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Original Research Paper

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SPECTROSCOPIC ANALYSIS AND ANTI- INFLAMMATORY ACTIVITY OF *PLUMERIA RUBRA L.*

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ABSTRACT An investigation was designed for the phytochemical screening by spectroscopic techniques and to determine the anti-inflammatory activity of *Plumeria rubra* L. leaves extract. The qualitative UV-VIS spectrum showed the peaks at 333.15 with absorption 0.0731 respectively. The FT-IR spectrum of the *Plumeria rubra* L. showed the absorption at 1019.79 /cm-1, 1633.07 cm^{-1}. 2920.54/ cm^{-1} , 3416.88/ cm^{-1} ,481.33/ cm^{-1}, 700.89/ cm^{-1}, and 2851.70/ cm^{-1}, 2926 cm-1, 2855 cm-1, 1609 cm-1. Anti-inflammatory activity of ethanolic leaf extract of *Plumeria rubra* L. showed that the percentage of inhibition 54.57% at 500µg/ml concentration was evidently higher than the lower concentration of 50 µg/ml (8.23%). The presence of various bioactive compounds justifies the use of the leaves for various ailments by traditional practitioners.

KEYWORDS : Ethanol extract, *Plumeria rubra*, spectroscopic techniques, anti-inflammatory activity

INTRODUCTION:

The medicinal plants are useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents [1]. The use of plant and plant derived substances to fight against microorganisms is now on the increase, partly because the abuse of traditional antibiotics has led to the development of resistance against chemical antibiotics by microbial strains, occurrence of undesirable side effects from some chemically synthesized drugs, scarcity and high cost of new generation antibiotics [2], biodegradation time of synthetic materials compared to natural or organic substances with faster degradation time.

The importance of medicinal plant in drug development is known to us and humans have used them for different diseases from the beginning of human history. Traditional folk treatment from wild plants has always guided researchers to search for novel medications to develop healthy life for humans and animals. In addition, some medicinal plants are still obscured within the plant which need to be scientifically evaluated [3]. A variety of techniques can be used to determine and estimate the presences of such phytoconstituents in medicinal plants. Chromatography and spectroscopic techniques are the most useful and popular tools used for this purpose.

Moreover, FTIR spectroscopy is an established time– saving method to characterize and identified functional groups [4]. UV-VIS spectroscopic is simple, cost effective and rapid tests for detecting phytocomponents. UV-visible spectroscopy uses light in the visible ranges or its adjacent ranges. The colour of the chemicals involved is directly affects the absorption in the visible ranges. Molecules undergo electronic transitions in these ranges of the electromagnetic spectrum [5]. The severe side effects of steroidal and non -steroidal anti-inflammatory drugs evoked us to search for new anti-inflammatory agents from natural botanical sources which may have minimal drawbacks. Therefore, this study is aimed at determining the phytochemical constituents by using spectroscopic techniques like UV-VIS, FT-IR and also to determining the anti-inflammatory activity of *Plumeria rubra* L.

MATERIALS AND METHODS

Collection And Processing Of Plant Material

Plumeria rubra L. belongs to the dogbane family and grows as a spreading shrub or small tree to a height of 2–8 m (5–25 ft) and similar width. It has a thick succulent trunk and sausage-like blunt branches covered with a thin grey bark. Leaves of the experimental plant *Plumeria rubra* L. were collected from Mukkombu and Neyveli, in the month of January and February.

Preparation Of Extract

The fresh leaves of the plant *P. rubra* L. washed thoroughly with water, away the insects and dust particles. Then, the leaves were cut into small pieces and ground with mortar and pestle with 20ml of ethanol. All the extracts were filtered with cheese cloth and kept for evaporation 24 hours in petridishes. Then residues were collected in bottle using ethanol by scalpel.

UV-VIS spectroscopic Analysis

The ethanolic extract of leaves was examined under visible and UV light for proximate analysis. For UV-VIS analysis, the extracts were centrifuged at 3000 rpm for 10 min and filtered through Whatman No. 1filter paper by using high pressure vacuum pump. The sample is diluted to 1:10 with the same solvent. The extracts were scanned in the wavelength ranging from 190-800 nm using Perkin Elmer Spectrophotometer and the characteristic peaks were detected.

FT-IR Analysis

FT-IR spectroscopic analysis is a very useful tool in the detection of functional groups of bio molecules, thus aiding in their structural elucidation. IR spectroscopy is based on the study of the reflected, absorbed or transmitted radiant energy in the region of electromagnetic spectrum ranging from wavelength 0.8 to 500 nm. A more commonly used measurement is the frequency and is expressed in wave number. The IR spectrum is usually divided into three regions namely near IR (12500 to 4000cm^{-1}) mid IR (4000 to the 400cm^{-1}) and far IR (400 to 20cm^{-1}).

In this experiment, each spectrum was calculated from a total of 32 co-added scans with a resolution of 4 cm−1. Prior to data analysis, the FTIR spectra were baseline corrected and smoothed with their absorbance normalized at 1900 cm−1. Pure potassium bromide (KBr) background spectrum was recorded before analysis of the samples. One milligram of sample powder was incorporated into 100 mg spectroscopic grade KBr powder (1% w/w) and pressed into a 1.0-mm transparent disc by 8 MPa pressure for transmission infrared spectroscopy. The organic functional groups of the samples were analyzed using a TENSOR-27 IR spectrometer in the frequency range of 4000 cm−1 to 400 cm−1. Each sample was scanned with three replicates. For each sample, scanning was examined for consistence and the average spectrum obtained for each sample was used for further analyses.

RESULTS AND DISCUSSION

The qualitative UV-VIS spectrum profile of ethanolic leaf extract of *Plumeria rubra* L. of showed (Fig-I) the peaks at 333.15 with absorption 0.0731 respectively. These absorption

bands are also characteristic for flavonoids and their derivatives.

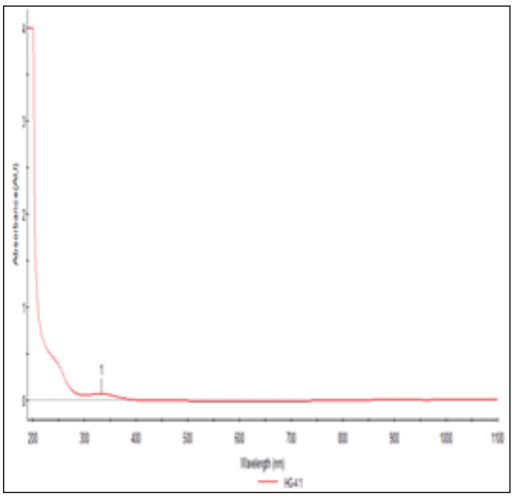

Fig-I UV-VIS Spectrum Of Ethanolic Leaf Extract Of Plumeria Rubra L.

The peaks at 357, 404,689 and 664 nm in the leaf extract indicates the presence of smaller amount of anthocyanins in the experimental plant *Euphorbia hirta*. In this study they found out that Ultraviolet/visual (UV/VIS) spectra between 200 nm and 600 nm of extracts from *Azolla* fronds showed a specific peak between 500 nm and 600 nm representing the presence of anthocyanins [6].

Results obtained were in agreement with the research evidences [7]. In that research on UV-VIS study they reported that the presence of peaks at 220, 242, 263, 302, 249 nm in and 251, 299, 325nm in aqueous extract of *Pyrrosia davidii* and *Pyrrosia petiolosa respectively. They also confirm the presence of* flavonoids and polyphenols in accordance with the peaks.

The FT-IR spectrum of the *Plumeria rubra* L. plant extract in the form of KBr pallet is shown in Figure- II. The absorption at 1019.79 /cm-1 is due to the C-N stretch aliphatic amines was present in the extract. The peak at 1633.07 cm^{-1} was assigned to N-H bend primary amines. 2920.54/ cm^{-1} assigned to the C-H stretch alkenes. The functional groups O-H stretch, H-bonded alcohols and phenols were confirmed by the presence of peak at 3416.88/ cm^{-1}. The peaks at 481.33/ cm^{-1}, 700.89/ cm^{-1}, and 2851.70/ cm^{-1} were unknown compounds.

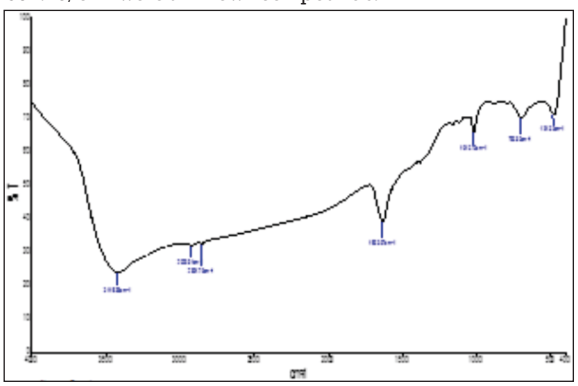

Fig-II FT-IR Spectrum Of Ethanolic Leaf Extract Of Plumeria rubra L.

The peaks at 2926 cm-1 narrow strong belong to CH2 (methylene) asymmetry alkane and likewise peak at 2855 cm-1 which is narrow weak assigned to CH2 (methylene) symmetry alkane; meanwhile the peak intensity at 1609 cm-1 is weak and was assigned to C=C skeletal stretching of alkene. The remaining peaks at 1451cm-1 which is also weak was assigned to methylene CH2 bending alkane and 1045 cm-1 medium belong to C-N stretching amine. Presence of C=O, C-H, C=C and C-O, C-C and C-O bonding structures are responsible for the formation of alkyl groups, methyl groups, alcohols, ethers, esters, carboxylic acid, anhydrides and deoxyribose [8].

Similarly, Pramila *et al.* [9] suggested that the band at 2927.23 cm^{-1} is due to the symmetric stretching of saturated (sp3) carbon. The band at 1633.44 cm^{-1} is assigned to the bending mode of absorbed water, since plant extracts are known to have a strong affinity for water. The band at 1537.09 cm^{-1} is due to C=C stretching associated with the aromatic skeletal mode of the extracts. The vibrational absorption band at 1384.66 cm^{-1} was assigned to rocking of methyl group. A notable band at 1253.97 and 1054.89 cm^{-1} can be assigned to C-O stretching. A band at 599.76 cm^{-1} represents the aromatic C-H out of plane bending.

Anti-inflammatory activity of ethanolic leaf extract of *Plumeria rubra* L. showed the following results (Fig-III). The inhibition caused by the control was 100. Leaves extract showed the percentage of inhibition 54.57% at 500µg/ml concentration which was evidently lower than the control and higher than the lower concentration of 50 µg/ml (8.23%). the inhibition caused by the 250 µg/ml of extract was 41.57%. Similarly, the percentage of inhibition at 100µg/ml concentration was only 19.22% .

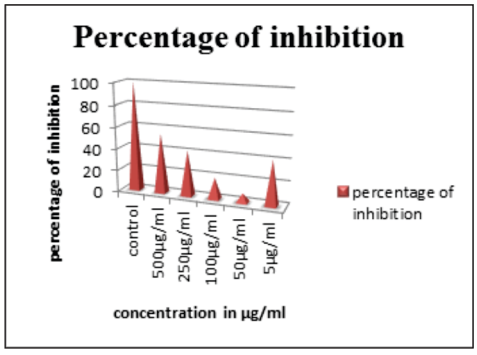

Fig-III Anti-infammatory Activity Of Ethanolic Leaf Extract Of Plumeria rubra L.

In a study of two Bangladeshi medicinal plants namely *Mesua nagassarium* and *Kigelia pinnata* researchers [10] has revealed the significant in vitro membrane stabilizing effect and so it revealed the medicinal plants contain the anti-inflammatory activity.

CONCLUSION

The present investigation deals with the studies of important techniques for identification of main phytochemicals present in crude drugs of *Plumeria rubra* L. which can be helpful in authenticating the plant material and to be helpful in characterization of the crude drug. The current pioneering study suggests that ethanolic extract of *Plumeria rubra* L. is a potent therapeutic agent. It paves the way for the development of several treatment regimens based on this extract. In addition, further research is necessary to identify and purify the active compounds responsible for therapeutic activity.

REFERENCES:

1. Nostro ,A., Germano, M.P., Danelo ,V., Marino, A., Cannatelli, M.A. 2000. Extraction methods and bio autography for evaluation of medicinal plant antimicrobial activity; Lett. Appl. Microbial; 30:379-384.
2. Masibo, M. and He. Q. 2009. In vitro antimicrobial activity and the major polyphenol in leaf extract of *Mangifera indica* L. *Malaysian Journal of Microbiology*. 5 (2): 73 – 80.
3. Lewis, W.H. and Elvin-Lewis, M. 1995. Medicinal plants as sources of new therapeutics. *Annals of the Missouri Botanical Garden* 82: 16 – 24.
4. Achterberg, J. 2013. *Imagery in Healing Shamanism and Modern Medicine*,

Shambhala Publications, Boulder, Colo, USA.PP:345-348.
5. Grube, M., Muter, O., Strikauska, S., Gavare, M., Limane, B. 2008. Application of FT– IR spectroscopy for control of the medium composition during the biodegradation of nitro aromatic compounds. *J. Indian Microbiol. Biotech*; 35:1545-1549.
6. Gunasekaran, S. 2003. UV-VIS spectroscopic analysis of blood serum. *Asian J. Microbiol. Biote.* Environ. Sci. 5(4):581-582.
7. Muradov, N., Taha, M., Miranda., A.F., Kadali, K., Gujar, A., Rochfort, S., Stevenson, T.,Ball, A.S. and Mouradov, A. 2014. Dual application of duckweed and azolla plants for wastewater treatment and renewable fuels and petrochemicals production. *Biotechnol Biofuels*: 7(1):15-26.
8. Cheng, D., Zhang, Y., Xina, X. and Gaoa, D. 2014. Comparative pharmacognosy of *Pyrrosia petiolosa* and *Pyrrosia davidii*, *Rev Bras Farmacogn* : 24: 368-380
9. Pramila, D.M., Xavier, R., Marimuthu, K., Kathiresan, S., Khoo, M.L., Senthilkumar, M., Sathya, K. and Sreeramanan, S. 2012. Phytochemical analysis and antimicrobial potential of methanolic leaf extract of peppermint (*Mentha piperita*: Lamiaceae). *Journal of medicinal plants research*: 6(2): 331-335.
10. Rashid, M. A., Sikder, M. A. A., Kaisar, M. A., Miah, M. K., Parvez, M. M. and Hossian A. K. M. N. 2011. Membrane stabilizing activity-a possible mechanism of action for the anti-inflammatory activity of two Bangladeshi medicinal plants: *Mesua nagassarium* (Burm.F.) and *Kigeliapinnata* (Jack) DC. *International Journal of Pharmaceutical Research and Development*. 3(3): 1-5.