JOURNAL OF KUFA–PHYSICS
www.uokufa.edu.iq/journals/index.php/jkp | ISSN: 2077–5830

EFFECT OF DIFFERENT METHODS OF EXTRACTION ON OPTICAL PROPERTIES FOR DYE LANTANA CAMERA

***Fatima Hamid Malik** **Abdullah Abus. Hussein**

University of Basrah, Polymer Research Center, Materials Science Department.

*Corresponding Author E-mail: fatima.hameed16@yahoo.com

ARTICLE INF.:

Article history:
Received: 01 JUL, 2019
Accepted: AUG, 2019
Available Online: 25 DEC, 2019

Keywords:

Lantana Camara
Spin coating method
Optical properties
Ethanol
extraction

ABSTRACT

This work focuses on the two methods of extraction for dye plant Lantana Camara (ethanol and water), thin film was synthesized from two solvents by spin coating method on glass substrates. Theses dyes were characterized by the measurement of Fourier transform infrared spectrophotometer FTIR, the result showed that the film had the chemical structure for flowers of lantana camara of two methods in rang (4000-400 cm^{-1}). The measurement the optical properties of the films were studied by using UV spectrophotometer. The range absorbance spectrum has been recorded at wavelength with in the (300-1000) nm. The optical absorption (A) for the peak of ethanol was 0.93 in the wavelength 330 nm while for extraction water was 0.7 in the wavelength 330 nm ,determined the optical constants such, as absorption coefficient (α) was less than of 10^4 that value of ethanol and water extraction , an extinction coefficient (k) was low value between (0.2-0.25) .and was found optical energy gap from extraction water (2.4) eV ,and the optical energy gap of extraction of ethanol was found (2.25) eV.

DOI: http://dx.doi.org/10.31257/2018/JKP/2019/110210

تأثير طريقة استخلاص الصبغة عل الخواص البصرية لزهرة لانتانا كامرا.

فاطمة حميد مالك **عبدالله عباس حسين**

جامعة البصرة ، مركز ابحاث البوليمر، قسم علوم المواد

الكلمات المفتاحية:

لانتانا كامارا
الطلاء البرمي
خواص بصرية
ايثانول استخلاص

الـــخُـــلاصـــة

في هذا البحث تم استخدام طريقتين لاستخلاص صبغة ازهار نبات لانتانا كامارا (الاستخلاص المائي والاسخلاص الايثانولي) وتم ايضا تحضير اغشية رقيقة لكلا الطريقتين وحضرت الاغشية على قواعد من الزجاج وبطريقة الطلاء البرمي (spin coating) ، كما تم تشخيص الاغشية البوليميرية المحضرة بواسطة الاشعة تحت الحمراء FT-IR واظهرت ان النماذج المحضرة مجاميع فعالة واضحة ضمن مدى من(400-) . $4000cm^{-1}$. كما درست الخواص البصرية لجميع الاغشية المحضرة الامتصاصية (A) حيث وجدت قيمة الامتصاصية 0.93 عند الطول الموجي330nmلاغشية الايثانول بينما قيمة الامتصاصية لنفس الطول الموجي هو 0.7 لاغشية الاسخلاص المائي وكذلك معامل الامتصاص(α) والتي قيمتة امن 10^4 في كلا الطريقتين (باستخدام الايثانول او الماء)،وقيمة معامل الخمود(K) تكون قليلة ايضا" وتم حساب فجوة الطاقة البصرية E_g لاغشية الايثانول تكون 3.5 eV ولاغشية الماء 4.1eVv.

INTRODUCTION

Natural products have an important role throughout the world. One of this is *lantana camara* in term of Characteristically, Lantana camara commonly known as wild sage or red sage. evergreen aromatic, ornamental or hedge shrub of 1–2 m height (Fig. 1). The woody shrubs have 4-sided stems with spines. The rough textured leaves have serrate margin and release a strong odour when crushed. In florescences was multi coloured flowers arranged in whorls on heads. The hard green fruits in clusters ripen to fleshy black drupes. Red sage natural and dyes have wide variety, renewable, non-toxic, non-carcinogenic, non-poisonous, biodegradable, and non-hazardous to life (1,2,3). *This* dyes are renewable, easily available, compatible with the environment (4, 5). Lantana camara is a perennial flowering plant, native to tropical regions of the America and Africa. It is a somewhat hairy shrub that when bruised gives a spicy pungent odour. The aromatic flowers are borne in clusters and are a mixture of red, yellow, blue, lilac, white and orange florets.

The leaves are pointed at the tip, rounded at the base and toothed in the margins. They grow as a bush and can reach up to 6 feet tall and wide (6,7,8,9).

Many of researcher's extrication of lantana camara oil and studies he chemical constituents, antibacterial and modulatory activities of the essential oil of Lantana camara Linn. Extracted oils were used in practical applications and were used as a potential substitute for chemical pesticides in some markets (10,11). Its use for fuel ethanol production is recommended in various research findings (12), be a good potential source of raw material for paper making ,The inhabitants in the tropical region of Garhwali Himalaya use Lantana camara as fuel wood (13,14).

Lantana Camara In Medicine

plants have been considered as tremendous source for medicine. The plant extract was generally used in the medical field treatment of itches, cuts, ulcers, swellings, bilious fever, cataract, eczema and rheumatism, and myriad of triterpenes, steroids and aminoacids .

Scientific classification, Kingdom, Plantae, Order Lamiales **,**Family ,Verbenacea, Genus *Lantana*, Species *camara* (15).

Figure (1):flowers of Lantan camara.

Materials and Method

1. Materials

Fresh flowers of *Lantana camara* were collected from a garden in my house in Basra Iraq. Micron filters of 0.45 and 0.25 (sigma Al-drch).

Solvent (water, ethanol), glasses substance, acetone was (cleaning glasses).

2. .Dye extraction

First, petals were separated from the plucked flowers, weighed and rinsed thoroughly water to remove dirt and impurities. In order to extract dyes from the selected flower petals.

2.2 Extraction with Water:

Place the flowers in the distilled water for 3 days at 20: 2 ml at room temperature and place the solution in a water bath at 70 ° C within 30 minutes to speed up the extraction process and

filter the dye resulting from a laboratory filter paper (17).

The dye solution was deposited on a thoroughly cleaned glass substrates of dimensions of 25 mm, 25 mm and 1mm, to obtain thin films, by spin coating method.

3. Optical measurement

3.1. Absorbance of thin films

The absorption UV region (300-900)nm , was studied of the effect solvent ,ethanol and water for thin films of flowers dyes of lantana camara .

3.2. Optical constant.

3.2.1. Thickness of the thin films (D) :-

The Swanepoal equation was used to calculate the thickness of the thin films (D) prepared within the studied.

$$D = \frac{1}{2} * \frac{\lambda_1 * \lambda_2}{\lambda_2 * n_1 - \lambda_1 * n_2} \dots\dots\dots\dots\dots (1)$$

Where , λ_1 and, λ_2 is the wavelength Lower and higher

of sample.

3.2.2. Absorption coefficient(α):-

It was calculated according to Beer-Lambert's law:

α = (2.303A/d).....(2)

where, A is absorbance(19)

3.2.3. Extinction Coefficient (K):-

Extinction Coefficient (K), were calculated according to the relations (20).

$$k = \frac{\alpha \lambda}{4\pi} \dots\dots (3)$$

3.2.4. Optical Energy Gab (Eg):-

Optical Energy Gab (Eg), were calculated by if(21)

$$\Delta K = 0$$

αhv=α(hv-E_g)^2.....(4)

4. RESULTS AND DISCUSSION

4.1. FT IR absorption spectroscopy

absorbance spectra of dye flowers Lana camara ,in the frequency range between 400 and 4000 cm^{-1} are shown in Figure (2 , 3).

The spectra were showed band at 2925 cm^{-1} assigned to aliphatic (C–H). Broadband resulting from hydroxyl group stretching (O-H) at 3417.9 cm^{-1} (Fig. 2) .

From the (Fig.3) the band at 3422cm-1 was showed a week band to terminal hydroxyl group

(O-H) of and sharp band at 2886.9 to aliphatic (C–H) of extracted natural dye.

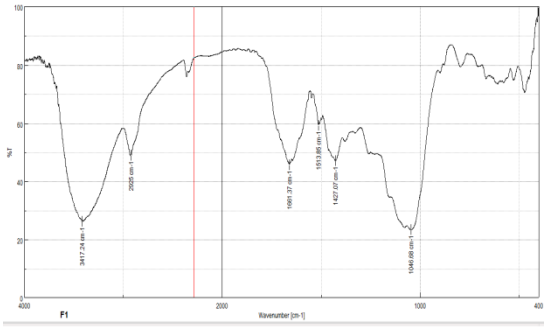


Figure (2):FTIR of extraction ethanol .

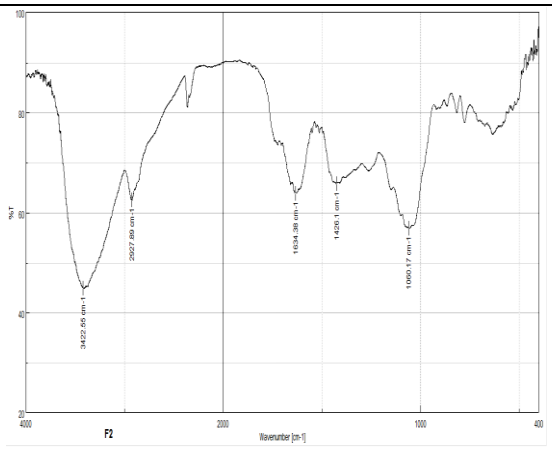


Figure (3):FTIR of extraction water

4.2. UV –VIS Spectrum

Optical characterization of the dye gives information about other physical properties, e.g. band gap energy and band structure, optically active defects etc. and therefore may be of

permanent interest for several different applications.

The absorbance spectra of the Water solution dye in 300 nm wavelength and had a greater absorbance at 0.93, agree with (Ram Govindan 2012). We note the used of ethanol in 0.07 at the same wavelength, while absorption values remain stable within the wavelength range of (500-900) nm. seen figure (4) and figure (5).

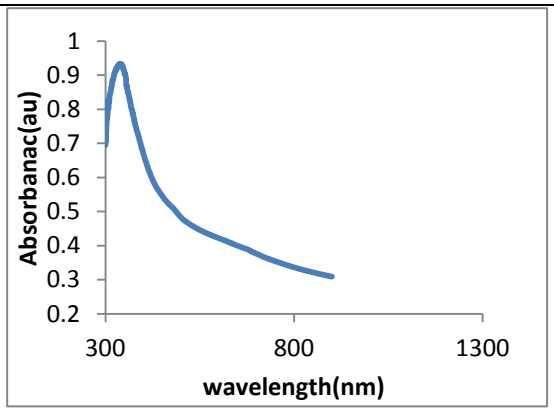
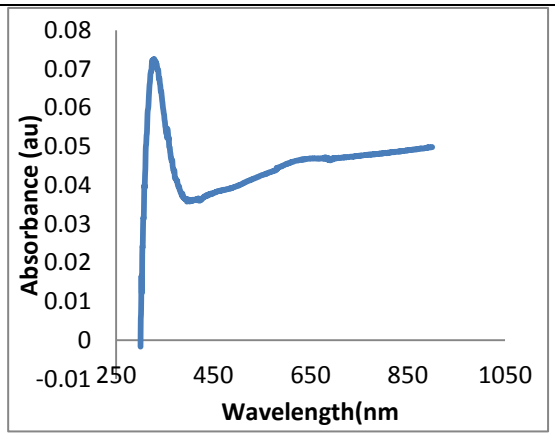


Figure (4):The absorbance spectra as function wavelength of extraction water.



Figure(5): The absorbance spectra as function wavelength of extraction ethanol.

In Figure (6,7), found absorption coefficient less than 10^4 and this determines type of electronic transitions that were indirect, can be applied Equation (3) to calculate energy gap. Also, the behavior of the absorption coefficient is similar to the absorption behavior, because the relationship was positive between them.

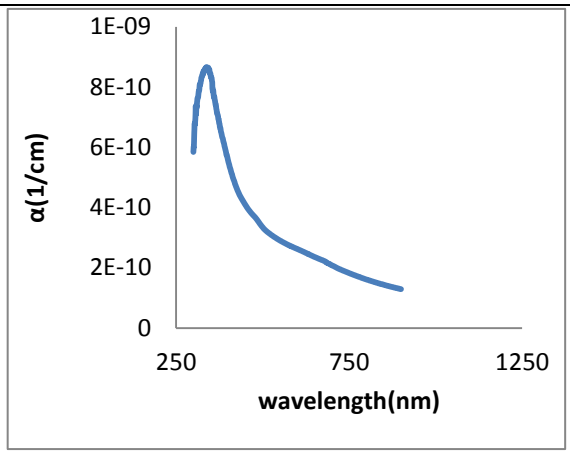


Figure (6): Absorption coefficient of thin films ethanol extraction of flowers lantana camara of function of wavelength

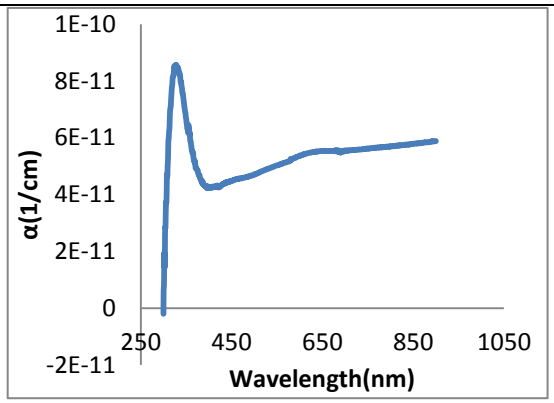


Figure (7): Absorption coefficient function of wavelength of water.

Figure (8). If the loss of photovoltaic energy occurs when using the water solubility method, the dispersion value increases with the increase of the wavelength. The missing energy portion is low and its value at the highest absorption peak at 330 nm is 0.25 and starts to method is using ethanol, shown Figure (9), Shown the fraction of light lost as a result of dispersion and absorption of the unit of distance from the penetration of the center can be determined by the use of Equation (3).

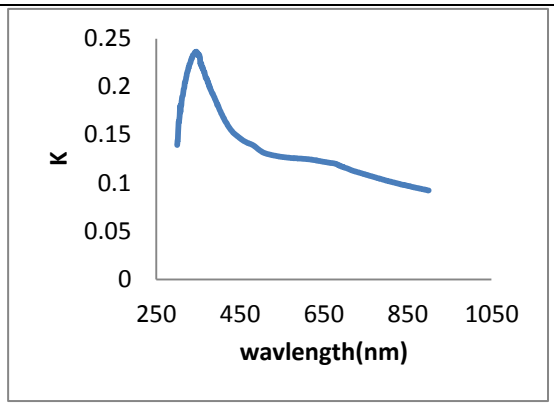


Figure (8): Extinction coefficient function of wavelength of ethanol

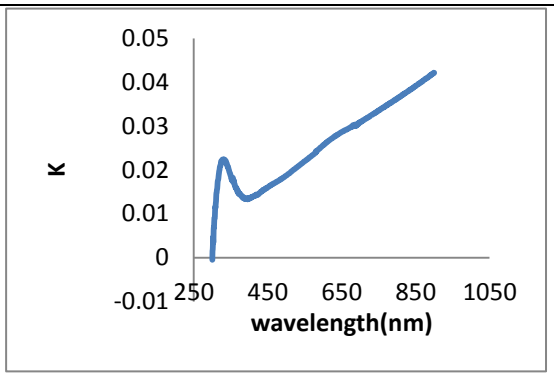


Figure (9): Extinction coefficient function of wavelength of water.

Figures (10, 11) shown the relationship between the absorption coefficient and the photon energy being raised to half as a function of photon energy. The optical energy gap was found by drawing a straight line from the top of the curve and intersecting the x-axis. The value of the pieces represents the value of the energy gap, if the optical power gap for ethanol extraction is 2.4 while the energy gap is 2.25. The behavior of this dye is similar to that of semiconductors in terms of energy gap values.

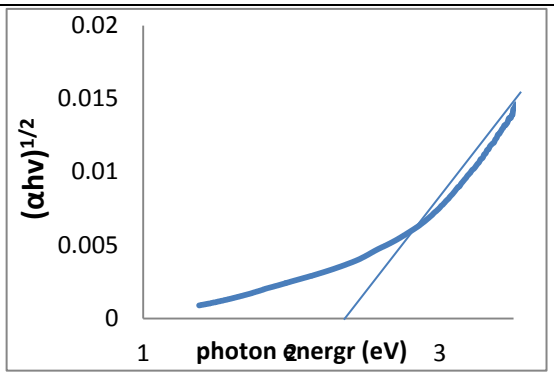
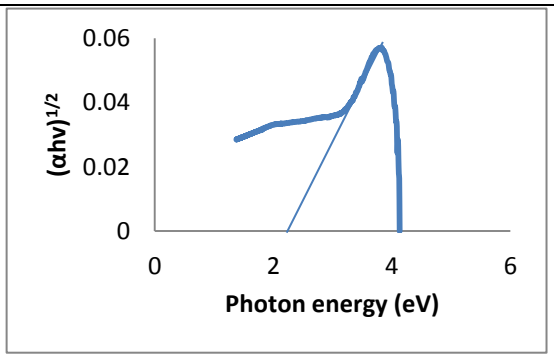


Figure (10): The relationship between (αhv)1/2 as function photon energy of ethanol.



Figure(11): The relationship between (αhv)1/2 as function photon energy of water.

5. Conclusion

The aim of this study is to make use of natural materials available and easy to obtain, which do not cause environmental damage. This dye was extracted in this type of flower so that the physical properties and effective groups can be learned and used in applications. Spectral spectrum For this spectrum, several applications, for example, act as light sensors and can be applied in practice if they are deflected by certain polymers or as a layer of solar cells. Finally, these compounds can play multiple roles in to prepare anew doping polymer tools and with a good protection from the harmful effects of ultraviolet rays, this make possibility of preparation biodegradable materials which It can be decomposed after a period of time and thus it is possible to reduce the occurrence of pollution in the environment.

References

[1] Rout P., Choudary A., Kar D. M., Das L., Jain A., Plants in traditional medicinal system-future source of new drugs, Inc. of pharm and pharmaceutical sci., 1, (2009), 1-23.

[2] Savanna P, Chandra M, G, Mariajancyrani J, Kiruthikajothi K. Eco-friendly dyeing of cotton fabric with a natural dye extracted from flowers of Lantana camara Linn. International Journal of Bioassays.(2014) 3(01), 1653, 1656.

[3] Thiyagarajan S, Balakrishnan K, Tamilarasi SA, study of extraction and dyeing behavior natural dye obtained from cotton A Study. IOSR, Journal of Applied Chemistry (2015) 8(5), 85-89.

[4] Kulkarni, S. S., Go hale, A. V., Bodake, U. M., Pat hade, G. R. Cotton dyeing with natural dye extracted from Pomegranate (Punica granatum) peel. Universal Journal of Environmental Research & Technology (2011), 1(2).

[5] Saha, P. D., Sinha, K. Natural dye from bixa seeds as a potential alternative to synthetic dyes for use in textile industry. Desalination and Water Treatment, (2012). 40(1-3), 298-301.

[6] Zareen, A., Khan, Z., Ajaib, M. Ethnobotanical evaluation of the shrubs of Central Punjab, Pakistan. Biologia Pakistan, (2013),59(1), 139-147.

[7] Purrohit A, Mallick S, Nayak A, Das NB, Nanda B and Sahoo S, Current science, 2007, Vol. 92, No.12.

[8] Sanjeeb K, Gaurav K, Loganathan K, Kokati V, Bhaskara R, Research J. Pharm. And Tech. 2012, 5(6), 711-715.

[9] Safia Z, Aoumeur B. Chemical composition and insecticidal properties of Lantana camara L. leaf essential oils from Algeria Pages 377-383 | Published online: 09 Jul 2012Journal of Essential Oil Research (2012) 24, 4.

[10] Safia Z, Aoumeur B, Chemical composition and insecticidal properties of Lantana camara L. leaf essential oils from Algeria, Journal of Essential Oil Research, online: (2012), 377-383

[11] Varshney VK, Gupta PK, Naithani S, Khullar R, Bhatt A, Soni PL. Carboxymethylation of a-cellulose isolated from Lantana camara with respect to degree of substitution and rheological behavior. Carbohydrate Polymers, (2006), 40–45.

[12] Bhatt N, Gupta PK, Naithani S. Ceric-induced grafting of Acrylonitrile onto Alpha Cellulose isolated from Lantana camara. Cellulose Chemistry and Technology, (2011),45 (5-6): 321-327.

[13] Seema P, A weed with multiple utility: Lantana camara, Rev Environ Sci Biotechnology (2011) 10:341–351.

[14] www.biosecurity.qld.gov.au.

[15] Saravanan P, Chandra M, G, Mariajancyrani J a, K Eco-friendly Dyeing of cotton fabric white a natural dye extraction from flowers of Lantana Camara linn. Kiruthikajothi Received for publication: (2013).

[16] Shazia P, Tahira A M, Filza Z, K, Muhammad N, Floral Dyes: An Opportunity for Punjab Leather Industry to Promote Sustainable Fashion Development, International Journal of Research in Advent Technology, (2016).4, 8.

[17] Abakr N., Funde A.M ,V .S ,..Krmbel, M ,"Determination of the optical parameters of a-Si:H thin films deposited by hot wire –chemical vapouer deposition technique using transmission spectrum only" ,Journals of physics , ,(2010).76,519-531.

[18] J. Singh" Optical Properties of Condensed Matter and Applications". John Wiley and Sons, Ltd. ISBN: (2006). 0-470-02192-6.

[19] Jemil,S.K. and Blawah,B.D., “Principles of Optoelectronic”, Baghdad University, Iraq, (1991).

[20] M.Fox "optical properties of solid "Oxford university press (2010).

[21] Ramu, G, Ramesh, B, Gsenthil K, Preliminary study of anti-solar activities of lantanacamara plants with yellow and red flowers , ,journal of pharmaceutical ,Biological and chemical sciences,(2012).