activity.

INTRODUCTION

Phenolics, denominated as phenolic acids and phenylpropanoids, are derived from two nonphenolic molecules, benzoic and cinnamic acids, respectively. The antioxidant capacity of some herbs used in dietology practice was determined by the DPPH free radical method, which was calibrated with ascorbic acid [1,2]. Justesen and Knuthsen [3] applied hydrolysis to İstanbul thymus, ammi majus (*Salvia officinalis* L.) and genuine thymus (*Thymus vulgaris* L.) samples and determined the flavonoid content (quercetin, camphorol, apigenin, luteolin, izoramnettin and hesperidin). Total antioxidant capacity of plant material depends not only on the content and composition of phenolics, but also on the contents of other antioxidants, for example ascorbic acid [4]. Antioxidants such as β-carotene, ascorbic acid, and α-tocopherol are proved to prevent oxidations of free radicals by *in vitro* and *in vivo* studies. Vitamin A, takes place in regulation of protective epitel of lung, stomach urinary tract and other organs and in defensive system of human body. Another antioxidant tocopherol, protects cell from free radicals, heavy metals, poisonous compounds, medicines and radiation by stabilizing lipid parts of cell membrane and transporting molecules. Tocopherols prevent degenerative effect of free radicals on tissues, skin and blood vessels. Another antioxidant, ascorbic acid (Vitamin C) helps growing and well, being of body cells in bones, ligaments and blood vessels. Besides, it helps response of body against infections and stress and proper use of iron [5-9].The aim of the present work was to study the total phenol, flavonol amounts, antioxidant capacity and antiradical activity of some *Salvia and Thnyme* species growing in Turkey.

EXPERIMENTAL

Plant material

Botanical names and herbarium codes of some aromatic plants plants growing endemically in Turkey are shown in Table 1. They were collected between May and September during flowering. Collected samples have been dried in room temperature and in shade. Species have been identified by Dr. Hüseyin Fakir from Süleyman Demirel University and Dr. Ramazan Göktürk from Akdeniz University. Herbarium samples have been kept in Akdeniz and Süleyman Demirel University herbariums.

Table 1: Botanical names and herbarium codes of some spice and medicinal plants.

Plants	Used parts	Herbarium number	Location and harvest year
Coridothymus capitatus (L.) Reichb. fil.	Flower+Leave	Leg: 1567	Antalya, 2005
Thymbra spicata L.var.*spicata*	Flower+Leave	Leg: 1568	Antalya, 2005
Satureja cuneifolia Ten.	Leave	H.F.3611	Isparta, 2005
Satureja hortensis L.	Leave	Leg:7615	Eskişehir, 2005
Satureja thymbra L.	Flower+Leave	Leg: 1565	Antalya, 2005

Soxhlet and ultrasonic water bath extraction

Used solvent mixtures and their quantities are determined with pre-trials. Extraction has been made with individual or different proportions mixtures of solvents. Mixtures are fixed as solvent mixtures to use in studies which have the most phenolic content. 10g of ground plant samples are weighed and solvent solutions and samples were extracted with Soxhlet apparatus for 5h and ultrasonic water bath device (2 h) and then obtained extracts are filtered by using filter paper. Removal of solvent and water was carried out with rotary evaporator (40 °C+ Vacuum). Obtained extracts have been kept at -18 °C until they've been analyzed. Extraction was planned with two repetitions. The codes belonging to application and solvent mixtures are shown below (Table 2). Used solvent mixtures and their quantities are determined with pre-trials. Extraction has been made with individual or different proportions mixtures of solvents. Mixtures are fixed as solvent mixtures to use in studies which have the most phenolic content. Five different solvent mixtures and two different devices are used for extraction. 0.5% Acetic acid was used for hydrolysis. Used solvent mixtures: methanol: acetone: water: acetic acid (55:40:4.5:0.5, h:h%, h:h%) methanol: water: acetic acid (95:4.5:0.5, h:h%, h:h%), acetone: water: acetic acid (95:4.5:0.5, h:h%, h:h%), ethanol: water: acetic acid (95:4.5:0.5, h:h%, h:h%) and water: acetic acid (98.5:0.5). 10g of ground plant samples are weighed and solvent solutions and samples are phenol extracted with Soxhlet device (5hours) and ultrasonic water bath device (2 hours) and then obtained extracts are filtered by using coarse filter paper.

Determination of total phenolic amount of substances

Total phenolic amounts of extracted plants were determined according to Singleton and Rossi [10] by using Folin-Ciocalteu Calorimetric method. Results were calculated as mg gallic acid (GA) equivalent by using calibration curve which is obtained from solutions prepared from gallic acid. Analysis was made with three parallels.

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Table 2: Solvent mixtures used in extraction, devices, sample amounts, time and application codes.

Uygulama Şifresi	Applications		Sample weight (g)	Time (s)
	Solvent mixes (h:h%)	Apparatus		
S1	Methanol:aceton:water:acetic acid (55:40:4.5:0.5)	Soxhlet	10	5
S2	Methanol: water:acetic acid (95:4.5:0.5)	Soxhlet	10	5
S3	aceton:water:acetic acid (95:4.5:0.5)	Soxhlet	10	5
S4	Ethanol: water:acetic acid (95:4.5:0.5)	Soxhlet	10	5
U1	Methanol:aceton:water:acetic acid (55:40:4.5:0.5)	Ultrasonic water bath	10	2
U2	Metanol:water:acetic acid (95:4.5:0.5)	Ultrasonic water bath	10	2
U3	Aceton:water:acetic acid (95:4.5:0.5)	Ultrasonic water bath	10	2
U4	Ethanol:water:acetic acid (95:4.5:0.5)	Ultrasonic water bath	10	2
U5	Water:acetic acid (95:4.5:0.5)	Ultrasonic water bath	10	2

Determination of total flavonol amount

Total flavonols were determined using the method proposed by Dai [11]. Standart and samples were evaluated by measuring the absorbance at 410 nm. Results were given as g rutin equivalent (Re)/g by using calibration curve which is obtained from rutin solutions.

Determination of antiradical activity

Antiradical activity is under the influence of holding free radicals and it's been determined by using 1, 1-diphenyl-2-picrilhidrazil (DPPH) method [12]. Diffferent concentrations of extracts (0, 25, 50, 100, 250, 500, 750, 1000, 1500 and 2000 ppm) were prepared into 50 mL tubes. Extracts were added 450 lL of Tris-HCL solution(50 mM-pH 7.4) and 1 ml DPPH (0.1 mM) and were incubated for 30 minutes. The absorbance of the standard and the samples were measured at 517 nm. Before calculating IC50 value, antiradical activity % of the extracts at different doses was determined using the following formula:

Antiradical Activity % = 100 x (absorbance of the control - absorbance of the sample / absorbance of the control)

The amount of extract concentration that provides 50% inhibition (IC50) was calculated by using the graphic obtained by placing antiradical activity values (%) against extract concentration. Results were given as IC50 = mg/ml. Analysis was made with three parallels.

Determination of antioxidant capacity

Antioxidant capacity were determined by using Phosphomolybdenum complex method [13]. Results were given in mg ascorbic acid equivalent (AAE)/g by using calibration curve prepared from solutions with ascorbic acid. Analysis were made with three parallels.

Statistical analysis

According to completely randomized experiment design was planned (7 different species x 9 different applications x 3 repetition). Obtained datas were statisticallyevaluated usingthe SPSS10.0 statistical program, importance of differences between groups was determined with variance analysis. Identifaciton of differences between groups was determined with Duncan multiple comparison test [14].

RESULTS AND DISCUSSION

Karabaş thyme (*T.spicata*) extract's total phenolic substance, flavonol amounts,antioxidant capacity andantiradical activity values were determined as 74.52-163.10 mg GAE/g,773.62-1006.69µgRE /g, IC50=572.60-1035.6 µg/ml and 42.31-101.52mg/ gAAE, respectively (Table 3). With the application of ultrasonic water bath acetone:water:aceticacid and solvent mixture, total phenolic compounds and the total flavonoid amounts were found at maximum level. For antioxidant capacity, using Soxhlet apparatus application, Ethanol: water: acetic acid solvent mixture, and ultrasonic water bath application methanol: water: acetic acid mixture obtained extracts has higher values than the others. Kosar et al. [15] studied to determine *T.spicata* water extract compounds, and rosmarinic acid had been reported as the best radical scavenger.Total phenolic substance, flavonoid amounts, antioxidant capacity and antiradical activity of thyme extracts were discussed with other species. Dorman et al. [12] determined total phenolic substance amount 49 mgGAE/g extract and antiradical activity (IC50=335.0 µg/ ml) was established found *Thymus vulgaris*. Extracts' total phenolic substance amount changed between 7.02 and 19.77 mg GAE / g, the total amount of flavonoid was found between 0:21 and 1:13 mg RE /g. Similarly antiradical activity vary depending on the factors mentioned above, essential oil not taken out plant extract to other, with high polarity ethanol and acetone extracts to hexane extract, have free radical scavenging property. Antioxidant capacity values vary according to applications and solvent used. For Karabaş thyme extracts' variance analysis total phenolic substance, flavonol amounts, antioxidant capacity and antiradical activity values shown statistically difference between the extracts at $p < 0.05$ level was determined to be important.

The total phenolic extracts of *S.cuneifolia*, flavonol amounts, average values of antioxidant capacity and antiradical activity in conjunction with Duncan multiple comparison test, results are presented in Table 4.Total phenolic contents and amounts of flavonols of *S.cuneifolia* were found between 121.17 and 198.93mg GAE/g and 1050.17 and 1562.21 µg RE/g, and maximum amounts was obtained with U3 application. Dormanet al. [12] established 166.0mgGAE/ g total phenol in methanol:water:acetic extraction acid application of *Satureja hortensis*. Similarly antiradical activity values by Eminağaoğlu et al. [16], using DPPH method, *Satureja spicigera* and wild thyme (*Satureja cuneifolia*) methanolic extracts, IC50 values found for wild thyme 68.0 µg / ml and for *spicigera* 267.0 µg / ml. The highest antioxidant capacity was determined in extracts obtained with S2 and U1 applications. Antioxidant capacity values vary according to applications and solvent used. Mensore et al. [17]. When variance analyse results scanned, for wild thyme extracts' total phenolic substance, flavonol amounts, antioxidant capacity and antiradical activity values, statistical difference between the extracts at $p < 0.05$ level was determined to be important.

The total phenolic substance, flavonoid amounts, antioxidant capacity and antiradical activity of black thyme (*S.thymbra*) extracts values were found between 82.97 and 115.09 mg GAE/ g,657.68 and 999.44 µgRE /g,IC50=388.24 and 701.23µg / ml and 91.14 and 123.34mg AAE/ g, respectively (Table 5). Extracts obtained with S2 and U3 applications, in order total phenolic substance and total flavonoid amounts determined as maximum values. For antioxidant capacity, obtained extract, with soxhlet apparatus application ethanol:water:acetic acid solvent mixture (S4) had higher values as compared to other applications. Loziene et al. [18] obtained extract from *T. puleigioides* using solvents with different polarities and reported total phenolic substance amount between 7.02 and 19.77mg GAE/g. When variance analyse results scanned, for Kara Kekik extracts' total phenolic substance, flavonol amounts, antioxidant capacity and antiradical activity values were found statistically important at $p < 0.05$ level.

The total phenolic extracts of wild basil, flavonol amounts, average values of antioxidant capacity and antiradical activity in conjunction with Duncan multiple comparison test, results are presented in Table 6. Total amount of phenolic substance was found low quantities in all extracts, highest amount obtained with U3 application71.13mg GAE/ g. Total flavonol was determined between 206.22 and 1280.83 µgRE /g. U3 was determined as the most successful application. Total phenolic substance results are compatible with obtained results. Total amount of flavonoid was found similar withthe values determined by Dorman et al. [12] for *Thymus vulgaris*. Antioxidant specification, related to antiradical activity and antioxidant capacity results average values were determined, respectively, IC50=691.64-1903.56 µg / mland27.73-107.77mg AAE/ g. The most successful results in both analyses have been acquired through the application of U3, th lowest results found in U5 extracts. Similarly, Dorman et al. [12] determined IC50 value respectively 800, 138, 2160, 3430 and 7120 µg /ml in wild basil methanol:water:acetic acid extract and its ethylacetate, hexane, water, n-butanol fractions; in water, n-butanol and hexane extracts. Our results are the same with the results determined by other researchers. Dorman et al. [12] found for *Satureja hortensis* methanol:water:acetic acid extract total phenolic substance amount 166.0mg GAE /g, antiradical activity value IC50= 800 µg/ ml. When variance analyse results scanned, for wild basil extracts' total phenolic substance, flavonol amounts, antioxidant capacity and antiradical activity values were found statistically inportant at $p < 0.05$ level.

The total phenolic extracts of Hispanic Thyme, flavonol amounts, average values of antioxidant capacity and antiradical activity in conjunction with Duncan multiple comparison test, results are presented in Table 7. The highest total phenolic and total flavonoid amounts of *C.capitatus*were found between 104.94 mgGAE/ g and 568.32 µgRE /g, respectively. Ultrasonic water bath containing acetone:water:acetic acid solvent mixture, U3 application, determined as the most successful application for both phenolic substance and flavonoid amount. Antiradical activity was determined between IC50=727.53-1081.58µg/ ml. With minimum amount, capturing at least 50% of the free radicals, extract application with Soxhlet device ethanol:water:acetic acid solvent mixture S4 is determined. Antioxidant capacity found 52.46-92.44mgAAE/ g, the highest valuesas in antiradical activity again found in S4 obtained extracts. Any other study was not encountered on Hispanic thyme extract or total phenolic substance, flavonoid amounts, antioxidant capacity and antiradical activity of extracts. Dorman et al. [12] determined Istanbul thyme total phenolic substance amount of water extract and antiradical activity using the DPPH method (IC50= µg/ ml) as 149 mg GAE/ g extrac and 335.0, respectively. In addition, Loziene et al. [18] determined total flavonoid amount 0:21 to 1:13mgRE /g for *T.puleigioides* thyme samples. Total phenolic content and the total amount of flavonols showed similar results with our findings. Antiradical activity was lower than indicated in the literature as to why the different species, extraction method, different components extraction depending on solvent and changes in antioxidant properties depending on the components can be considered [17-20]. When variance analyse results scanned, for Hispanic thyme extracts' total phenolic substance, flavonol amounts, antioxidant capacity and antiradical activity values were found statistically important at $p < 0.05$ level.

The demand of today's human for a healthier and longer life, directed researches to find alternative treatments of many diseases. Recently, pollution, stress and industrial food consumption increased the existence of free radicals. Antioxidants are the most effective compounds against free radicals. A lot of studies have reported that antioxidants characteristics. It is believed that detection of natural antioxidant sources and proper consumption of them in daily diet or use of isolated compounds in clinical practices would be beneficial for healthy life.

Table 3: Total phenolicextracts, flavonol amounts, antioxidant capacity and values related to antiradicalactivity,Duncan multiplecomparison test results* (n:3) for Karabaş Thyme extract.

	Total phenol (mg GAE/g)	Total flavonol (µg RE/g)	Antiradical activity (IC_{50}=µg/ml)	Antioxidant capacity (mg AAE/g)
S1**	128.61±1.01 d	785.69±3.44 c	778.59±0.67 e	92.74±2.67 b
S2	127.60±1.01 de	774.82±1.46 c	779.39±0.62 e	71.91±1.52 e
S3	118.47±2.03 g	889.55±3.87 b	1035.6±1.25 a	95.18±0.93 b
S4	124.22±1.55 f	773.62±2.41c	786.34±1.23 cd	101.52±2.98 a
U1	144.50±2.56 b	982.54±1.26a	786.34±4.84 cd	86.64±1.05 d
U2	125.23±0.59 ef	773.62±0.75 c	785.34±2.47 d	98.69±0.74 a
U3	163.10±2.03 a	1006.69±3.08 a	572.60±0.44 f	89.84±1.50 c
U4	137.06±1.55 c	858.15±3.04 b	787.31±1.98 c	57.72±0.58 f
U5	74.52±0.59 h	966.84±2.55 a	797.99±1.22 b	42.31±1.03 g

*means in the same raw with the same letters are not significally different ($p<0.05$).**S1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with soxhlet apparatus;S2- methanol:water:acetic acid (95:4.5:0.5) with soxhlet apparatus;S3- aceton:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;S4- ethanol:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;U1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with ultrasonic water bath;U2- methanol:water:acetic acid (95:4.5:0.5) with ultrasonic water bath;U3- aceton:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U4- ethanol:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U5-water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath

Table 4:Total phenolic extracts, flavonol amounts, antioxidant capacity and values related to antiradicalactivity, Duncan multiple comparison test results* (n:3) for wild Thyme extract.

	Total phenol (mg GAE/g)	Total flavonol (µg RE/g)	Antiradical activity (IC_{50}=µg/ml)	Antioxidant capacity (mg AAE/g)
S1**	188.12±3.10 b	1431.78±1.58 b	776.04±0.67a	107.85±0.93c
S2	182.37±2.03 c	1397.97±2.31c	766.06±0.62b	117.92±1.56a
S3	151.60±0.59 e	1350.87±1.28d	764.45±1.25bc	80.53±1.13f
S4	150.59±0.59 e	1227.69±1.38e	757.88±1.23d	92.74±2.39e
U1	183.04±1.55 c	1383.47±0.91c	757.88±4.84d	116.85±1.43a
U2	159.38±3.10 d	1232.52±0.36e	757.06±2.48d	103.27±2.30d
U3	198.93±1.18 a	1562.21±0.96a	758.71±0.44cd	100.07±1.26d
U4	160.73±0.59 d	1096.06±1.63f	758.78±1.98cd	94.57±1.95e
U5	121.17±1.55 f	1050.17±2.06g	767.61±1.23b	112.81±3.52b

*means in the same raw with the same letters are not significally different ($p<0.05$).**S1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with soxhlet apparatus;S2- methanol:water:acetic acid (95:4.5:0.5) with soxhlet apparatus;S3- aceton:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;S4- ethanol:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;U1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with ultrasonic water bath;U2- methanol:water:acetic acid (95:4.5:0.5) with ultrasonic water bath;U3- aceton:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U4- ethanol:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U5-water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath

Table 5: Total phenolicextracts, flavonol amounts, antioxidant capacity and values related to antiradicalactivity,Duncan multiplecomparison test results* (n:3) for black thyme (Satureja thymbra) extract.

	Total phenol (mg GAE/g)	Total flavonol (µg RE/g)	Antiradical activity (IC_{50}=µg/ml)	Antioxidant capacity (mg AAE/g)
S1**	103.25±2.68 b	713.23±1.37 d	523.52±1.48 f	*118.07±0.35 b*
S2	115.09±3.84 a	657.68±2.06 d	388.24±1.12 g	119.60±1.21 b
S3	104.61±6.11 b	947.52±3.63 ab	626.19±1.76 d	107.24±3.81 d
S4	104.27±2.68 b	837.62±9.37 c	370.46±2.30 h	123.34±0.95 a
U1	101.90±2.55 b	821.92±1.46 c	590.38±1.22 e	111.36±1.21 c
U2	87.03±1.76 c	871.43±1.82 bc	657.59±0.42 c	107.62±2.08 d
U3	103.93±0.59 b	999.44±1.05 a	697.29±2.21 a	107.39±1.47 d
U4	84.32±2.11 c	900.42±7.74 bc	679.25±0.67 b	104.03±1.79 e
U5	82.97±1.01 c	876.27±0.55 bc	701.23±1.41 a	91.14±0.87 f

*means in the same raw with the same letters are not significally different ($p<0.05$).**S1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with soxhlet apparatus;S2- methanol:water:acetic acid (95:4.5:0.5) with soxhlet apparatus;S3- aceton:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;S4- ethanol:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;U1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with ultrasonic water bath;U2- methanol:water:acetic acid (95:4.5:0.5) with ultrasonic water bath;U3- aceton:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U4- ethanol:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U5-water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath

Table 6: Total phenolicextracts, flavonol amounts, antioxidant capacity and values related to antiradicalactivity,Duncan multiplecomparison test results* (n:3) for wild basil (*Satureja hortensis*) extract.

	Total phenol (mg GAE/g)	Total flavonol (µg RE/g)	Antiradical activity (IC_{50}=µg/ml)	Antioxidant capacity (mg AAE/g)
S1**	23.13±2.68 e	920.95±4.45 c	1414.33±0.19 c	*82.97±2.58 e*
S2	38.68±2.55 d	540.54±5.36 d	792.70±0.61 g	74.28±1.73 f
S3	22.11±1.76 e	206.22±1.09 e	1773.30±1.03 b	99.53±3.11 b
S4	43.07±0.59 c	581.60±2.21d	833.25±0.19 e	88.32±2.45 d
U1	44.76±1.17 c	1056.20±5.28 b	805.11±0.44 f	93.05±0.83 c
U2	48.14±0.59 b	1016.35±3.63 b	794.07±1.13 fg	97.40±1.27 b
U3	71.13±1.55 a	1280.83±2.47 a	691.64±1.67 h	107.77±2.38 a
U4	44.09±0.59 c	1030.84±3.81 b	879.19±1.73 d	77.40±0.35 f
U5	11.49±0.59 f	548.99±4.56 d	1903.56±0.72 a	27.73±1.72 g

*means in the same raw with the same letters are not significally different ($p<0.05$).**S1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with soxhlet apparatus;S2- methanol:water:acetic acid (95:4.5:0.5) with soxhlet apparatus;S3- aceton:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;S4- ethanol:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;U1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with ultrasonic water bath;U2- methanol:water:acetic acid (95:4.5:0.5) with ultrasonic water bath;U3- aceton:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U4- ethanol:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U5-water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath

Table 7: Total phenolicextracts, flavonol amounts, antioxidant capacity and values related to antiradicalactivity,Duncan multiplecomparison test results* (n:3) for Hispanic Thyme (*Coridothymus capitatus*) extract.

	Total phenol (mg GAE/g)	Total flavonol (µg RE/g)	Antiradical activity (IC_{50}=µg/ml)	Antioxidant capacity (mg AAE/g)
S1**	84.32±1.55 c	527.26±4.95 a	818.01±1.16 e	*88.24±1.00 b*
S2	86.35±1.55 c	435.48±2.02 b	792.60±0.87 f	87.17±0.48 b
S3	94.13±2.68 b	567.11±1.11 a	863.64±0.57 d	83.81±1.08 c
S4	93.79±2.11 b	475.33±2.88 b	727.53±0.88 g	92.44±1.08 a
U1	94.13±1.01 b	535.71±3.02 a	971.12±1.04 c	76.34±1.15 e
U2	87.03±2.68 c	445.14±2.00 b	872.58±0.61 d	79.69±0.35 d
U3	104.94±3.10 a	568.32±0.21 a	964.17±6.48 c	83.89±3.10 c
U4	74.18±1.55 d	325.58±0.21 c	1021.45±0.12 b	63.82±1.87 f
U5	36.31±3.66 e	532.09±1.38 a	1081.58±1.65 a	52.46±0.93 g

*means in the same raw with the same letters are not significally different ($p<0.05$).**S1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with soxhlet apparatus;S2- methanol:water:acetic acid (95:4.5:0.5) with soxhlet apparatus;S3- aceton:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;S4- ethanol:water:acetic acid (95:40:4.5:0.5) with soxhlet apparatus;U1- methanol:aceton:water:acetic acid (55:40:4.5:0.5) with ultrasonic water bath;U2- methanol:water:acetic acid (95:4.5:0.5) with ultrasonic water bath;U3- aceton:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U4- ethanol:water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath;U5-water:acetic acid (95:40:4.5:0.5) with ultrasonic water bath

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