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Spectrophotometric study of plant extracts *of Nerium oleander, Conocarpus lancifolins, Eucalyptus camaldulensis Dehnh, Vicia* and *Jasminum Humile* using set of different organic solvents

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Abstract:

Spectrophotometry scanning was conducted for plant extracts of *Nerium oleander*. *Conocarpus lancifolins*, *Eucalyptus camaldulensis Dehnh*, *Vicia* and *Jasminum Humile*. Spectrophotometric analysis methods (Ultra Violet and Visible rays) at range 200-800 nm were applied. Leaves were collected from different places at Nasiriyah city from March to April 2011. The cold extraction method was used through ethanol 95 %, acetone and petroleum ether. The aim of this study is to establish standard basic data about chemical composition of these extracts that could be used as a reference for other future studies.

Keywords: Spectrometric analysis, Ultra Violet, Acetone, Extraction methods.

Introduction:

The use of medical plants and herbs is very old, and it begun with human civilization at Summaries time since 2500 BC. The idea of use the herbal medicine appeared clearly at the 17th BC when there was found tangible indication and manuscript about treatment by herbal medicine. The usage of medical plants flourished at Saurian time and many Islamic philosophical were famous at this aspect such as Abu-Baker Al Razy (925-864) AC, Abincenna (980-1038) AC, and Abn-Al Bettar (1228) AC [1].

These plants contain materials that are generally: organic matter, water and metals. These materials are different according to types of plants .The general distribution in plants includes water 70 %, organic matter 23% and metals 3% [2].

Most of researchers focus on a study of organic content of extracts such as phenols, Glycosides, Tannins, aromatic, Carbohydrates, Triterpens, strolls and inorganic content of extracts due to its importance. These give the plant ability to build the organic material by photosynthesis so what the contents of plant have physiology and practical effects [3]. The main dominant factor for mineral features of plants is hereditary factor [4].

In Iraq, many studies have been carried out on these extracts, to investigate the ecology of these extracts and collect data on its abundance and distribution. Many methods have been used to isolate and identify these extracts [5.6]. Objective of this study is conducting spectrophotometry scanning of plant extracts of *Nerium oleander, Conocarpus lancifolins*, *Eucalyptus camaldulensis Dehnh, Vicia* and *Jasminum Humile* via using spectrophotometric analysis methods such as Ultra Violet and Visible rays at range 200-800 nm using set of different organic solvents in order to establish standard basic data about chemical composition of these extracts that could be used as a reference for other future studies.

Materials and Methods:

1- Samples collection and handling

Leaves of plant were collected from many places in Thi-Qar city, Iraq in April 2011. Leaves were washed separately under running tap water, followed by distilled water, then dried at room temperature in dark condition and milled electronically to coarse powder and stored until use [7].

2- Preparation of the extracts:

Cold extracts were prepared by extracting 20 g of plant powder with 200 ml of pure organic solvents. The extraction was carried out for 24 hours. Then the extract was filtered and concentrated to half of the original volume by air-drying. The residual solution was left in Petri dishes to dry at laboratory temperature. These steps have been repeated many times to obtain enough amount of crude extracts. Crude extracts were collected and kept in the laboratory until use [7].

3- Scanning tests:

Scanning qualitative tests have been carried out to know their general spectrum. These tests were conducted by spectrophotometer UV-Vis P.G T60U. The UV-Vis spectra of the prepared mixtures dissolved in organic solvents (measured against reagent blank as a reference) have been measured and data obtained was included in Table 2.

4- Statistical analysis:

Results were analyzed statistically using analysis of variance (ANOVA) and test of less significant difference among the extracts in the solvent one and among the solvents in extract one, according to the statistical system (SPSS). Values of standard deviation (SD) of the λ_{max} values for all extracts in the solvent one and for the all solvents in extract one, also were calculated as well as the correlation coefficient among all λ_{max} values at the confidence limits 95%.

Results and discussion:

Study of the UV-Vis Spectra of the plant extracts:

Plant extracts are sensitive organic reagents suitable for the spectrophotometric determination of ions of transition elements in trace concentration. The intensity of colored solutions formed from the dissolve of the plant extract with the organic solvents plays an important role for UV-Vis spectral studies. This is because of the presence of a sharp and high absorption peak, which belongs to the mixture. The large bathochromic shift of this peak in the visible region with respect to that of the extract may give a good indication on the mixture formation. This means that the mixtures have the ability to absorb light in the visible region.

Absorption spectra are mainly affected by the polarity of the solvent [8]. So taking into consideration this point the absorption spectra in the present investigation was studied in two polar solvents (acetone, ethanol 95%) and non-polar solvent (petroleum ether) [9]. Specific properties (dielectric constant, boiling point, and formula) of these three solvents are mentioned in Table 1.

Table1: Organic solvent properties [10]

Solvent	Formula	Boiling point	Dielectric Constant (20ºC)
Petroleum ether	C_5H_{12}	36ºC	1.844
Acetone	C_3H_6O	56ºC	20.6
Ethanol 95%	C_2H_6O	78ºC	22.4

After examining the results shown in Table 2 by comparing the λ_{max} value of plants extracts obtained by ethanol and acetone with the λ_{max} value of plants extracts obtained by petroleum ether regarding that ether petroleum extracts spectrum represents the spectrum of extracts compounds in pure case according to the fact non polar solvent does not affect packages absorption [11].

Table 2: Values of λ_{max} for extracts in different organic solvents (10%w/v)

Symbol	**Scientific name**	**λ_{max} (nm)**		
		Petroleum ether	**Acetone**	**Ethanol 95%**
A	*Nerium oleander*	564	554	576
B	*Conocarpus lancifolins*	537	543	534
C	*Eucalyptus camaldulensis*	432	456	498
D	*Vicia*	621	576	654
E	*Jasminum Humile*	603	546	587

The results of statistical analysis ($p < 0.05$) showed that there were significant differences among λ_{max} values of the plants extracts in ethanol, and the highest λ_{max} value of the plants extracts in ethanol was (621 nm) in *Vicia* extract and the less value was (432 nm) in *Eucalyptus camaldulensis* extract (Table 3).

Table 3: Mean and standard deviation of the λ_{max} values of all the extracts in all solvents

Extract	λ_{max} (nm)			Mean	SD
	Petroleum ether	Ethanol 95%	Acetone		
Nerium oleander	576	564	554	564.6	9.578
Conocarpus lancifolins	534	537	543	538	4.153
Eucalyptus camaldulensis	498	432	456	462	28.94
Vicia	654	621	576	617	33.91
Jasminum Humile	587	603	546	578.6	25.47
Mean	569.8	551.4	535		
SD	54.50	68.86	42.60		
Min	432				
Max	654				

Figure 1 explains that there was increase in the λ_{max} value of the extracts of *Jasminum Humile* and *Conocarpus lancifolins* in ethanol when compared to the λ_{max} value of the extracts in petroleum ether. That may be due to the presence of auxoghromic group (-OH) in the molecule of ethanol, which contains non bonding electrons attract each other with electrons π for chromophore in the compounds of extracts with an exchange of the type n→ π which leads to shift position of absorption bands towards the red area (bathochromic shift) [12],[13]. In extracts of *Vicia*, *Nerium oleander* and *Eucalyptus camaldulensis* in ethanol, low λ_{max} value were observed. This is probably due to the effect of solvent polarity on the position of the absorption bands that influence attraction electrostatic between the polar solvent with polar chromophore groups in extracts compounds, which leads to increased energy transfer $n \rightarrow \pi^*$ and thus eliminate the wavelength towards the blue area (hypochromic shift) [14],[15].

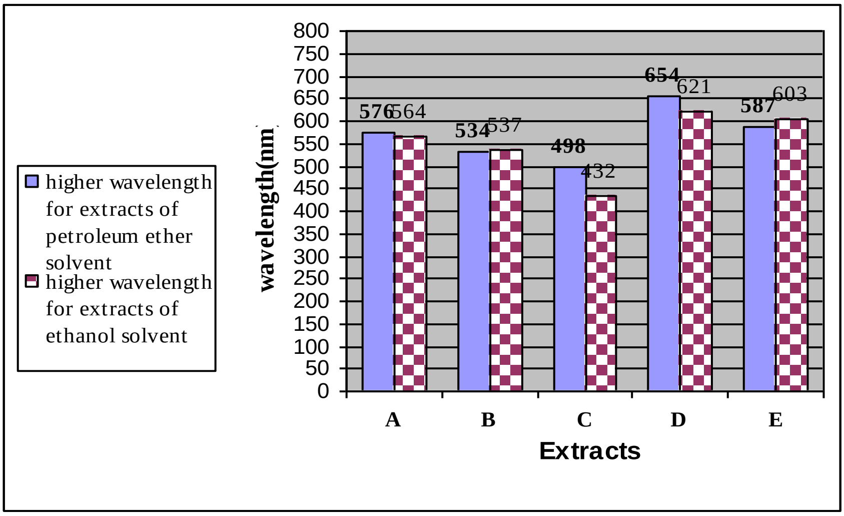

Figure 1: λ_{max} of the extracts of ethanol and petroleum ether

The results of statistical analysis showed that there was a significant positive correlation ($P < 0.01$) among λ_{max} values of the plants extracts in ethanol and λ_{max} values of the plants extracts in acetone ($r = 0.948$), and this goes back to the polar nature of each. Also the results of statistical analysis ($p < 0.05$) showed that there was significant differences among λ_{max} values of the plants extracts in acetone, where the highest λ_{max} value of the plants extracts in acetone appeared in the *Vicia* extract a (576 nm) and the lowest value was (456 nm) and appeared in the *Eucalyptus camaldulensis* extract.

Figure 2 shows that there was decrease in the λ_{max} value of the extracts in acetone for all plants used in this study, except for *Conocarpus lancifolins* when compared to the λ_{max} value of the extracts in petroleum ether. This may be due to the attraction electrostatic between the chromophoric groups in components of the extracts and polar solvent [15]. The high value of λ_{max} for extract of *Conocarpus lancifolins* in acetone was probably because of the phenomenon of succession between the chromophoric groups in extract compounds with the carbonyl group in acetone, where this sequence leads to the change the wavelength towards red region (bathochromic shift)[11], or may be due to the chromophoric group (carbonyl) in acetone attached to an aromatic ring in extract compounds [16].

Figure 2: λ_{max} of the extracts of acetone and petroleum ether

Also the results of statistical analysis ($P < 0.05$) showed that there were significant differences among λ_{max} values of the plants extracts in all solvents. The highest λ_{max} value of the plants extracts in all the solvents in *Vicia* extract in petroleum ether was (654 nm) and the lowest value was (432 nm), which appeared in *Eucalyptus camaldulensis* extract in ethanol.

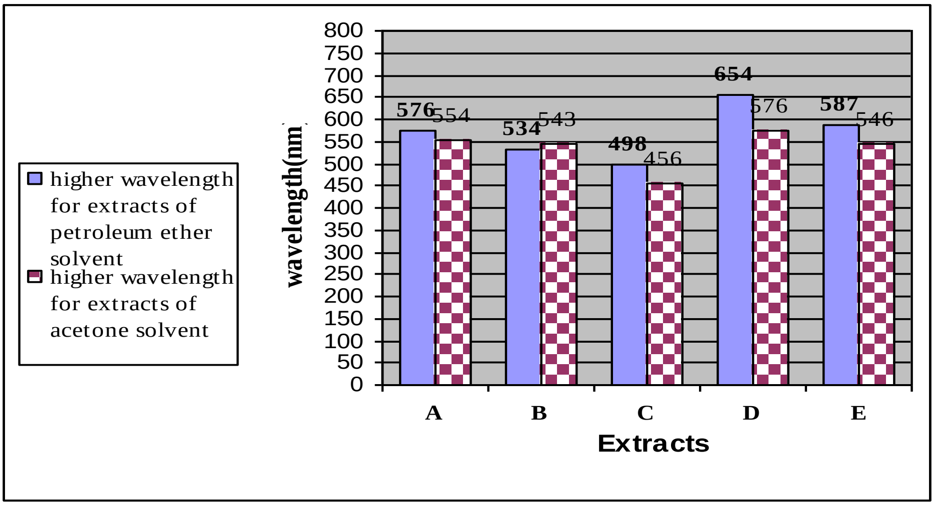

Figure 3 shows that there were differences among the λ_{max} values of the extracts in petroleum ether for all plants. The largest value has emerged in the plant of *Vicia* and the lowest value appeared in plant of *Eucalyptus camaldulensis*. This may be due to the presence of compounds aromatic polycyclic in extracts of *Vicia*, which lead to increase the λ_{max} value [14], and can come back this differences to the nature of organic compounds and mineral constituents of these extracts.

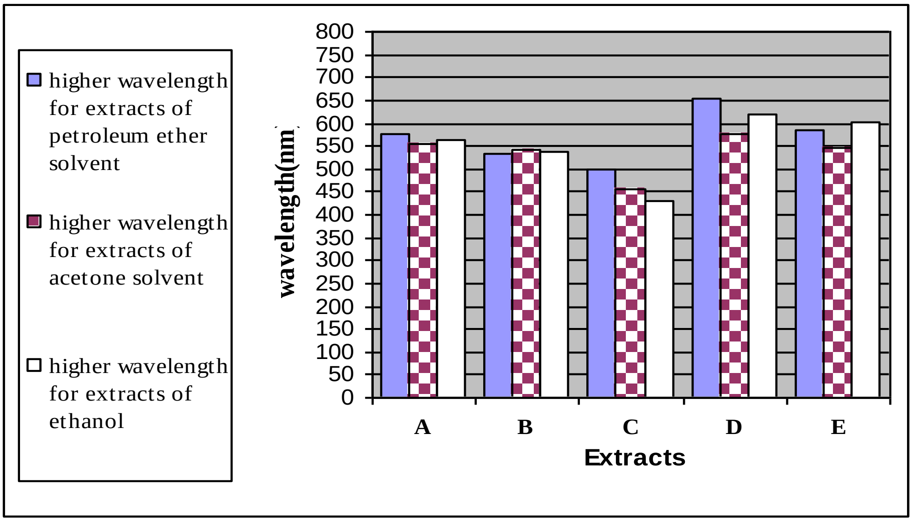

Figure 3: λ_{max} of the extracts in all solvents

The results of statistical analysis showed that there was a significant positive correlation ($p<0.05$) among λ_{max} values of *Nerium oleander* extract in all the solvents and λ_{max} values of *Eucalyptus camaldulensis* extract in all solvents ($r = 0.664$) and *Jasminum Humile* extract in all solvents ($r = 0.658$), and is positively correlated ($p<0.01$) with λ_{max} values of *Vicia* extract in all solvents ($r = 0.988$), as well as inverse significant correlation ($p<0.01$) with λ_{max} values of *Conocarpus lancifolins* extract in all solvents ($r = -0.908$). The results showed that there was inverse significant correlation ($p<0.01$) among λ_{max} values of *Conocarpus lancifolins* extract in all the solvents and λ_{max} values of *Vicia* extract in all solvents($r = -0.948$) and *Jasminum Humile* extract in all solvents ($r = -0.779$), as well as significant positive correlation ($p<0.01$)among values λ_{max} of *Vicia* extract in all solvents and the values λ_{max} of *Jasminum*

Humile extract in all solvents(r = 0.758), and this may be due to the differing nature of the compounds consisting of these extracts.

The results of statistical analysis showed that there was inverse significant correlation ($p<0.01$) among λ_{max} values of *Nerium oleander* extract in all the solvents and λ_{max} values of the plants extracts in ethanol (r = -0.783) and acetone (r = -0.836), and this means that for the purpose of obtaining the highest λ_{max} value of Nerium oleander extract and depending on the values of (r) for each of them preferred to use ethanol solvent in the extraction process.

The results also indicated that there was significant positive correlation ($p<0.05$) among λ_{max} values of *Conocarpus lancifolins* extract in all the solvents and λ_{max} values of the plants extracts in acetone (r = 0.652) and in ethanol (r = 0.585), and this means that for the purpose of obtaining the highest λ_{max} value of *Conocarpus lancifolins* extract and depending on the values of (r) for each of them preferred to use acetone solvent in extraction process.

The results showed that there was inverse significant correlation ($p<0.01$) among λ_{max} values of *Eucalyptus camaldulensis* extract in all the solvents and λ_{max} values of the plants extracts in acetone (r=-0.965) and in ethanol (r = -0.985), and this means that for the purpose of obtaining the highest λ_{max} value of *Eucalyptus camaldulensis* extract and depending on the values of (r) for each of them prefer to use the acetone solvent in extraction process.

The results explained that there was inverse significant correlation ($p<0.05$) among λ_{max} values of *Vicia* extract in all the solvents and λ_{max} values of the plants extracts in ethanol (r = -0.691) and an inverse relationship ($p<0.01$) with λ_{max} values of the plants extracts in acetone (r = -0.755), and this means that for the purpose of obtaining the highest λ_{max} value of *Vicia* extract and depending on the values of (r) for each of them preferred to use the ethanol solvent in the process of extraction.

The results showed also the absence of significant correlation among λ_{max} values of *Jasminum Humile* extract in all solvents with λ_{max} values of the plants extracts in the ethanol solvent and acetone solvent. This may be due to the nature of compounds consisting of the extract. Results also showed the absence of significant correlation among λ_{max} values of the plants extracts in petroleum ether and λ_{max} values of the plants extracts in other solvent. This possibly due to the nature of non-polar petroleum ether, which is different from the polar nature of both ethanol and acetone.

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دراسة طيفية للمستخلصات النباتية لنباتات الدفلة والكاربستا واليوكالبتوس والفيسيا والياسمين الأخضر باستخدام مذيبات عضوية مختلفة

جواد علي حسين
مديرية تربية ذي قار

الخلاصة :

تم أجراء مسح طيفي لمستخلصات أوراق خمسة أنواع من النباتات ، وهي نباتات الدفلة (*Nerium oleander*) والكاربستا (*Conocarpus lancifolins*) ونبات اليوكالبتوس (*Eucalyptus camaldulensis Dehn*) ونبات الفيسيا (*Vicia*) والياسمين الأخضر(*Jasminum Humile*) ضمن المدى (٢٠٠ـ٨٠٠) نانومتر لأطيافها المرئية وفوق البنفسجية و باستخدام مذيبات عضوية مختلفة .

جمعت الأوراق من مدينة الناصرية خلال المدة من اذار الى نيسان ٢٠١١، استخدمت طريقة المستخلص البارد باستخدام مذيب الايثانول بتركيز (٩٥٪) ومذيب الايثر البترولي والاسيتون، للحصول على المستخلص الخام لهذه الاوراق. الهدف من الدراسة هو وضع قاعدة معلومات طيفية قياسية حول التركيب الكيميائي لتلك المستخلصات يمكن الرجوع لها في دراسات مستقبلية أخرى.

الكلمات الدلالية :التحليل الطيفي ، الاشعة فوق البنفسجية، الاسيتون ، طرق الاستخلاص.