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SYNTHESIS AND CHARACTERIZATION OF LABLAB PURPUREUS DRIED LEAVE EXTRACTS

Abstract

The current study was carried out to determine the wavelengths (λ_{max}) and frequency in *Lablab purpureus* (L.) (L. *purpureus*) leaves by using molecular spectroscopic technics (FT-IR spectroscopy and UV-Vis Spectrophotometry). A series of extracts were prepared by using solvents (polar and non-polar solvents) and *Lablab purpureus* dried leaves powder. The polar (double-distilled water, ethanol, and ethyl acetate) and the non-polar solvent extracts (carbon tetrachloride and hexane) were put into the FT-IR spectroscopy and UV-Vis Spectrophotometry. The FT-IR spectra give various peaks at different frequencies in synthesized extracts showing a different functional group with stretching frequencies which represents the carboxylic acids, amides, esters, etc. And also obtained absorbance values corresponding wavelengths from UV-Vis spectrophotometer. From the spectral results, the presence of absorption peaks may be arising due to active biomolecules in the leaf extract with various solvents. According to all wavelengths, highly conjugated molecules are present.

Keywords: *Lablab purpureus leaves*, shaded dried leaves, FT-IR, UV-Vis spectrometer, Polar and non-polar solvents.

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I. INTRODUCTION

Lablab purpureus (L.) (L. *purpureus*) sweet is a normally short-lived, and summer-growing plant. It is a climbing, twining, upright, or trailing herbaceous plant that can increase to 3-6 cm in length. It gives vigorous taproot, pubescent trailing, or glabrous stems. *L. purpureus* leaves are trifoliolate and alternate. The leaves are rhomboid in shape with a length and breadth of 7.5-15 cm x 14 cm. The leaves' upper surface is very soft and short hair is present. This plant containing white to purple or blue in color with 1.5 cm in length. These plant-containing seeds are linear in shape with 4-15 cm length x 1-4 cm breadth. These plant seeds are ovoid, varying in color, dependent on cultivar or variety, normally white to brown, and few seeds are black[1-4]. *Lablab* is a flexible leguminous plant. Its young pods and seeds, and immature leaves are cooked and edible as vegetables[2-3]. *L. purpureus* seeds are used in medicine (ethnoveterinary), for example, in Kenya to treat lung and eye problems in goats and sheep.

The family name of L. purpureus (Hyacinth Bean) is Fabaceae. This tree is naturally occurring in Africa, and it is developed throughout the tropics for diet. The regular names of water are lablab-bean[5], hyacinth bean[6], Dolichos bean, sem bean, Egyptian kidney bean, *bonavist bean*, Indian bean, and Australian pea (*L. purpureus (*L). Various names of *L. purpureus* in South Asia were depicted in **Table 1**.

Table 1: Various names in South Asia

Place	Scientific Name
Gujarati	Surti Papdi
West Bengal	Sheem
Kerala	Amarakka
Tamil	mochai
Karnataka	avarekalu saaru
Maharashtra	Shravan ghevda
Andhra Pradesh/Telangana	Hyacinth bean

II. LITERATURE REVIEW

To prepare nanoparticles using purple colour *L. purpureus* flowers and silver nanoparticles and characterization. By the green approach method, carbon nanospheres are developed from *L. purpureus* using an electrode-like high-performance supercapacitor. To prepare Zinc oxide nanoparticles with *L. purpureus* leaves and analysis of its bactericidal and photocatalytic application. Identification and characterization of *L. purpureus* L. sweet (Dolichos Bean) Recombinant Inbred Lines (RIL) with elevated pod fragrance and great pod yield. To evaluate the few germplasms of L. *purpureus* beans in UP[11]. Redevelopment analysis in Dolichos bean and lablab bean genotypes. L. *purpureus* L (Hyacinth bean)-An underutilized yield as well as coming potential. L. *purpureus* L (Hyacinth bean) leaves contain polyamine levels and its relative to deficiency tolerance. Lablab leaves used in yolk painting are representative of the food of layers and feed ingredients. A review on medical and pharmacology consequence of *L. purpureus* (Dolichos lablab). Physico-structural variation in *L. purpureus* (L.) sweet beans. Genetic assessment of yield and concerned characters of Lablab Bean. Utilization capacities of *L. purpureus* (L.) sweet and the

restrictions of field insects and infections in Nigeria. Consequences of leaf production on natural protein and ore contents of initial growing contours of lablab. Evaluation of natural variety of *L. purpureus* (L.) sweet (Kenyan Dolichos bean) utilizing SSR (simple sequence repeat) indicators. Molecular diversity of L. *purpureus* (L.) sweet (Kenyan lablab bean) accesses applying expanded piece size polymorphism indicators. Influence of plant density on food produce and quality of lablab bean and intercropped corn. Natural diversity evaluation in *L. purpureus* L (Dolichos Bean) centered on fundamental element assessment and individual connection cluster evaluation. A over review on medical status and pharmacology *L. purpureus* (Dolichos lablab). To prepare semi crude peptide of lablab bean to analyze the antimicrobial activity. Molecular and agronomical estimation of six *L. purpureus* L. (lablab bean) cultivars. To study conformity of vicilin from Phaseolus calcaratus and Dolichos lablab by using various scanning calorimetry and FT-IR spectroscopy. Structure, composition, morphology, and physicochemical things of a navy bean, lablab bean, tepary bean velvet bean, and rice bean starches. A protein (carbohydrate-binding) from the cooked lablab beans successfully acts against the diseases of SARS-CoV-2 and influenza viruses. An analysis of the properties of starch separated from three kinds of L. *purpureu*s seed

Now present researcher investigates to identify the functional groups in *L. purpureus* leaves with various solvents (ethanol, ethyl acetate, hexane, and carbon tetrachloride) by using FT-IR spectroscopy.

III. MATERIALS AND METHODS

1. **Materials:** The HPLC grade solvents (ethanol, ethyl acetate, hexane, and carbon tetrachloride) were purchased by Merck Company from Mumbai.

2. **Collection and preparation of powder with Lablab purpureus (*L. purpureus*) leaves:** To collect *L. purpureus* leaves (***Figure 1a***) in the winter season (December 2021-March 2022) from Kaza village, Movva Mandalam, Krishna district, A.P India. These leaves wash through distilled water and dry in shadows for 25-30 days (**Figure 1b**). After 25-30 days these dried leaves mix with mechanical Shakar up to amorphous powders (**Figure 1c**).

Figure 1: a) *L. purpureus* leaves, b) Shaded dried leaves, c) Shaded dried leaves powder.

3. **Formulation *L. purpureus* leaves extract with various solvents:** To prepare five types of extracts (Hexane, ethanol, double-distilled water, carbon tetrachloride, and ethyl acetate) using dried powder. This extract was stored in sealed bottles at 5 ^{o}C for further

usage **Figure 2**.

Figure 2: *L. purpureus* leaves extract with different solvents like hexane (1), ethanol (2), double-distilled water (3), carbon tetrachloride (4), and ethyl acetate (5).

4. **Characterization of *L. purpureus* leaves extract:** To identify the functional group in different samples by using an instrument is like FT-IR spectroscopy. Compound (chemical bond) absorbed incident light radiation to get an infrared absorption spectrum. To determine the chemical bond in the molecule by using this interpretation spectrum. Prepare five types of extracts (Hexane, ethanol, double-distilled water, carbon tetrachloride, and ethyl acetate) using dried powder. The prepared extracts were inserted in FT-IR spectroscopy (FT-IR5300, JASCO), with wavelength range from 400 to 4000 cm^{-1} and 4 cm^{-1} resolution.

IV. RESULTS AND DISCUSSION

1. **FT-IR Spectral analysis:** The prepared series (five) of extracts were placed into FT-IR spectroscopy to give series (five) spectra at various frequencies as shown in (**Figures 3-7**). These spectra give various peak values and the feasible functional groups described in the samples. Based on the ratio of the peak, components were separated. The out coms of FT-IR evaluation obeyed the presence of aromatic compounds, alcohol, aldehyde, and ester .

The FT-IR spectra are shown (**Figure 3**) various peaks at different frequencies in hexane and *L. purpureus* dried leaves powder extract. These spectral peaks observed at frequencies 2923.70 cm^{-1}, 2843.79 cm^{-1}, 1711.04 cm^{-1}, 1452.96 cm^{-1}, 1373.05 cm^{-1}, 1184.62 cm^{-1}, 1080.51 cm^{-1}, 985.51 cm^{-1}, 841.50 cm^{-1} (**Table 2**).

The peaks were observed at frequencies 2923.70 cm^{-1}, and 2843.79 cm^{-1} representing the OH stretching vibrational frequencies. The peaks at frequencies 2923.70 cm^{-1} and 2843.79 cm^{-1} are asymmetric starching frequencies and starching frequencies. asymmetric starching frequencies have a greater dipole moment than the symmetric starching frequencies, hence asymmetric starching frequencies are more than symmetric starching frequencies. The peak was observed at 1452.96 cm^{-1} and 1373.05 cm^{-1} representing the in-plane bending vibrations i.e., scissoring and rocking. The main functional group is observed at frequency 1711.04 cm^{-1} representing the "C=O" stretching frequency which represents the carboxylic acid as a functional group. The C-O

stretching frequencies are observed at 1184.62 cm^{-1} and 1080.51 cm^{-1}, which represents the alkoxy group, and finally, two bands are observed at 985.51 cm^{-1} and 841.50 cm^{-1}, which represents the OH out plane bending vibrations i.e., waging and twisting.

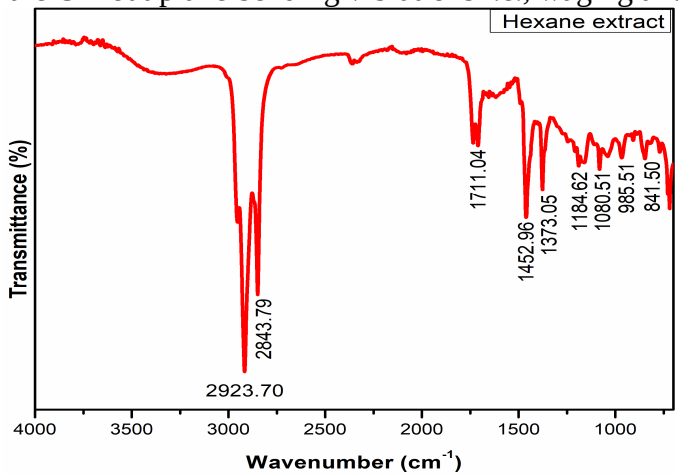

Figure 3: FT-IR spectra obtained by hexane and *L. purpureus* dried leaves powder extract.

The FT-IR spectra are shown (**Figure 4**) various finding peaks at different frequencies in Ethanol and *L. purpureus* dried leaves powder extract. These spectral peaks observed at 3350.41 cm^{-1}, 2938.36 cm^{-1}, 2843.79 cm^{-1}, 1612.06 cm^{-1}, 1392.84 cm^{-1}, 1035.79 cm^{-1} (**Table 2**).

The peaks were observed at 2938.36 cm^{-1}, and 2843.79 cm^{-1} representing the CH stretching vibrational frequencies. The peaks at 2938.36 cm^{-1} and 2843.79 cm^{-1} are asymmetric starching frequencies and starching frequencies. asymmetric starching frequencies have a greater dipole moment than the symmetric starching frequencies, hence asymmetric stretching frequencies are more than symmetric stretching frequencies. The peak was observed at 1392.84 cm^{-1} representing the N-H in-plane bending vibration. The main functional group is observed at 1612.06 cm^{-1} representing the "C=O" stretching frequency which represents the Amide as a functional group. The C-N stretching frequencies are observed at 1035.79 cm^{-1} which represents the C-N bond is present.

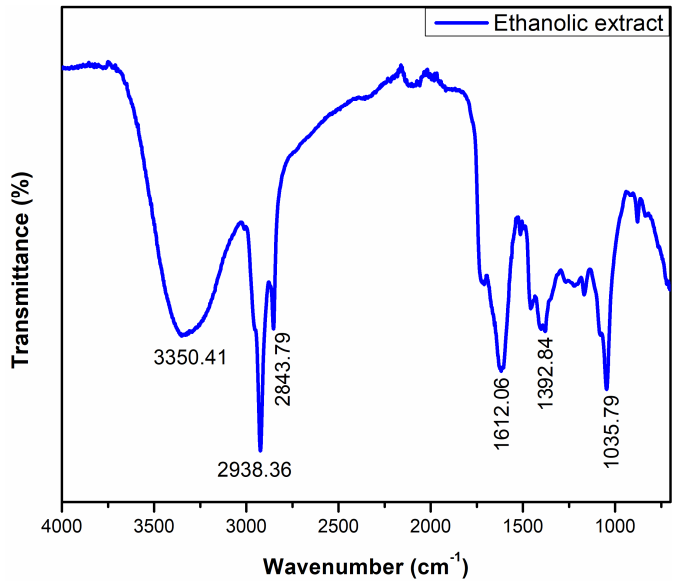

Figure 4: FT-IR spectra with ethanol and *L. purpureus* dried leaves powder extract

In **Figure 5** shown various peaks of FT-IR spectra at different frequencies in double distilled water and *L. purpureus* dried leaves powder extract. These spectral peaks observed at 3275.53 cm^{-1}, 2068.88 cm^{-1}, 1636.24 cm^{-1} (**Table 2**).

The peak frequencies found were at 3275.53 cm^{-1}, and 2843.79 cm^{-1} representing the NH stretching vibrational frequencies. The main functional group is observed at 1636.24 cm^{-1} representing the "C=O" stretching frequencies in Amide as a functional group. The C-N stretching frequencies are observed at 2068.88 cm^{-1} which represents the C=N stretching frequencies.

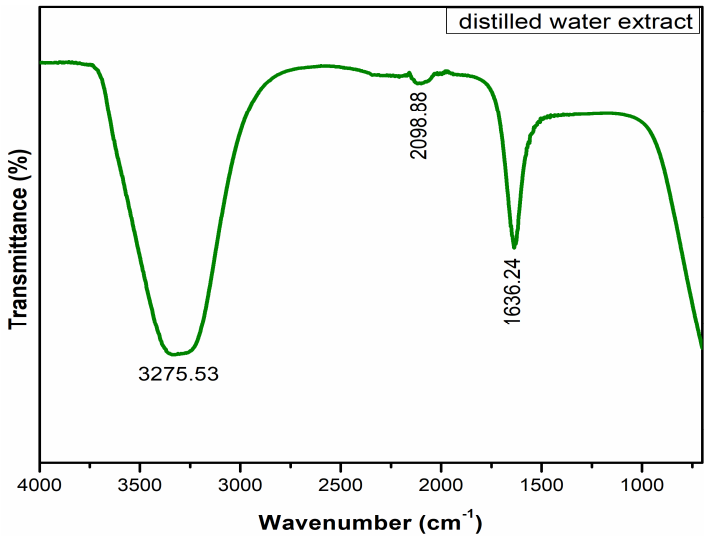

Figure 5: FT-IR spectra with double distilled water and *L. purpureus* dried leaves powder extract.

The FT-IR spectra are shown (**Figure 6**) various peaks at different frequencies in Carbon tetrachloride and *L. purpureus* dried leaves powder extract. To finding the spectral peaks at 2928.10 cm^{-1}, 2854.03 cm^{-1}, 1746.23 cm^{-1}, 1472.76 cm^{-1}, 1378.18 cm^{-1}, 1159 cm^{-1} (**Table 2**).

The peaks were observed at frequencies 2928.10 cm^{-1}, and 2854.03 cm^{-1} representing the CH stretching vibrational frequencies. The peaks at 2928.10 cm^{-1} and 2854.03 cm^{-1} are asymmetric starching frequencies and starching frequencies. asymmetric starching frequencies have a greater dipole moment than the symmetric starching frequencies, hence asymmetric starching frequencies are more than symmetric starching frequencies. The peak was observed at 1472.76 cm^{-1} and 1378.18 cm^{-1} representing the in-plane bending vibrations i.e scissoring and rocking. The main functional group is observed at 1746.23 cm^{-1} representing the "C=O" stretching frequency which represents the ester as a functional group. The C-O stretching frequencies are observed at 1159 cm^{-1} and 1080.51 cm^{-1}, which represents the alkoxy group.

The FT-IR spectra are shown in **Figure 7** various peaks at different frequencies in Ethyl acetate and *L. purpureus* dried leaves powder extract. These spectral peaks observed at 3276.36 cm^{-1}, 2928.10 cm^{-1}, 2838.65 cm^{-1}, 1710.51 cm^{-1}, 1378.18 cm^{-1}, 1238.88 cm^{-1}, 1040.19 cm^{-1} (**Table 2**).

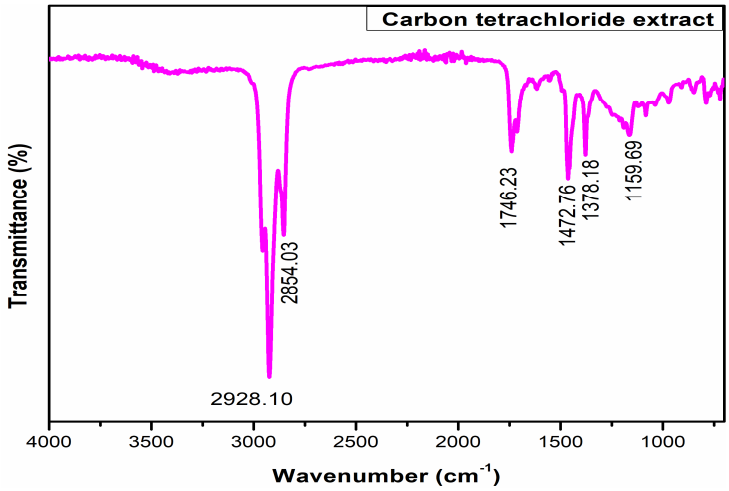

Figure 6: FT-IR spectra with carbon tetra chloride and *L. purpureus* dried leaves powder extract.

The peaks were observed at 2928.10 cm^{-1}, and 2838.65 cm^{-1} representing the OH stretching vibrational frequencies. The peaks at 2928.10 cm^{-1} and 2838.65 cm^{-1} are asymmetric stretching frequencies and stretching frequencies. asymmetric stretching frequencies have a greater dipole moment than the symmetric starching frequencies, hence asymmetric starching frequencies are more than symmetric stretching frequencies. The peak was observed at frequencies 1378.18 cm^{-1} and 1238.88 cm^{-1} representing the OH in-plane bending vibrations i.e. scissoring and rocking. The main functional group is observed at 1710.51 cm^{-1} representing the "C=O" stretching frequency which represents the carboxylic acid as a functional group. The C-O stretching frequency is observed at 1040.19 cm^{-1}, which represents the alkoxy group.

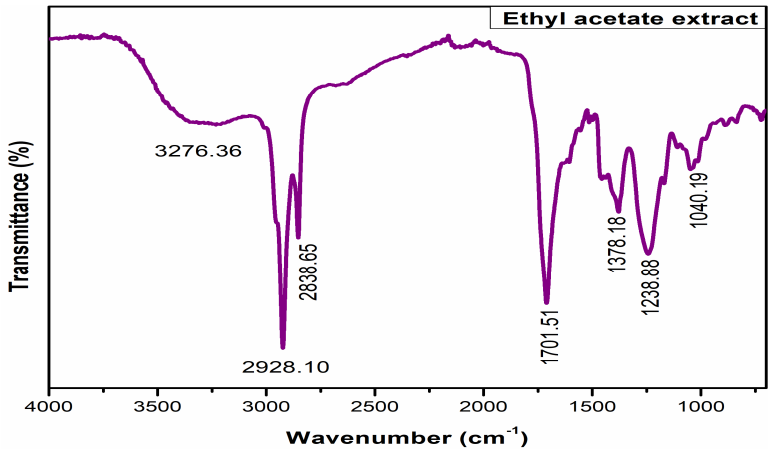

Figure 7: FT-IR spectra with ethyl acetate and *L. purpureus* dried leaves powder extract

Table 2: FT-IR spectral analysis of *L. purpureus* dried leaves to powder and different solvent extracts.

Sl. no.	Spectral values	Functional groups
Powder extract with Hexane		
1	2923.70 cm^{-1} and 2843.79 cm^{-1}	OH, asymmetric and asymmetric starching frequencies
2	1452.96 cm^{-1} and 1373.05 cm^{-1}	OH, in-plane bending vibrations
3	1711.04 cm^{-1}	"C=O" stretching frequency
4	1184.62 cm^{-1} and 1080.51 cm^{-1}	C-O stretching frequencies
5	985.51 cm^{-1} and 841.50 cm^{-1}	out plane bending vibrations
Powder extract with Ethanol		
6	2938.36 cm^{-1}, and 2843.79 cm^{-1}	CH, asymmetric and asymmetric starching frequencies
7	1392.84 cm^{-1}	N-H in-plane bending vibrations
8	1612.06 cm^{-1}	"C=O" stretching frequency
9	1035.79 cm^{-1}	C-N stretching frequency
Powder extract with Double distilled water		
10	3275.53 cm^{-1}, and 2843.79 cm^{-1}	NH stretching vibrational frequencies
11	1636.24 cm^{-1}	"C=O" stretching frequency
12	2068.88 cm^{-1}	C=N stretching frequency
Powder extract with Carbon tetrachloride		
13	2928.10 cm^{-1}, and 2854.03 cm^{-1}	CH, asymmetric and asymmetric starching frequencies
14	1472.76 cm^{-1} and 1378.18 cm^{-1}	CH, in-plane bending vibrations
15	1746.23 cm^{-1}	"C=O" stretching frequency
16	1159 cm^{-1} and 1080.51 cm^{-1}	C-O stretching frequencies
Powder extract with Ethyl acetate		
17	2928.10 cm^{-1}, and 2838.65 cm^{-1}	-OH stretching vibrational frequencies
18	1378.18 cm^{-1} and 1238.88 cm^{-1}	-OH, in-plane bending vibrations
19	1710.51 cm^{-1}	"C=O" stretching frequency
20	1040.19 cm^{-1}	C-O stretching frequency

2. **UV-Visible spectral analysis:** The electromagnetic radiations range in UV-Vis spectrophotometry is 200-800 nm. This range is split into two regions, one is the UV range (200-400 nm) and the second one is the visible range (400-800 nm). Organic, biological, and conjugated molecules are studied by UV-Vis spectrophotometry.

The prepared *L. purpureus* dried leaves with hexane extract was passed into the UV-VIS spectrophotometer (**Figure 8**). The results of hexane extract were detected wavelengths at 647 nm and 682 nm and corresponding absorbance at 3.66 and 3.42. These wavelengths (647 nm and 682 nm) give information about the frequency range being between 400-484 Hz and energy range being between 1.65-2.00 eV and also given the absorbed red color region and the visible region color is blue-green. According to Beer's lamberts law, the highest absorbance (3.66) value represents the highest molar absorptivity or high molar extinction coefficient at minimum concentration. At a minimum concentration, the smallest detection limits are detected. These wavelengths and absorbance values represent the biomolecules and highly conjugated molecules (Note: here scale range from 300- 800 nm are measured).

The prepared *L. purpureus* dried leaves with ethanol extract was passed into the UV-Vis spectrophotometer (**Figure 9**). The results of ethanol extract were detected wavelengths at 215 nm, 275 nm, 415 nm, and 660 nm, and the corresponding absorbance at 1.635, 0.718, 0.380, and 0.136. The UV region wavelengths at 215 nm and 275 nm give the information simple organic n-π* molecule. The visible region wavelengths at 415 nm and 660 nm give information about highly conjugated organic molecules. According to Beer's lamberts law, the highest absorbance (1.635) value represents the highest molar absorptivity or high molar extinction coefficient at minimum concentration. At a minimum concentration, the smallest detection limits are detected. These wavelengths and absorbance values represent the biomolecules and highly conjugated molecules.

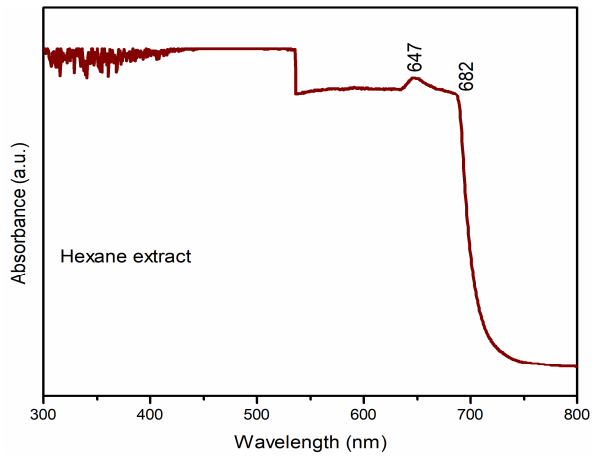

Figure 8: UV-Vis spectra of Hexane extract.

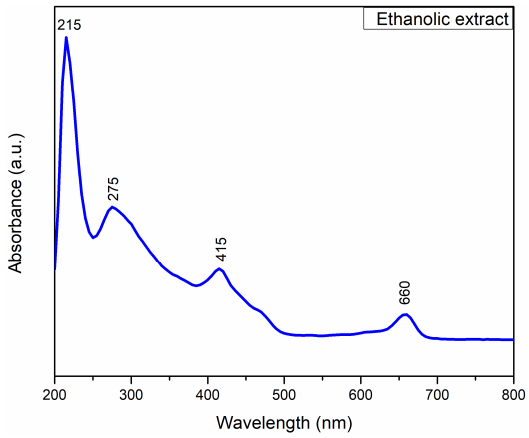

Figure 9: UV-Vis spectra of Ethanol extract.

The prepared *L. purpureus* dried leaves with double distilled water extract was passed into the UV-Vis spectrophotometer (**Figure 10**). The results of the double distilled water were detected wavelengths at 219.27 nm, and 272.17 nm, and the corresponding absorbance at 0.040, and 0.003. The UV region wavelengths at 219.27 nm and 272.17 nm give the information simple organic n-π* molecule. According to Beer's lamberts law, the highest absorbance (0.040) value represents the highest molar absorptivity or high molar extinction coefficient at minimum concentration. At a minimum concentration, the smallest detection limits are detected. These wavelengths and absorbance values represent the biomolecules and highly conjugated molecules.

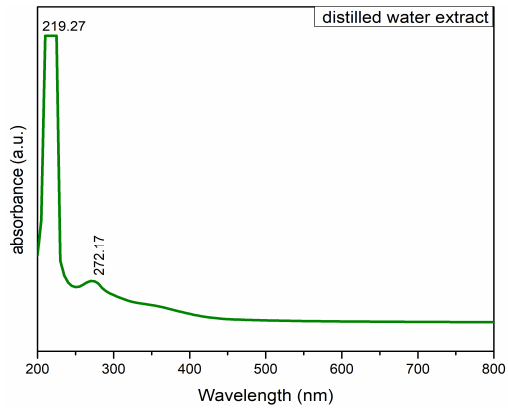

Figure 10: UV-Vis spectra of Double-distilled water extract.

The prepared *L. purpureus* dried leaves with carbon tetrachloride extract was passed into the UV-Vis spectrophotometer (**Figure 11**). The results of the carbon tetrachloride extract were detected wavelengths at 260 nm, 418 nm, 455 nm, and 665 nm, and the corresponding absorbance at 0.839, 1.023, 0.783, and 0.538. The UV region wavelengths at 260 nm give the information simple organic n-π* molecule. The visible region wavelengths at 418 nm, 455 nm, and 665 nm give information about highly conjugated organic molecules. According to Beer's lamberts law, the highest absorbance (1.023) value represents the highest molar absorptivity or high molar extinction coefficient at minimum concentration. At a minimum concentration, the smallest

detection limits are detected. These wavelengths and absorbance values represent the biomolecules and highly conjugated molecules.

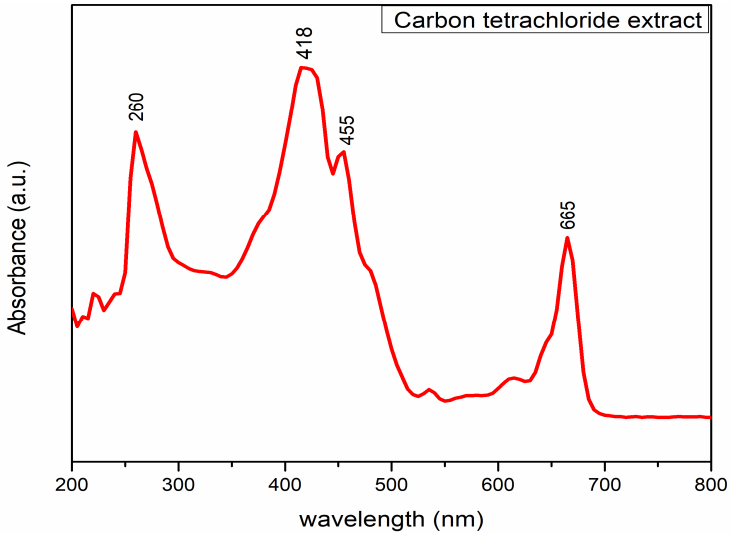

Figure 11: UV-Vis spectra of Carbon tetrachloride extract.

The prepared *L. purpureus* dried leaves with ethyl acetate extract was passed into the UV-Vis spectrophotometer (**Figure 12**). The results of the ethyl acetate extract were detected wavelengths at 273 nm, 413 nm, and 665 nm, and the corresponding absorbance at 0.33, 0.618, and 0.205. The UV region wavelengths at 273nm give the information simple organic n-π* molecule. The visible region wavelengths at 413 nm and 665 nm give information about highly conjugated organic molecules. According to Beer's lamberts law, the highest absorbance (0.618) value represents the highest molar absorptivity or high molar extinction coefficient at minimum concentration. At a minimum concentration, the smallest detection limits are detected. These wavelengths and absorbance values represent the biomolecules and highly conjugated molecules.

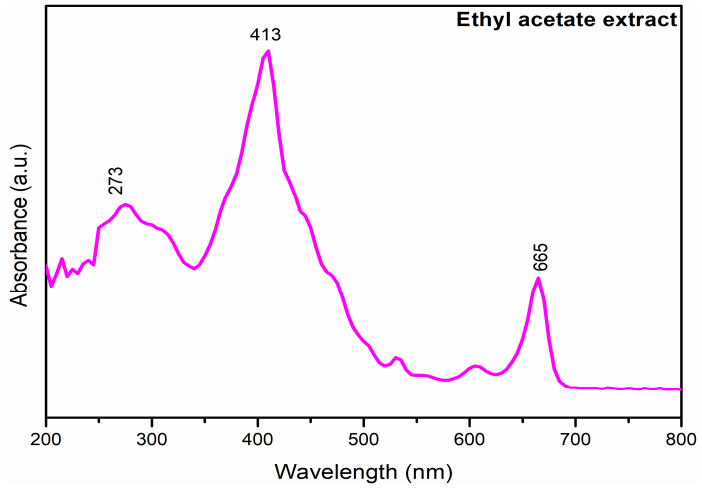

Figure 12: UV-Vis spectra of ethyl acetate extract.

V. CONCLUSION

In the present research, the investigation identified the functional group in *L. purpureus* leaves by using FT-IR spectroscopy and UV-Vis spectrophotometer. To prepare five types of extracts using solvents like hexane, ethanol, double-distilled water, carbon tetrachloride, and ethyl acetate with dried powder. The FT-IR spectra give various peaks at different frequencies in synthesized extracts showing a different functional group with stretching frequencies which represents the carboxylic acids, amides, esters, etc. and also obtained absorbance values corresponding wavelengths from UV-Vis spectrophotometer. From the spectral results, the presence of absorption peaks may be arising due to active biomolecules in the leaf extract with various solvents.

1. **Conflict of interest:** The authors have no conflicts of interest regarding this investigation**.**

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