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Determination of Some Chemical Constitutes of Oak Plants *(Quercus spp)* in the Mountain Oak Forest of Sulaimani Governorate

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Abstract:

*In this research work some chemical constitutes of Oak species were evaluated as a natural products in acorn, pericarp and cupules in the tree oak species (**Quercus aegilops, Q. infectoria and Q. libani**).*

The plant sample was collected in Khamza location district of Sulaimani Governorate during October-November 2004.

The preliminary chemical detection for the composition in acorn, pericarp and cupules in each of the three species showed the presence of flavonoid, alkaloid, glycosides, tannins, phenolic compounds, resins, saponins, terpenes and steroid while the detection gave a negative results for alkaloids and saponins in acorn of the three test oak species.

Total phenols conc. was determined by folin-cioculate method, while the total tannins were determined by radical diffusion method after extraction by dissolving samples in acetone (70%). Results indicated the existence of significant differences in total phenols and total tannins, conc. at 5% LSD among the fruit parts and species, indicating that pericarp of Q. aegilops contain the highest conc. of total phenols and total tannins, reaching (268.38 and 180.814 mg/g) respectively. Conc. of these compounds in cupules of Q. infectoria were the lowest reaching (171.49 and 51.802 mg/g) respectively.

Ellagic acids were separated and determined using HPLC technique (high performance liquid chromatography), column (BD-C-18) type and mobile phase (0.01 M potassium phosphate buffer, methanol 70:30 v/v) after extraction by methanol (80%). The acorn of Q. infectoria contained the highest conc. of ellagic acid (5.168 mg/g) while cupules of Q. libani contained the lowest conc. of these compounds (1.310 mg/g).

Keywords: Various Oak species (***Quercus aegilops, Q. infectoria and Q. libani***), acetone and methanol extraction, HPLC, folin-coiculate and radical diffusion method determination.

Introduction:

Oaks are one of the important trees, distributed in many regions of temperate zone in the world. They are source of raw materials, for some useful products to human race [1]. The species of oak, the (Quercus genus), are classified under the family Fagaceae. Four species of oak (***Q. aegilop, Q. infectoria, Q. libani and Q. Marcantherea***) are grown in the Iraqi Kurdistan Forest [2].

Oaks contain about 25-28 chemical compounds. These include tannic acid, egallic acid, ellagic acid, monoterpens, p-coumarin, vanillic acid, tolune and kaempferol [3]. These Quercus species contain secondary products such as poly phenolic compounds; tannins are ellagic acids which are considered to be a great importance in medicinal, pharmaceutical, antimicrobial and anti disease[4]. In a study of Iranian oaks; identified ***Q. infectoria, Q.***

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libani and Q. marcantherea [5]. In Turkey 25 species of Quercus have been recognized including ***Q. aegilops, Q. infectoria and Q. libani*** [6]. In Syria and Jordon three species have been recorded i.e. ***Q. aegilops, Q. infectoria and Q. libani*** in addition to other species distributed naturally in these countries [7].

Oaks tree can be seen in many places in the northern mountain forest of Iraqi Kurdistan which lays between 1000-2700 m.a.s.l contours [2]. This region naturally divided into two district zones, the forest zone and the thorn cushion zone [8].

The formal study of herbs, called herbology, dates back to the ancient culture of the Middle East; China and India. These cultures revered the power of nature and developed herbal remedies based on the plants found in their home environments. Written evidence of the medicinal use of herbs has been found of Mesopotamian clay tablets and ancient Egyptian papyrus [9]. Herbal therapy is also a major component in India's Ayurvedic medicine, traditional Chinese's medicine, Native American medicine, homeopathy and naturopathy. In the united state, herbal remedies handed down from European settler and learned from Native Americans were a mainstay of medical care until the early 1900S. The rise of technology and the biomedical approach to health care eventually led to the decline of herbal medicine [10].

Because of relevant studies in Iraq are rare, this research work aimed to detecting some chemical compound existing in acorn, pericarp and cupules of the three oak species grown naturally in Iraqi Kurdistan, such as glycoside, flavonoid, tannins, saponins, alkaloids, resins, terpens and steroid. In addition of quantitative determination of total phenols, total tannins and ellagic acid from acorn, pericarp and cupules of the test oak species.

Material and Method:

The samples of the three oak species ***Q. aegilops, Q. infectoria and Q. libani*** were collected during the growing period extend from October to November in 2004 from Khamza region. The studied site is located at bench mark of 35° $\bar{2}$ $\bar{\bar{4}}$ N, 45° $\bar{15}$ $\bar{\bar{27}}$ E, with altitude of 1333 m. a. s. l with a slop of 26° NE, Khamza site is located 21km NE of Sulaimani city.

Plant samples were identified in the location depending on the variation among the plant species description. Variation in leaves, acorn, cupules, shape size and the presence of the plants at different altitudes [1, 8, 11].

The samples were air dried in botany research laboratory at the department of biology. Sulaimani University at room temperature, ground to fine powder by electric blender, then stored in plastic containers at 4C°.

The aqueous extract of each sample was prepared by soaking 15g of the dry powdered sample in 100ml of double distilled water (DDH_2O) for 24 hours. The extract centrifuged for 10 min. at 2500 rpm. then filtered using Wattman filter paper No. 42. All extract were placed in rotary evaporated under vacuum at 30C°; then lyophilized (freezer dry) to obtain dried extract. One gram of dry powdered extract was dissolved in 5ml DDH_2O. A standard procedure for identification of the various classes of active chemical constituent was used [12]. Alcoholic extraction are similar to aqueous extraction expect using 70% ethanol instead of DDH_2O [13]. The preliminary detection of some chemical

composition were performed such as flavonids that l0g of dry powdered extract (A) was dissolved in 5ml of ethanol 95% filtered; then Aliquot of 10ml of KOH 50% was added to 10ml ethanol 50% (B), equal volumes from (A) and (B) solution were mixed, a yellow color was developed indicating the presence of flavonoid [14].

Glycosides detected by a portion of the aqueous filtrate of each plant extracts, 1ml was placed in a clean test tube, treated with 2ml fehling reagent [1ml of fehling A + 1ml of fehling B (15)] placed in a water path for 10 minutes till boiling; then cooled. The appearance of red-brown precipitate indicated the presence of saccharides. Retreated by adding 1ml of the aqueous plant extract to 5ml [Benedict's reagent (15)]. Appearance of red precipitate indicated the presence of saccharides. Addition of few drops of [kedde reagent (16)], confirmed the presence of the glycoside. Since violet-blue coloration in each extract indicated the presence of glycoside [17].

Phenolic compound detected by a portion of the aqueous filtrate of each plant extract, 5ml was added to 1-2 drops of 1% of ferric chloride. A blue-green coloration in each extract indicated the presence of phenolic compounds [18].

Resins detected by 10ml methanol 95% was added to 1g dry powdered extract placed in water bath for 2 minutes, filtered; then 20ml of DD H_2O were added and mixed with 4% HCl [17].

Tannins detected by dried powder sample 0.5g were boiled in 20ml DD H_2O in test tubes; then filtered. A few drops of 0.1g ferric chloride ($FeCl_3$) were added to the filtrate. A blue-black or brownish-green precipitate confirmed the presence of Gallic tannins or catechol tannins respectively [19].

Alkaloids detected by a small portion 0.2ml of the extract was stirred and placed in 5ml 1% of HCl on a steam bath, then 1ml of the filtrate was treated with 1-3 drops of Mayer's reagent and appearance of white precipitate was evidence for the presence of alkaloid [19].

Terpenoids detected by 5ml of each extract was mixed with 2ml chloroform. 3ml of conc. sulfuric acid (H_2SO_4) was carefully added to form a layer. A reddish-brown coloration of the interface was formed to prove the presence of terpenoid[20].

Steroid detected by ethanolic extracts of each samples 0.5ml with 2ml (H_2SO_4) were added to 2ml acetic acid anhydrate. Color change from violet to blue or green in samples indicating the presence of steroids [20].

Total phenol were extracted with aqueous acetone 70%, 5g of dried samples were extracted with 100ml methylene dichloride (MDC) for 1h. with occasional stirring to remove pigments, lipid …etc then; air-dried in hood overnight. Dry samples were ground in Wiley mill to pass through 20 meshes (size of the sieve) then; extracted 3 times with 80ml of 70% aqueous acetone for 2 hours with continuous stirring. 4g of (Na_2SO_4) were added to each extract to remove water from the samples (Dehydration). The extracts were centrifuged for 20 minutes at 2000 rpm to precipitate all debris. All extracts were pooled and rotary evaporated under vacuum at 30C° to remove acetone. Extracts were partitioned first with 80ml hexane then; 40ml (MDC) to remove non pigment and non polar materials using separation funnel then; rotary evaporated to remove

the solvent, 10ml ethanol was added to the extracted sample gradually and kept in the dark glass in the deep freezer until use. Total phenolic content in acorn, pericarp and cupules extracts was determined by a modification of the folin-ciocalten method [21]. Determination of total phenol with folin-ciocalten reagent is based on the reaction between phenols and oxidizing agent phosphomolybdate which results in the formation of a bluish complex. The intensity of the color was measured in a spectrophotometer at 650nm. One ml of the extract placed in a graduated test tube, 3ml of folin-ciocalten reagent was added. The tube were shaken and heated in a boiling water bath for 1min., cooled under a running tap water then; diluted to 25ml with DD H_2O, absorbance was measured at 650nm. When precipitation occurred, the solution was filtered or centrifuged before measurement. Three replicates of each sample were analyzed and the average was used as final reading. A standard curve was prepared on the bases of known conc. of tannic acid.

Total tannic acid of acorn, pericarp and cupules extracts were determined by radial diffusion assay in the three oak species [22].

Ellagic acid extracted by 5g of hydrolyzed material samples from each plant in the three tests oak species with 100ml of 80% methanol at 30C° for 24 hours using soxhlet extractor. The extract was evaporated to be gum which then; dissolved in 30ml of water acidified with a drop of 1M sulfuric acid and 0.1% triethylamine. A layer of n-butanol 30ml was added and the mixture was heated under reflux for 5 hours, after standing of room temperature for 24 hours, the crude ellagic acid was collected by filtration from butanol layer as solid crystal and recrystallised with 5ml pyridine [23]. Ellagic acid was separated from sample extracts of the three test oak species using a method described by [24].All samples were tested by taking 1ml from each extract and added to 1ml mobile phase. After mixing in vertex, 5ml was injected into (HPLC) and compared to three retention time. The area was calculated for each peak and compared with the known conc. of the prepared samples.

The conc. in several parts of Q. spp was calculated as follows:

$$Conc.\ of\ samples\ \ \mu g/ml = \frac{Area\ of\ sample}{Area\ of\ stan.dard} \times conc.\ of\ stadard$$

Statistical analysis was conducted using [CRD] in a factorial design with three replication. Means were compared using LSD at probability of 5% [25].

Results and Discussion:

Results revealed the presence of Glycoside, Alkaloida, Tannin, Saponins, Flavonids, Resin, Terpenes, Steroids and phenolic compounds in fruit parts of ***Q. aegilops, Q. infectoria and Q. libani.***

Glycosides are regarded as important compounds in plants. They represent a source for storing carbohydrates which in turn play important role in photosynthesis and regulation of osmotic pressure and also play important role in transfer of necessary materials for food assimilation in plants. It also plays a role in preventing plants from infection by insects and pests [18].

To detect glycosides in plant, the addition of Bendect reagent and Feheling reagents showed the appearance of red and blue precipitates, when Keede reagent was added, the presence of glycosides in each

fruit part of the three oak species was confirmed [17].

The presence of tannin in plant is detected by formation of a jelly precipitate when lead acetate is added to the plant extract, but the presence of phenols in plant is detected by adding 10% Alcoholic $FeCl_3$ to the plant extraction with formation of a green- blue color [26].

To detect flavonoids in plant, the addition of KOH to alcoholic extract led to formation yellow color and this was a resultof the presence of flavonoids in fruit parts. Similar results were recorded by [27]).

This study revealed the presence of alkaloids in pericarp and cupules of the test oak species (Table 1). Orange white precipitates are formed when Drangdroff and Mayer reagents were added to plant extracts respectively; brown precipitate appeared when Wagner's reagent was added. These results confirmed the presence of alkaloids in fruit parts. While the detection gave negative results of alkaloids in acorn of the test oak species.

Saponins are chemical compounds composed of tritrepines and steroids [28]. The indicated positive results of saponins in pericarp and cupules of the test oak species by shaking the aqueous extract and the appearance of turbidity [18, 27]. Results also revealed the absence of saponins in acorn of the three oak species since the frothing was not formed when the aqueous extract was shaked.

Resins are commonly called gum; they differ according to their nature and from species to species. Resins generally have defense function in plants [18]. The appearance of turbidity in alcohol extract after adding acidified water indicated the presence of resins in the all fruit parts of the test oak species.

The brown precipitate was formed when chloroform was added to alcoholic extract with few drops of H_2SO_4 . This positive test indicated that the plant contains terpenes.

The results also showed that the fruit parts of test oak species contain steroid because blue-green color appeared in alcoholic extract when anhydrate glacial acetic acid was added to this extract.

Table (2) shows the total phenol concentration in acorn, pericarp and cupules of ***Q. aegilops, Q. infectoria and Q. libani.*** Samples were collected during October to November. This period of the year played a major and important role in expression of total phenol concentration in three parts, since it is considered as the final stage for fruit maturation.

This study showed highly significant differences among species. ***Q. aegilops*** had the highest level of total phenol 232.58 mg/g, while ***Q. infectoria*** had the lowest 193.08 mg/g among the three species because there are great differences in the fruit maturation among different species of oak plant in Iraq, these differences in the period of fruit maturation of ***Q. infectoria*** may reach up to one month [29]. According to this, the content of total phenol levels is lowest if compared with the other species, because during the fruit maturation these compounds are used to release energy by oxidation [30].

Significant differences among the fruit parts were found; pericarp had the highest level of total phenol 236.64 mg/g. cupules were the lowest 202.35 mg/g among other parts, because the fruit hard sheath (pericarp) may be divided into an exocarp of highly lignified cells and a mesocarp

Table 1: Preliminary detection of some secondary compounds in the three oak species.

Active Compounds	Testing Method		Species and fruit parts								
	Reagents Used	Color	*Q. aegilops*			*Q. infectoria*			*Q. Libani*		
			acorn	Pericarp	Cupules	acorn	Pericarp	Cupules	acorn	Pericarp	Cupules
Glycosides	Benedict Reagent	Red- precipitate	+	+	+	+	+	+	+	+	+
	Fehling Reagent	Red- precipitate	+	+	+	+	+	+	+	+	+
	Keede Reagent	Violet-blueprecipitate	+	+	+	+	+	+	+	+	+
Alkaloid	Dragendroff Reagent	Orange-precipitate	-	+	+	-	+	+	-	+	+
	Mayer Reagent	White- precipitate	-	+	+	-	+	+	-	+	+
	Wagners Reagent	Brown-precipitate	-	+	+	-	+	+	-	+	+
Tannins	Ferric Chloride (0.1%)	Blue-green coloration	+	+	+	+	+	+	+	+	+
	Lead acetate (0.1%)	White-gelatinize precipitate	+	+	+	+	+	+	+	+	+
Saponins	Shaking Vigorously for aqueous plant extract	Appearance of Foam	-	+	+	-	+	+	-	+	+
Flavonoids	Ethanol (50%) + KOH (50%) added to ethanolic extract	Appearance of Yellow color	+	+	+	+	+	+	+	+	+
Resin	Ethanolic extract added to distilled water mixed with (4%) HCl	Turbidity	+	+	+	+	+	+	+	+	+
Terpenes	Ethanolic extract+ chloroform + (1) drop H_2SO_4	Reddish-brown color	+	+	+	+	+	+	+	+	+
Steroids	Ethanolic extract+ acetic acid anhydrate + (1) drop H_2SO_4	Blue or green color	+	+	+	+	+	+	+	+	+
Phenolic compound	Ferric chloride(1%) + Aqueous extract	Blue-green color	+	+	+	+	+	+	+	+	+

(+): Positive Test , (-): Negative Test

and endocarp of parenchyma cells, the lignin's are considered polyphenol compounds [31].

The interaction of plant species and fruit parts showed significant differences in total phenol. The highest concentration appeared in the pericarp of ***Q. aegilops*** 268.38 mg/g compared with all other parts in the species. The lowest concentration was found in cupules of ***Q. infectoria*** 171.49 mg/g.

High total phenol concentrations found in young leaves of Q. gambelii and this amount decreased as plant matured. Results indicated that variation in total phenol concentration among species might be due to genetic variation and as a result of environmental factors [32]. Cold and humid climate may increase the total phenol concentrations cause an increase in the respiration process (burning of carbohydrates) and this will obstacle glycosylation process [33].

Phenolic compounds are usually concentrated in some plant parts such as leaves, fruits, bark and stem. They rarely present in immature fruit and disappear at maturation [34]. It was concluded that the fruit might be used to energy from oxidation of these compounds in metabolic process, and phenolic compounds are also a source of acidity in the fruit [30]. These compounds act as a protective barrier at the period of plant growth. Finally, these compounds may disappear or concentrate as final product of secondary metabolic process of mature plants such as xylem, bark and galls.

The total phenolics in acorn from different species of oak, namely, Q. alba, Q. velutina, and Q. rubra. Q. velutina was found to have the highest level of total phenolics and Q. alba was the lowest among the three species [35].

A comparison of total phenol contents in some important oak species revealed that the heartwood of Q. petrea and Q. robur with 39.3 and 62.6 mg/g were rich in total phenols in Q. rubra is about 24 mg/g and the bark of Q. robur also contains 25 mg/g phenols [36]. Thus these values are similar to Q. vulcanica which was about 25.26 gm/g in bark, 4.41 mg/g in sapwood and 6.83 mg/g in heartwood [37]. On the other hand, various sapwood and heartwood samples of Q. cerris, contained total phenols ranged between 3 and 15 mg/g wood [38]. The plant parts play a major role in total phenol concentration in ***Q. aegilops***. He concluded that leave contain the lowest amount of phenolic compounds than branches [39].

There were considerable differences in the contents of total phenol compounds among these species, and the three species under studied these variation return to sampling seasons within each species, the environmental and genetic factor may also affect the variability in total phenol concentration in each species. The concentration of these secondary compounds may change as plants mature because of the physiological changing occurring during the plant growing cycle, Soil type, fertility and water supply are known to affect total phenol levels in plants. Moreover, species vary in their response to climatic and physiological changes. Induced changes in the chemical composition particularly, in the concentration of the secondary compounds like phenolics may occur [40].

Table 2: Total phenolic concentration (mg/g) in three fruit parts of *Quercus Spp.* Folin-Ciocalteau assay, expressed as tannic acid equivalents.

Species	Fruit Parts			
	acorn	pericarp	cupules	Mean
Q. aegilops	231.926 c	268.38 a	197.43 e	232.58 a
Q. infectoria	213.11 d	194.64 e	171.49 f	193.08 c
Q. libani	187.29 e	246.90 b	238.14 bc	224.12 b
Mean	210.77 b	236.64 a	202.35 c	

Means with similar letters indicate non-significant differences.

LSD value at level 5% for parts and species = 8.124

LSD value at level 5% for interaction (parts × species) =14.7

Results revealed significant differences in tannin concentration among the acorn, pericarp and cupules of ***Q. aegilops, Q. infectoria and Q. libani*** during vegetative growth (Table 3), the highest tannin concentration was recorded in acorn and pericarp 116.928 mg/g, 118.207 mg/g respectively, while the lowest was recorded in cupules 98.571 mg/g.

Significant differences were found in tannin concentration among the test species. ***Q. aegilops*** contained the highest concentration of tannin 158.229 mg/g, while ***Q. infectoria*** accumulated the lowest level of tannin 66.429 mg/g.

The interaction of plant species and fruit parts showed significant differences in tannin concentration, the highest concentration appeared in the pericarp of ***Q. aegilops*** 180.814 mg/g, while the lowest concentration was in the cupules of ***Q. infectoria*** 51.802 mg/g. Some studies confirmed the presence of tannins in different parts of oak species. The tannins were present in the young leaves of Q. gambelii in concentration about 111 mg/g and 87 mg/g in mature leaves [32]. While the tannins concentration is about 79 mg/g in young leaves and 54 mg/g in mature leaves of Q. grisea [41]. The highly significant variation in tannin accumulation were found among sites, sampling dates and plant parts from normal oak trees of ***Q. aegilops*** in Singular and Makloob mountains [39].

Thus, variation in concentration among the species and parts appears due to the environmental and genetic factors affecting the vegetative plant growth [39].

Table 3: Total tannins concentration (mg/g) in three fruit parts of *Quercus Spp.*
Radial diffusion assay, expressed as tannic acid equivalents.

Species	Fruit Parts			
	acorn	pericarp	cupules	Mean
Q. aegilops	149.907 b	180.814 a	143.968b c	158.229 a
Q. infectoria	91.339 d	56.146 e	51.802 e	66.429 c
Q. libani	109.539 d	117.663 cd	99.943 d	109.048 b
Mean	116.928 a	118.207 a	98.571 b	

Means with similar letters indicates non significant differences.

LSD value at level 5% for parts and species = 16.584.

LSD value at level 5% for interaction (parts × species) = 28.723.

Ellagic acid is a phenolic compound found in oak plants in the form of hydrolysable tannins called ellagitannins. Ellagic acid is a very stable compound and is readily absorbed through the gastrointestinal system in mammals, including humans.

The chromatogram that shows standard ellagic acid at 25µg/ml, with a retention time Rt, 5.383 minutes.

HPLC analyses were recorded presence of ellagic acid in acorn of Q. ***aegilops, Q. infectoria and Q. libani***, with a Rt, 5.14, 4.842 and 5.058 minutes respectively, but the analysis revealed the presence of ellagic acid in pericarp of the three oak species, with a Rt, 5.162, 4.778 and 5.258 minutes respectively. While the presence of ellagic acid in cupules of the test oak species, with a Rt, 4.665, 4.992 and 5.2 minutes respectively. HPLC revealed the presence of ellagic acid in the extracts as is shown in (Table 4), ellagic acid was present at the highest level in acorn of ***Q. infectoria*** 5.168 mg/g and the lowest level in cupules of ***Q. libani*** 1.310 mg/g. It is clear from the study that the ellagic acid was present at high concentration in acorn compared with other parts. Low concentration in cupules was recorded in the three species under study. A comparison of ellagic acid contents in some important oak species revealed that the heartwood of Q. alba contain 2.3 mg/g, Q. prinus of heartwood contain 1.2 mg/g and the callus of Q. alba, also contain 3.7 mg/g, thus these values are similar to the values of ellagic acid of the test oaks [42].

The ellagic acid analysis confirmed that differences exist in oak tannins concentrations which vary between oak species according to their geographical location [44].

Table 4: Ellagic acid concentration (mg/g) in the three fruit parts of *Quercus Spp.*

Species	Fruit Parts		
	acorn	pericarp	cupules
Q. aegilops	3.565	2.209	2.171
Q. infectoria	5.168	2.900	2.101
Q. libani	3.721	1.419	1.310

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دیاریکردنی هەندێك ئاوێتەی کیمیاوی لە ڕووەکی بەڕوو لە ناوچە دارستانە شاخاوییەکانی شاری سلێمانی.

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پوختــە

لەم توێژینەوەیەدا هەوڵ دراوە بە دیاریکردنی ڕێژەی هەندێك لە ئاوێتە کیمیاوییەکان کە بەرهەم دەهێنرێت لەلایەن ڕووەکی بەڕووەوە وەك بەرهەمێکی سروشتی لە بەرو تووێکڵی بەرو کلاوەی بەر لە هەرسێ جۆری بەڕوودا (*Q. aegilops, Q. infectoria and Q. libani*).

کۆکردنەوەی نموونەی ڕووەکەکان لە ناوچەی خەمزەی شاری سلێمانی بووە لەنێوان مانگی تشرینی یەکەم و تشرینی دووەمی ساڵی ٢٠٠٤.

هەڵسەنگاندنە سەرەتاییەکان لە بەرو تووێکڵی بەرو کلاوەی بەری بەڕوودا دەریان خست بەبوونی ئاوێتە کیمیاوییەکان وەك فلافینەکان، تفتەکان، گلایکۆسیدەکان، تانینەکان، پێکهاتەی فینۆڵەکان، ماددە ڕاتنجەکان، ماددە سابوونیەکان، تێرپینەکان لەگەڵ ستیرۆیدەکان. بەڵام ئەنجامی هەڵسەنگاندنی لە ماددە تفتەکان و ماددە سابوونیەکان لە بەری هەرسێ جۆرەکەدا نیگەتیڤ بوون.

چڕی تەواوی پێکهاتە فینۆڵییەکان دیاریکرا بە ڕێگەی (folin-cioculate) بەڵام تەواوی ماددە تانینییەکان دیاریکرا بە ڕێگەی (radial diffusion) دوای هەڵهێنجانی بەهۆی تواندنەوەی نموونەکە لە ئەسیتۆندا ٧٠٪. ئەنجامەکان دەریان خست بەبوونی جیاوازییەکی بەرجەستەیی لە کۆی چڕی پێکهاتە فینۆڵییەکان و تانینەکاندا لەسەر ئاستی ٥٪ بۆ هەردوو بەشە جیاوازەکانی بەرو هەروەها جۆرە جیاوازەکاندا.

هەروەها دەرکەوت کە چڕی پێکهاتەی فینۆڵ و تانین لە تووێکڵی بەری بەڕووی جۆری *Q. aegilops* زۆرترینە کە دەگاتە ٢٦٨,٣٨، ١٨٠,٨١٤ ملگم/گم یەك لەدوای یەك. بەڵام چڕی ئەم دوو پێکهاتەیە لە کلاوەی بەری بەڕووی جۆری مازوو *Q. infectoria* کەمترینە کە دەگاتە ١٧١,٤٩، ٥١,٨٠٢ ملگم/گم یەك لەدوای یەك.

ترشی ئیلاجیك (Ellagic acid) جیاکرایەوە و پێوانەی کرا بە بەکارهێنانی HPLC، ستوونی جۆری (BD-C-18) قۆناغی بزوێنەر (٠,٠١ مۆلار لە بەفەری فۆسفاتی بۆتاسیۆم و میپانۆڵ ٧٠:٣٠ ق/ق) دوای هەڵهێنجانی بەهۆی میپانۆڵی ٨٠٪. بەری ڕووەکی جۆری مازوو (*Q. infectoria*) چڕییەکەی لەم ترشە زۆرترین بوو کە دەگاتە ٥,١٦٨ ملگم/گم بەڵام لە کلاوەی بەری بەڕووی لەبەنی (*Q. libani*) چڕییەکەی کەمترینە کە دەگاتە ١,٣١ ملگم/گم.

تحديد بعض المكونات الكيمياوية في نباتات البلوط (Quercus Spp) في غابات جبال محاحظة السليمانية.

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الخلاصه

في هذا بحث تم تقيم بعض المكونات الكيمياوية التي تنتجها نباتات البلوط كانتاج طبيعي في الثمار والغلاف الثمار والكأس الثمار لثلاث انواع من البلوط (*Q. infectoria, Q. aegilops* and *Q. libani*).

النماذج جمعت في منطقة خمزة بمحافظة السليمانية خلال تشرين الاول والثاني لعام ٢٠٠٤.

اشارا التقديرات الاولية لهذه المكونات الكيمياوية في الثمار والغلاف والكأس للانواع الثلاث وجود فلافينات والقلويات وكلايكوسيدات وتانينات والفينولات والراتنجات والصابونيات والتربينات وستيرويدات ولكن تواجد القلويات والصابونيات في الثمار للأنواع الثلاث كانت سلبية.

التركيزات الكلية للفينولات تم تقديرها بواسطة طريقة (folin-cioculate) ولكن للتانينات الكلية تم تقديرها بواسطة طريقة (radical diffusion) بعد استخلاصها بواسطة ذوبان النماذج في اسيتون ٧٠٪.

النتائج دلت على وجود الفروقات المعنوية في تراكيز الفينولات والتانينات الكليتين على مستوى احتمالية ٥٪، من بين اجزاء الثمار والانواع، كما وأشار بأن غلاف نوع أجيولوبيس (*Q. aegilops*) تحتوي على الاكثر تركيزاً من الفينولات والتانينات الكليتين، حيث تصل ٢٨٦,٣٨، ١٨٠,٨١٤ ملغم/غرام على التوالي. ولكن تراكيز هذه المكونات في غلاف الثمار لنوع ئنفكتوريا (*Q. infectoria*) كانت الاقل حيث تصل ١٧١,٤٩، ٥١,٨٠٢ ملغم/غرام على التوالي.

فصلت حامض ألاجك (Ellagic acid) وتم تقديرها بواسطة HPLC، وعمود نوع (BD-C-18)، وطور الحروك (٠,٠١ مولار بفر فوسفات بوتاسيوم وميثانول ٧٠:٣٠ ح/ح) بعد استخلاصها بواسطة ميثانول ٨٠٪. ثمار (*Q. infectoria*) تحتوي على تراكيز الاكثر من حامض ئلاجك بلغت ٥,١٦٨ ملغم/غم بينما كأس ثمار اللبني (*Q. libani*) تحتوي على الاقل تركيزاً من هذه المكونات حيث بلغت ١,٣١٠ ملغم/غم.

وەرگیراوە لە ٢٠٠٨/١٠/٢٨ دا , و پەسەندکرا لە ٢٠١٠/٢/١٠ دا

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