FT-IR PROFILE OF *ERAGROSTIS AMABILIS* (L.) WIGHT. ARN AND *ERAGROSTIS PILOSA* (L.) BEAUV.

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Abstract. The present study was aimed to reveal the functional constituents of two grasses *Eragrostis amabilis* (L.) Wight. Arn. and *Eragrostis pilosa* (L.) Beauv. aerial and underground parts extracts (petroleum ether, chloroform, acetone, ethyl acetate, ethanol) using FT-IR. About 1.0 mg of *E. amabilis* and *E. pilosa* aerial and underground parts crude extracts pellets were measured in an automatic recording IR Spectro-photometer in the range of 400 to 4000 cm^{-1}. The existences of metabolites functional groups in the studied extracts of *E. amabilis* aerial and underground parts were recorded. The functional groups presence and absence explained the similarities and variation between the species *E. amabilis* and *E. pilosa* and aerial and underground parts extracts of *E. amabilis* and *E. pilosa*. The existence of alcohols, phenols, 1°2° amines, amide, α, β unsaturated aldehyde, ketone, nitro compounds and aliphatic amines in the aerial parts of *E. amabilis* and *E. pilosa* were confirmed. The peaks 668.5 cm^{-1} and 729 cm^{-1} showed their restricted presence only in the ethyl acetate and petroleum ether extracts of *E. pilosa* aerial parts. The observed results confirmed the biochemical variation between the species *E. amabilis* and *E. pilosa* and parts (aerial and underground). These profiles may be used as phytomarker for the identification of *E. amabilis* and *E. pilosa* aerials and underground parts and reveal inter-specific variation between *E. amabilis* and *E. pilosa* and among the *Eragrostis* species. The observed results proved that the FT-IR spectroscopic profiles are valuable marker and chemo metrics to distinguish the species and crude drugs.
Key words: FT-IR, Spectroscopic profile, functional group, *Eragrostis*, Grass

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INTRODUCTION

Fourier transform infra red (FT-IR) is a preferred method of infrared spectroscopy to reveal the functional constituents or group of the individual compounds and crude extracts. One of the greatest advantages of the infrared spectroscopy is that virtually any sample in any state may be analyzed [29].

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Recently Allison *et al.* [1] predicted the concentration of lignin and hydroxylcinnamic acids using FT-IR. Ramamurthy and Kannan [21] screened the bioactive group of chemicals in the dry leaf powder of *Calotropis gigantea* by FT-IR analysis. FT-IR is conducted for the verification of chemical constitution of essential oil citrol from the Lemon grass [24]. The FT-IR spectra revealed the presence of n-alkene, conjucated alkene, primary and secondary alcohols from *Cymbopogon citrates* [18]. The comparative biochemical studies among these two species of *Cyperus scariosus* and *Cyperus rotundus* by using various spectroscopic, analytical and in silico molecular docking studies [6]. FT-IR spectroscopic profiles are used as pharmacognostical marker to identify the medicinally important plants [2, 3, 7, 8, 9, 11, 15, 19, 20, 22, 23, 28, 30]. Sujatha et al., [26] studied the biochemical profile, in vitro toxicity and cytotoxic activity of *Eragrostis amabilis* (L.) Wight. Arn. and *Eragrostis pilosa* (L.) Beauve. But there is no report on the functional constituents of *E. amabilis* and *E. pilosa* aerial and underground parts extracts. With this knowledge, the present study was aimed to reveal the functional constituents of two grasses *E. amabilis* and *E. pilosa* aerial and underground parts extracts (petroleum ether, chloroform, acetone, ethyl acetate, ethanol) using FT-IR.

MATERIALS AND METHODS

COLLECTION OF EXPLANTS

The aerial and underground parts of *Eragrostis ambilis* (L.) Wight. Arn. and *Eragrostis pilosa* (L.) Beauv. aerial were collected from A. Thirumalapuram, Tirunelveli district, Tamil Nadu, South India.

EXTRACTS PREPARATION

The plants were washed with tap water to remove the soil and other debris. The aerial and underground parts of *E. amabilis* and *E. pilosa* were dried under shade condition at room temperature for fifteen days. The dried samples were grounded to fine powder using mechanical grinder. The powdered samples were then stored in refrigerator for further analysis. The dried and powdered *E. amabilis* and *E. pilosa* aerial and underground parts (30 g) were extracted with 400 ml of ethanol, acetone, ethyl acetate, chloroform and petroleum ether by using soxhlet extractor for 8–12 h not exceeding the boiling point of the solvents. After 12 hrs the extract was collected in the petridishes and allowed to evaporate the excess solvents. The residues of the plant samples were stored in sterilized bottles for further phytochemical analysis.

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PELLETS PREPARATION AND FTIR ANALYSIS

About 1.0 mg of *E. amabilis* and *E. pilosa* aerial and underground parts crude extracts (petroleum ether, chloroform, acetone, ethyl acetate and ethanol) were separately made into thin discs with 10−100 mg of potassium bromide using a mould and pressed under anhydrous conditions. The pellets were measured in an automatic recording IR spectro-photometer (Shimadzu 8400S) in the range of 400 to 4000 cm^{-1}. The percentage of transmissions was recorded against the wave number. The peak values of FT-IR were recorded and the functional groups were predicted [8, 16, 28].

RESULTS

The FT-IR spectrum of *E. amabilis* and *E. pilosa* aerial and underground parts ethyl acetate, petroleum ether, acetone, chloroform and ethanolic extracts exhibited various characteristic spectral profile (Figs 1–20; Tables 1 and 2).

FT-IR PEAK VALUES OF *ERAGROSTIS AMABILIS* AERIAL AND UNDERGROUND PARTS

The results of FT-IR analysis provided the peak values, probable functional groups of different extracts (ethyl acetate, petroleum ether, acetone, chloroform and ethanol) of *E. amabilis* and *E. pilosa* aerial and underground parts were tabulated in Table 1 and 2. The existences of metabolites functional groups in the studied extracts of *E. amabilis* aerial and underground parts were recorded in Table 1. The functional groups presence and absence explained the similarities and variation between the aerial and underground parts extracts of *E. amabilis*. The functional group existences have the direct correlation with the solvents employed for the extractions. The peaks of 718.96 cm^{-1}, 1039.82 cm^{-1}, 1377.7 cm^{-1}, 2848.82 cm^{-1}, 2916.8 cm^{-1} and 3363.95 cm^{-1} showed their presence in all the studied extracts of aerial and underground parts of *E. amabilis*. The peaks of 836.13 cm^{-1} and 1462.03 cm^{-1} demonstrated their existence only in the underground parts of *E. amabilis*. The peaks of 1164.34 cm^{-1}, 1513.16 cm^{-1}, 1709.97 cm^{-1}, 1735.8 cm^{-1}, 2357.67 cm^{-1} and 3854.49 cm^{-1} illustrated their occurrence only in the aerial parts of *E. amabilis*. The peak at 3363.95 cm^{-1} confirmed the O–H stretch and free hydroxyl group presence in the studied extracts of *E. amabilis* aerial and underground parts, these intensity bonds are due to the existence of alcohols and phenols. Carboxylic acid was present due to O–H stretch at 2916 cm^{-1} in all the studied five extracts of *E. amabilis* aerial and underground parts. An aldehyde (2848.82cm^{-1}) was observed in all the studied extracts of aerial and underground parts of *E. amabilis* due to the presence of H–C=O:C=H stretch. A peak at 1377.21 cm^{-1} was observed in all the studied extracts of *E. amabilis* aerial and underground parts. Medium bond 1039.82 cm^{-1} revealed the presence of aliphatic amines due to C–N stretch in all the studied extracts of *E. amabilis*. 718.96 cm^{-1} medium bond was present in all

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the studied extracts of *E. amabilis* due to presence of C–CL stretch. The existence of alcohols, phenols, 1°2° amines, amide, α, β unsaturated aldehyde, ketone, nitro compounds, and aliphatic amines in the aerial parts of *E. amabilis* was confirmed by the existence of the peak values 3854.49 cm^{-1}, 2357. 67 cm^{-1}, 1735.80 cm^{-1}, 1710.08 cm^{-1}, 1513.16 cm^{-1}, and 1164.34 cm^{-1} (Table 1). Alkyl halide was found at the region of 836.25 cm^{-1} peak in all the studied extracts of *E. amabilis* underground parts. C–H bend at 1462.03 cm^{-1} was obtained in all the studied extracts of *E. amabilis* underground parts (Table 1). The peaks of 668.48 cm^{-1}, 1559 cm^{-1}, 2341 cm^{-1}, 3752.93 cm^{-1}, 3712.82 cm^{-1}, 3676.66 cm^{-1}, 3650.73 cm^{-1}, and 3629.61 cm^{-1} showed their presence and confirmed the existence of 1°2° amines, nitro compounds, amide, alcohols and phenols only in the chloroform and ethanolic extracts of *E. amabilis* aerials parts. These profiles may be used as phytomarker for the identification of *E. amabilis* aerials parts. The peaks of 910.04 and 1624.07 cm^{-1} demonstrated their restricted occurrence and verified the presence of 1°2° amines and 1° amines in the chloroform and petroleum ether extracts of *E. amabilis* underground parts (Table 1, Figs 1–10).

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Table 1

FT-IR peak values and functional groups of *E. amabilis* aerial and underground parts

Peak values (cm^{-1})	Bond	Functional groups	Aerial					Underground				
			EA	AC	CL	ET	PE	EA	AC	CL	ET	PE
668.47	N–H wag	1°2° amines	–	–	+	+	–	–	–	–	–	–
718.96 (m)	C–CL stretch	Alkylhalides	+	+	+	+	+	+	+	+	+	+
836.13 (m)	C–CL stretch	Alkylhalides	+	+	–	–	+	+	+	+	+	+
910.04 (m)	N–H wag	1°2° amines	–	–	–	–	–	–	+	+	–	+
1039.82 (m)	C–N stretch	Aliphatic amines	+	+	+	+	+	+	+	+	+	+
1164.34 (m)	C–N stretch	Aliphatic amines	+	+	+	+	+	+	+	–	+	–
1237.21 (m)	C–N stretch	Aliphatic amines	–	–	+	+	–	–	+	–	–	–
1377.70 (m)	C–H bend	Alkenes	+	+	+	+	+	+	+	+	+	+
1462.03 (m)	C–H bend	Alkenes	+	+	+	–	+	+	+	+	+	+
1513.16 (s)	N–O asymmetric stretch	Nitro compounds	+	+	+	+	+	+	+	–	+	–
1559 (s)	N–O asymmetric stretch	Nitro compounds	–	–	+	+	–	–	–	–	–	–
1624.07 (m)	N–H bend	1° amines	–	–	–	–	–	–	–	+	–	+
1709.97 (s)	C=O stretch	Saturated aliphatic	+	+	+	+	+	+	+	–	+	–
1735.80 (s)	C=O stretch	α,β-unsaturated aldehyde, ketone	+	+	+	+	+	+	–	+	+	+
2341 (m)	N–H Stretch	1°2° amines, amide	–	–	+	+	–	–	–	–	–	–

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Peak values (cm^{-1})	Bond	Functional groups	Aerial					Underground				
			EA	AC	CL	ET	PE	EA	AC	CL	ET	PE
2357.67 (m)	N–H Stretch	1°2°,amines, amide	+	+	+	+	+	+	+	–	+	–
2848.82 (m)	H–C=O:C=H stretch	Aldehyde / alkenes	+	+	+	+	+	+	+	+	+	+
2916.80 (m)	O–H stretch	Carboxylic acid	+	+	+	+	+	+	+	+	+	+
3363.95 (s,b)	O–H stretch, free hydroxyl	Alcohols, phenols	+	+	+	+	+	+	+	+	+	+
3629.61 (s,sh)	O–H stretch, free hydroxyl	Alcohols, phenols	–	–	+	+	–	–	–	–	–	–
3650.73 (s,sh)	O–H stretch, free hydroxyl	Alcohols, phenols	–	–	+	+	–	–	–	–	–	–
3676.66 (s,sh)	O–H stretch, free hydroxyl	Alcohols, phenols	–	–	+	+	–	–	–	–	–	–
3712.82 (s)	O–H stretch	Alcohols, phenols	–	–	+	+	–	–	–	–	–	–
3752.93 (m)	O–H stretch	Alcohols, phenols	–	–	+	+	–	–	–	–	–	–
3821.74 (m)	O–H stretch	Alcohols, phenols	–	+	–	+	–	–	+	–	–	+
3854.49 (s)	O–H stretch	Alcohols, phenols	+	+	+	+	+	+	–	+	+	+

Note: PE – Petroleum ether, AC – Acetone, CL – Chloroform, ET – Ethanol, EA – Ethyl acetate. m - medium , s - strong, sh – sharp.

(+) Indicates the presence of functional components; (–) Indicates the absence of functional components.

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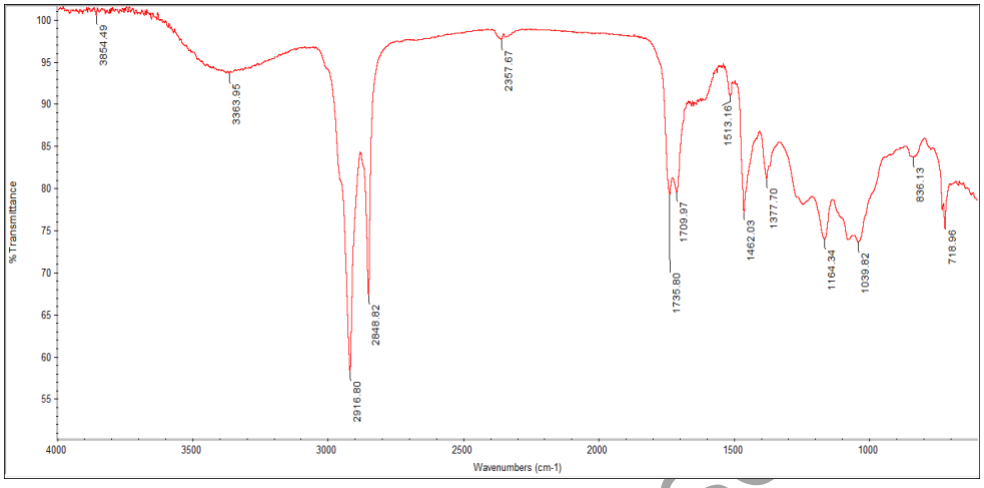

Fig. 1. FT-IR spectrum of *E. amabilis* aerial parts ethyl acetate extracts.

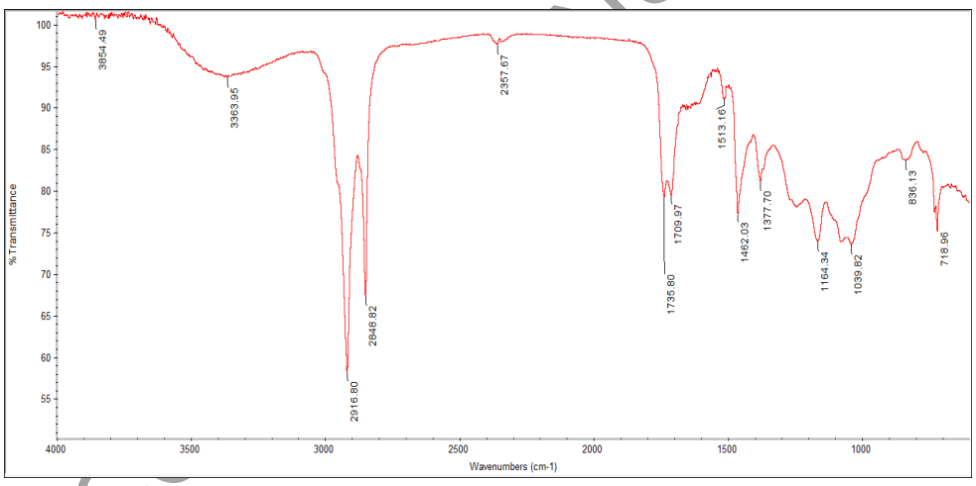

Fig. 2. FT-IR spectrum of *E. amabilis* underground parts ethyl acetate extracts.

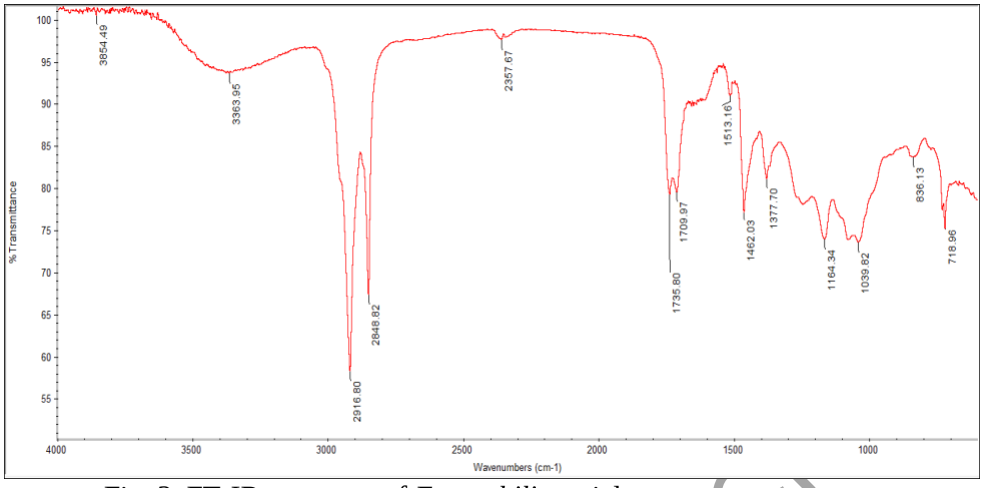

Fig. 3. FT-IR spectrum of *E. amabilis* aerial parts acetone extracts.

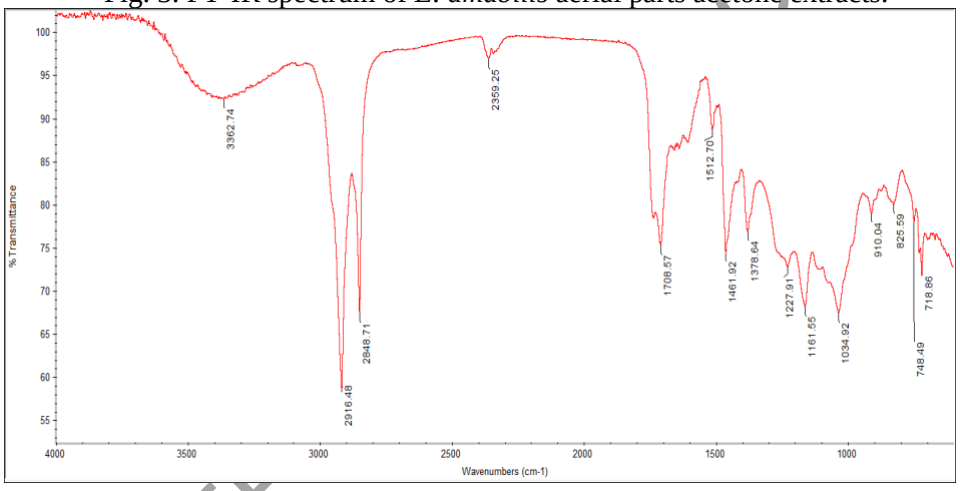

Fig. 4. FT-IR spectrum of *E. amabilis* underground parts acetone extracts.

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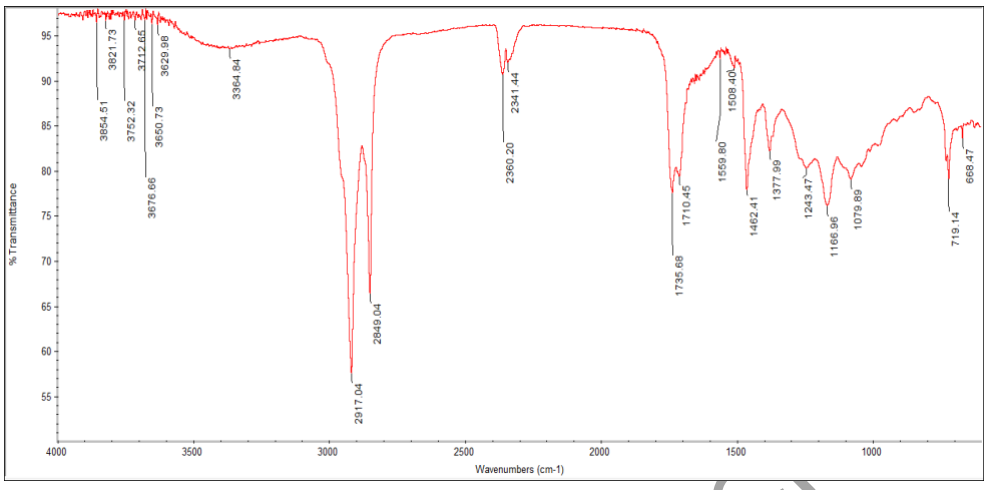

Fig. 5. FT-IR spectrum of *E. amabilis* aerial parts chloroform extracts.

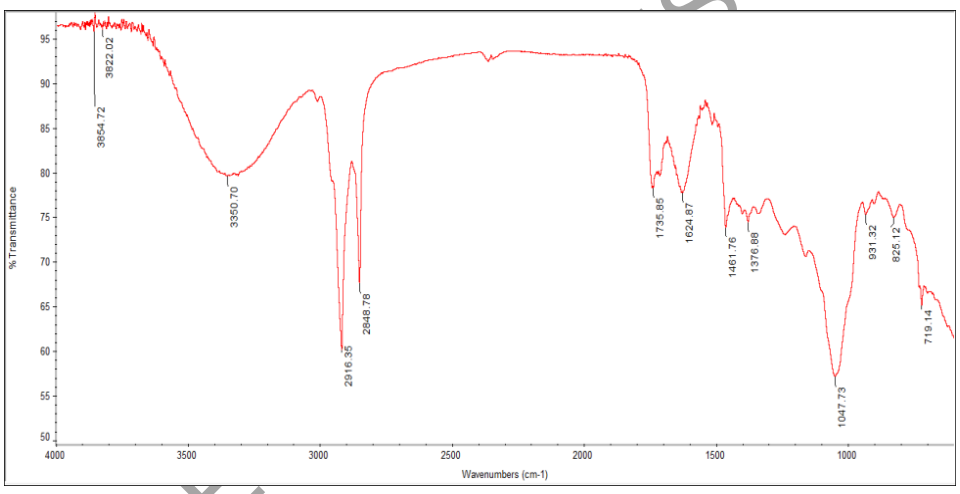

Fig. 6. FT-IR spectrum of *E. amabilis* underground parts chloroform extracts.

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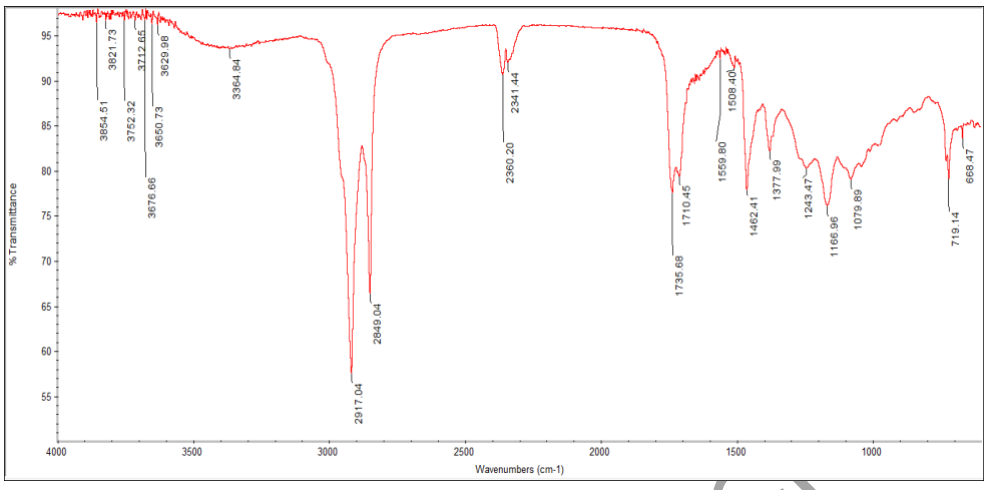

Fig. 7. FT-IR spectrum of *E. amabilis* aerial parts ethanolic extracts.

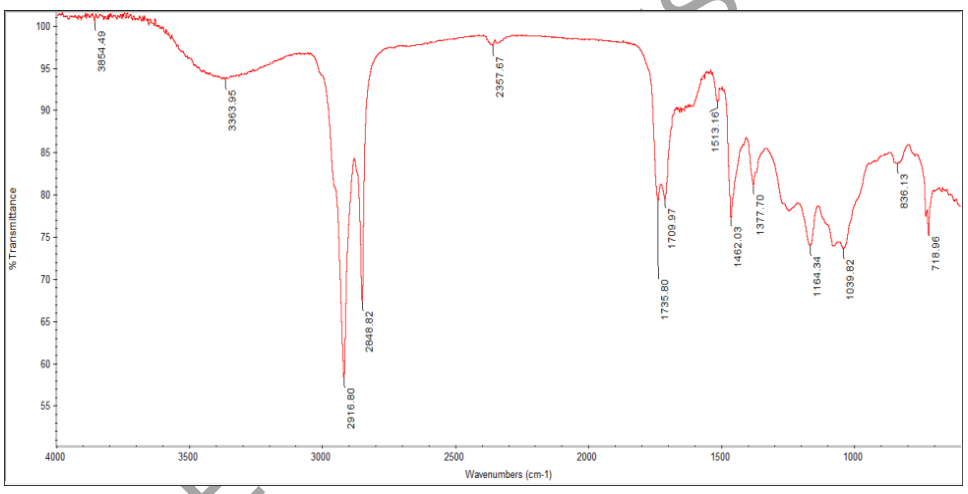

Fig. 8. FT-IR spectrum of *E. amabilis* underground parts ethanolic extracts.

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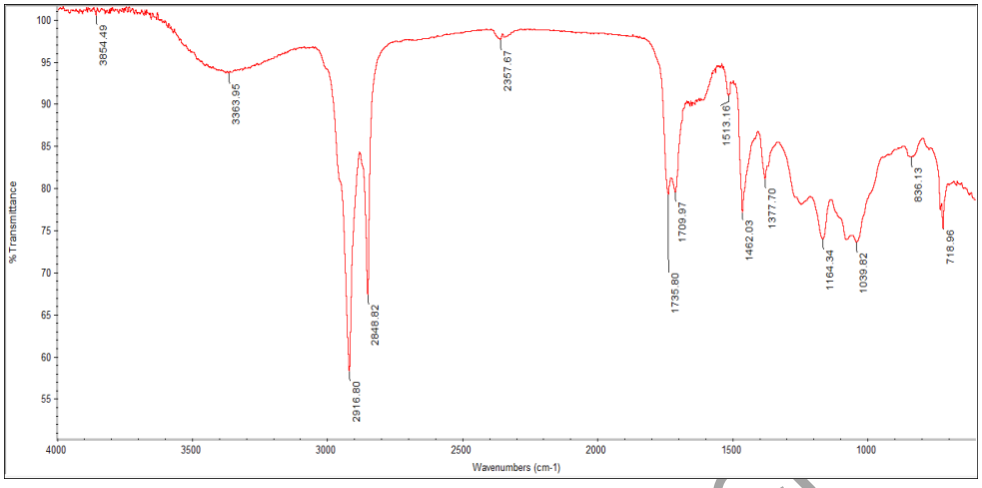

Fig. 9. FT-IR spectrum of *E. amabilis* aerial parts petroleum ether extracts.

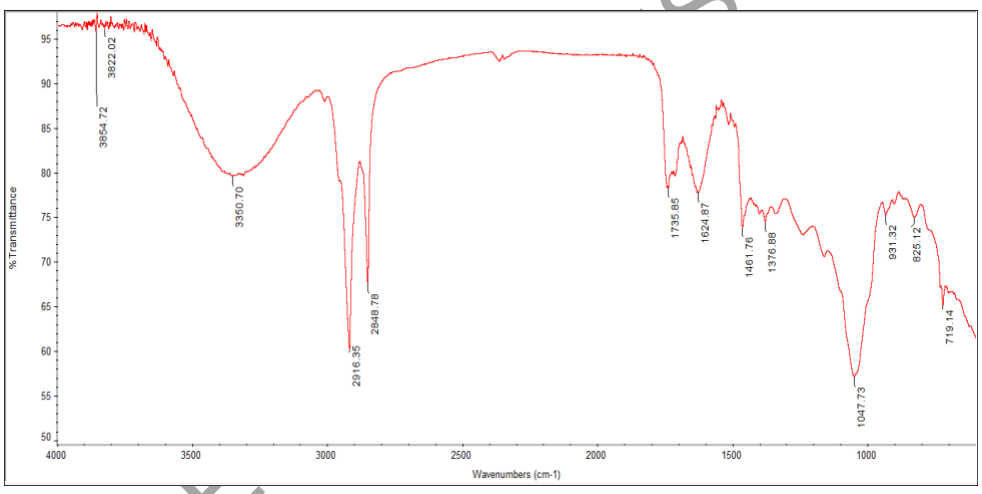

Fig. 10. FT-IR spectrum of *E. amabilis* underground parts petroleum ether extracts.

FT-IR PEAK VALUES OF *ERAGROSTIS PILOSA* AERIAL AND UNDERGROUND PARTS

The existence of metabolites functional groups in the studied extracts of *E. pilosa* aerial and underground parts were recorded in Table 2. Depends upon the solvents and endogenous chemical composition, the functional group existence was varied. The functional groups presence and absence explained the similarities and variation between the aerial and underground parts extracts of *E. pilosa*. The peaks of 719 cm^{-1}, 1039.37 cm^{-1}, 1162.81 cm^{-1}, 1378.89 cm^{-1}, 1451.28 cm^{-1}, 1740 cm^{-1}, and 2848.82 cm^{-1} were showed their presence in all the studied extracts of aerial and underground parts of *E. pilosa* and confirmed the existence of alkyl halides, aliphatic amines, alkenes, saturated aliphatic and aldehyde. The following peaks

825.25 cm^{-1}, 1237.21 cm^{-1}, 1508.07 cm^{-1}, 1636.26 cm^{-1}, 1711.08 cm^{-1}, 2359.25 cm^{-1}, 2916.4 cm^{-1}, 3352.26 cm^{-1}, 3589 cm^{-1}, 3630.61 cm^{-1}, 3650 cm^{-1}, 3670.25 cm^{-1}, 3771 cm^{-1}, 3727.39 cm^{-1}, and 3821.74 cm^{-1} were showed their presence in all the studied extracts of *E. pilosa* aerial parts and validated the existence of alkyl halides, aliphatic amines, nitro compounds, alkenes, saturated aliphatic, aldehyde, carboxylic acid, alcohols and phenols. The peaks of 668.5 cm^{-1} and 729 cm^{-1} showed their restricted presence only in the ethyl acetate and petroleum ether extracts of *E. pilosa* aerial parts.

The peaks of 825.25 cm^{-1}, 1508.07 cm^{-1}, 1636.86 cm^{-1}, 2916.4 cm^{-1}, and 3352.26 cm^{-1} showed their jointly presence in ethyl acetate, acetone and chloroform extracts of *E. pilosa* underground parts and authenticated the occurrence of alcohols, phenols, carboxylic acid, alkenes, nitro compounds and alkyl halides. The peaks of 1237.21 cm^{-1}, 1711.08 cm^{-1}, 2359.25 cm^{-1}, 3589 cm^{-1}, 3670.25 cm^{-1}, 3771 cm^{-1}, 3727.39 cm^{-1}, 3821.74 cm^{-1}, and 3854 cm^{-1} showed their commonly presence in the chloroform and ethyl acetate extracts of *E. pilosa* underground parts (Table 2. Fig. 11–20).

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Table 2

FT-IR Peak values and functional groups of *Eragrostis pilosa* (L.) aerial and underground parts

Peak values	Bond	Functional groups	Aerial					Underground				
			EA	AC	CL	ET	PE	EA	AC	CL	ET	PE
668.5 (s, b)	N–H wag	1°2°,amines	–	–	–	–	–	–	–	–	+	+
719 (m)	C–CL stretch	Alkylhalides	+	+	+	+	+	+	+	+	+	+
729 (m)	C–CL stretch	Alkylhalides	–	–	–	–	–	–	–	–	+	+
825.25 (m)	C–CL stretch	Alkylhalides	+	+	+	+	+	+	+	+	–	–
1039.37 (m)	C–H stretch	Aliphatic amines	+	+	+	+	+	+	+	+	+	+
1162.81 (m)	C–N stretch	Aliphatic amines	+	+	+	+	+	+	+	+	+	+
1237.21 (m)	C–N stretch	Aliphatic amines	+	+	+	+	+	+	–	+	–	–
1378.89 (m)	C–H bend	Alkenes	+	+	+	+	+	+	+	+	+	+
1451.28 (m)	C–H bend	Alkenes	+	+	+	+	+	+	+	+	+	+
1508.07 (s)	N–O asymmetric stretch	Nitro compounds	+	+	+	+	+	+	+	+	–	–
1636.86 (m)	–C=C stretch	Alkenes	+	+	+	+	+	+	+	+	–	–
1711.08 (s)	C=O stretch	Saturated aliphatic	+	+	+	+	+	+	–	+	+	–
1740 (s)	C=O stretch	Saturated aliphatic	+	+	+	+	+	+	+	+	+	+
2359.25	H–C=O:C=H stretch	Aldehyde	+	+	+	+	+	+	–	+	+	+
2848.74 (m)	H–C=O:C=H stretch	Aldehyde	+	+	+	+	+	+	+	+	+	+

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Peak values	Bond	Functional groups	Aerial					Underground				
			EA	AC	CL	ET	PE	EA	AC	CL	ET	PE
2916.40 (m)	O–H stretch	Carboxylic acid	+	+	+	+	+	+	+	+	+	–
3352.26 (s, b)	O–H stretch, H-bended	Alcohols, phenols	+	+	+	+	+	+	+	+	–	+
3589 (s,b)	O–H stretch free hydroxyl	Alcohols, phenols	+	+	+	+	+	+	–	+	–	–
3630.61 (s,sh)	O–H stretch free hydroxyl	Alcohols, phenols	+	+	+	+	+	+	–	+	+	+
3650 (s,sh)	O–H stretch free hydroxyl	Alcohols, phenols	+	+	+	+	+	+	–	+	+	+
3670.25 (s,sh)	O–H stretch	Alcohols, phenols	+	+	+	+	+	+	–	+	+	+
3771 (s,sh)	O–H stretch	Alcohols, phenols	+	+	+	+	+	+	–	+	–	–
3727.39 (s,sh)	O–H stretch	Alcohols, phenols	+	+	+	+	+	+	–	+	–	–
3821.74 (s,sh)	O–H stretch	Alcohols, phenols	+	+	+	+	+	+	–	+	+	+
3854 (s,sh)	O–H stretch	Alcohols, phenols	+	+	+	+	+	+	–	+	+	+

Note: PE – Petroleum ether, AC – Acetone, CL – Chloroform, ET – Ethanol, EA – Ethyl acetate, s – strong, sh – shade, b-broad. (+) Indicates presence of components; (–) Indicates absence of components.

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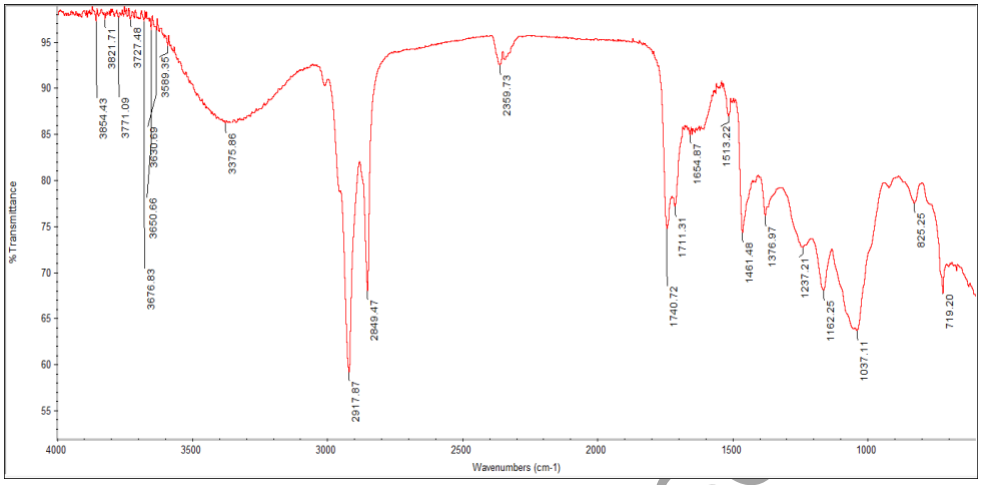

Fig. 11. FT-IR spectrum of *E. pilosa* aerial parts ethyl acetate extracts.

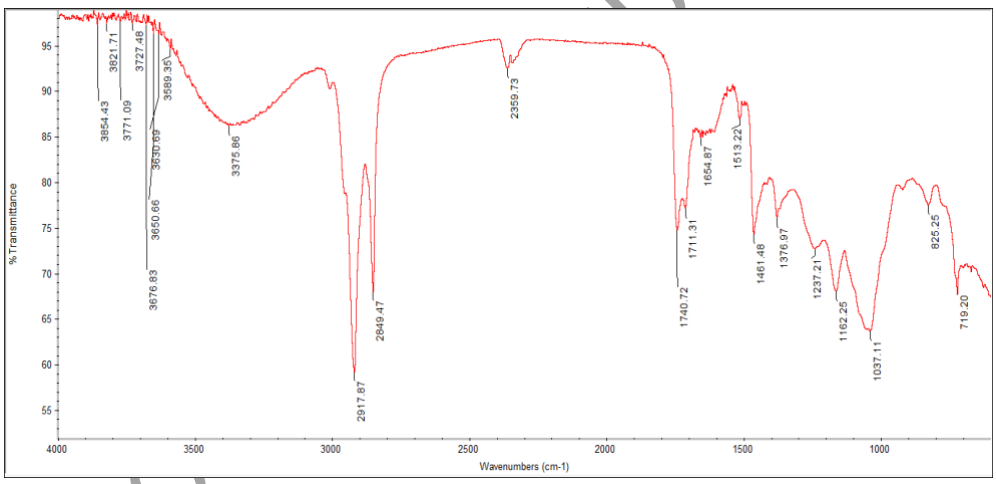

Fig. 12. FT-IR spectrum of *E. pilosa* underground parts ethyl acetate extracts.

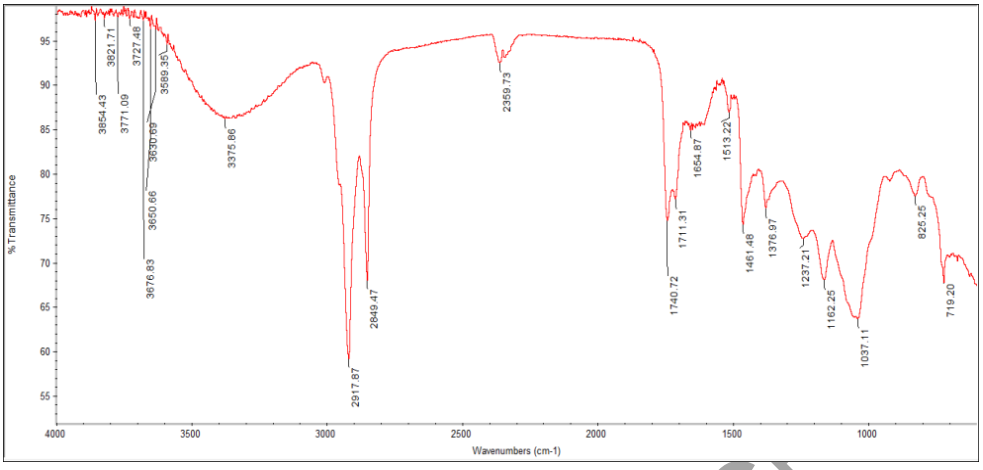

Fig. 13. FT-IR spectrum of *E. pilosa* aerial parts acetone extracts.

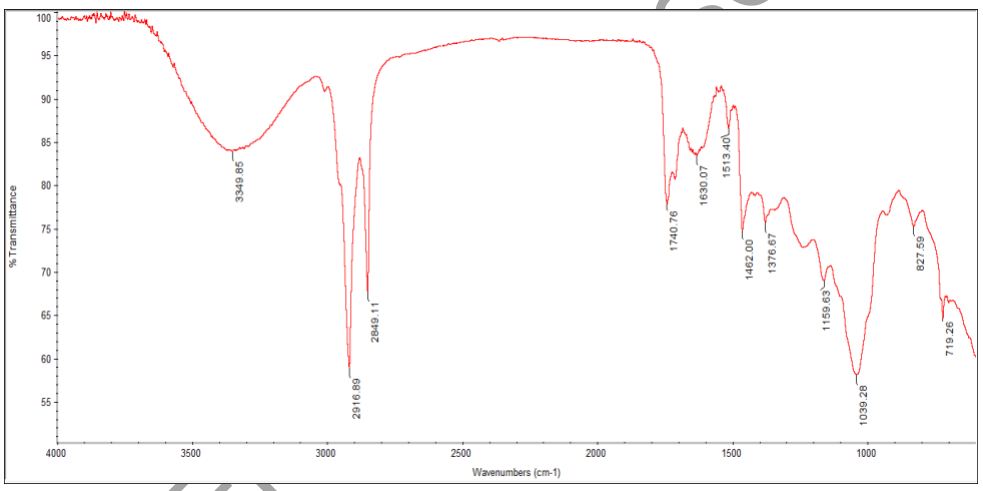

Fig. 14. FT-IR spectrum of *E. pilosa* underground parts acetone extracts.

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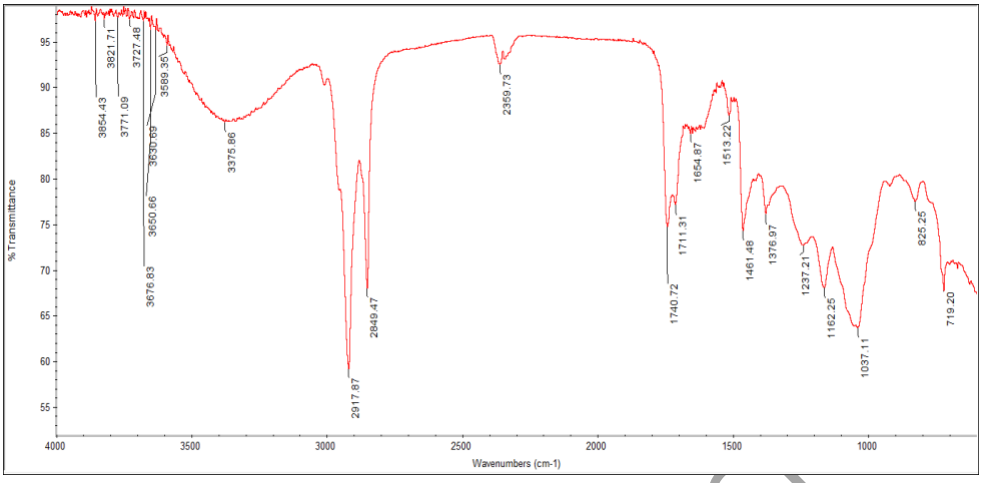

Fig. 15. FT-IR spectrum of *E. pilosa* aerial parts chloroform extracts.

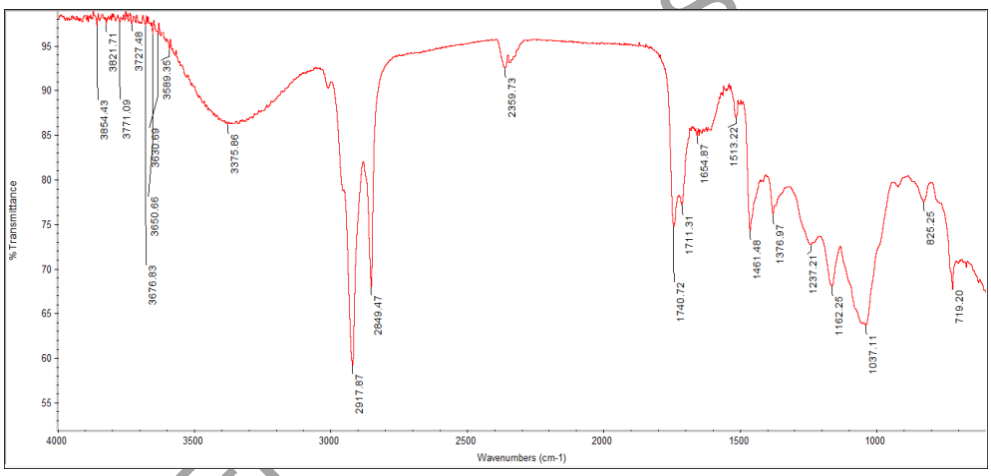

Fig. 16. FT-IR spectrum of *E. pilosa* underground parts chloroform extracts.

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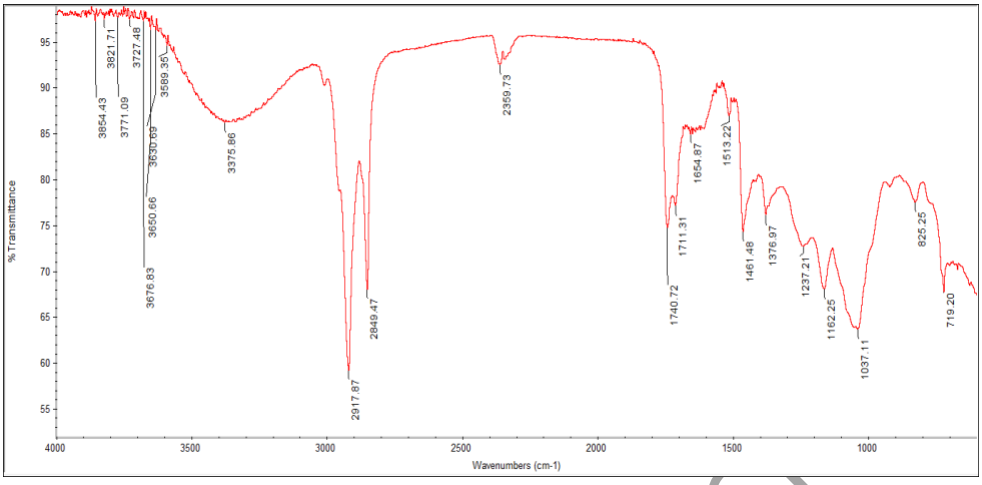

Fig. 17. FT-IR spectrum of *E. pilosa* aerial parts ethanolic extracts.

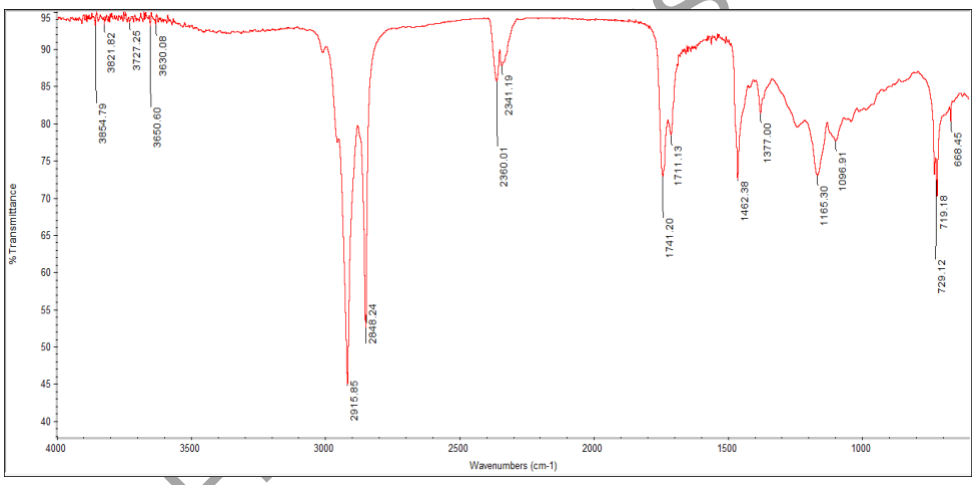

Fig. 18. FT-IR spectrum of *E. pilosa* underground parts ethanolic extracts.

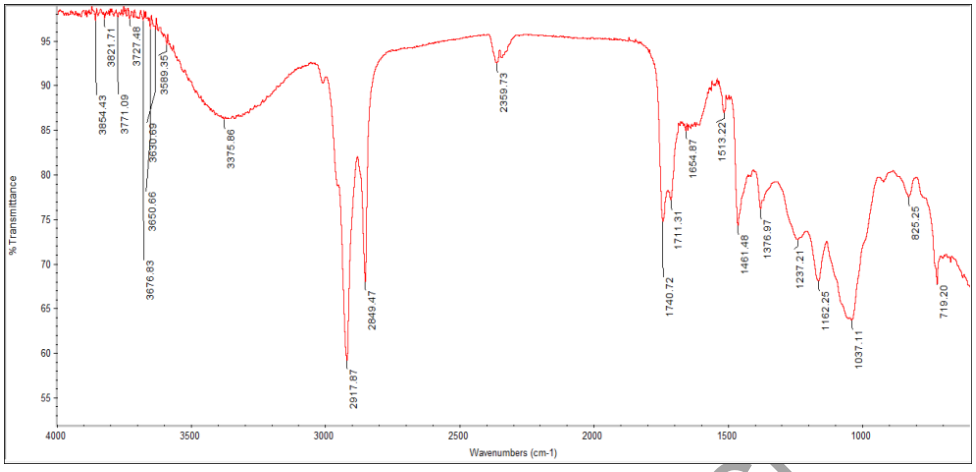

Fig. 19. FT-IR spectrum of *E. pilosa* aerial parts petroleum ether extracts.

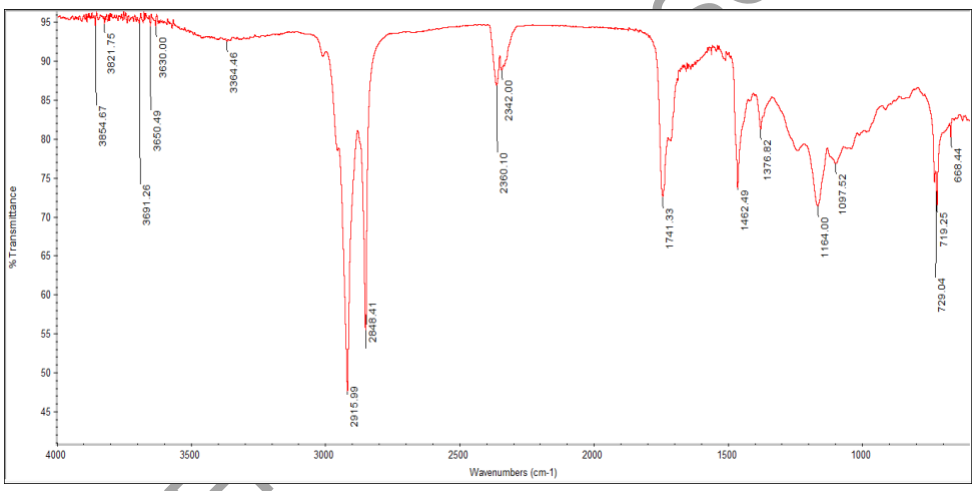

Fig. 20. FT-IR spectrum of *E. pilosa* underground parts petroleum ether extracts.

DISCUSSION

In pharmacognosy, the morphological, anatomical and microscopical characters were used to distinguish the drug from its adulterants. At present, the identification of medicinal plants and crude drugs based on their morphological parameters is very questionable. For the authentication of the medicinal plants, chemical and molecular markers are required. Molecular markers are employed as tool to distinguish the medicinally important species from its adulterants. But cost wise it is little expensive and skilled person assistant is required. An additional form of accomplishing variability studies is the development of analytical techniques such as spectroscopy and chromatography that can reveal the qualitative

and quantitative chemical profiles (markers) for the medicinally and economically important species in the study. Phyto-profiles are employed as markers to differentiate and identify the crude drugs and medicinally important species. These profiles will help the traditional healers to identify chemotypes [22, 25].

Among the spectroscopy, FT-IR spectroscopy was a valuable tool to characterize and identify the compounds and functional groups (chemical bonds) present in the crude extracts / fraction / isolated compounds and powder of the plant. FT-IR spectroscopy documents the interaction between the infra red radiation and crude extracts / fraction / isolated compounds and powder of the plant and determining the frequencies at which the sample absorbs the radiation and the intensities of the absorptions [5, 6].

The spectroscopic profiles are used as phytomarker to solve taxonomical problems and determined the phylogenetic relationships among different groups of plants [8, 10, 12, 14, 22]. The inter specific and intra specific variation of *Plumbago* species was determined using UV-Vis and FT-IR spectroscopic profiles [22]. Yu *et al*. [31] distinguished the Green Bristle Grass, Yellow Foxtail and Chinese Pennisetum Seeds using HATR-FT-IR. In the present study also, the FT-IR spectroscopic profiles clearly distinguished the difference between the studied two *Eragrostis* species. Previous reports on FT-IR analysis of grasses showed the presence of various functional groups with strong bonds in different regions. FT-IR analysis confirmed the presence of organic structure of siloxane and silanol bonds in lemon grass calcinated at different temperature [17]. Brown *et al*. [4] studied the cell wall composition of *Setaria italica* using FT-IR.

In *Eragrostis pilosa*, the very strong absorption peaks at 3352.26 (s, b), 3589(s,b), 3630.61(s,sh), 3650(s,sh) cm–1 confirmed the presence of amino acids, alcohols, phenols [21]. Similar absorption were observed in *E. amabilis* various extracts with peaks at 3363.95(s,b), 3629.61(s,sh) and confirmed the presence of amino acids, alcohols, phenols [21]. In the studied extracts of *Eragrostis pilosa* and *E. amabilis*, the peaks are noticed at 2916.80(m) and 2916.40(m) due to the indicative of the Carboxylic acid [8, 28]. The *E. pilosa* and *E. amabilis* plant extracts showed the peaks at 2359.25, 2848.74(m) and 2848.82(m) cm–1 due to existence of aldehyde [8,13, 28]. The peaks at 2341, 2357.67(m) predicts the occurrence of 1°2° amines, amide in *E. amabilis* [8, 28]. In *E. pilosa* and *E. amabilis* extracts, the peaks at 1711.08(s), 1740(s), 1709.97(s) and 1735.80(s) confirmed the saturated aliphatic functional group presence [8, 28]. The strong peaks at 1508.07(s), 1513.16(s), and 1559(s) cm–1 represent the presence of nitrocompounds and indicative of the aminoacids, proteins, lignins in the studied extracts of *E. pilosa* and *E. amabilis* [21]. The alkenes presence is confirmed by the expression of peaks at 1378.89(m) and 1451.28(m), 1636.86(m) in *Eragrostis pilosa* extracts and 1377.70(m), 1462.03(m) in *E. amabilis* extracts. The 1237.21 cm–1 bands in the studied extracts of *E. pilosa* and *E. amabilis* predict the presence of ester carbonyl [27]. The peaks at 1039.37(m), 1039.82(m), 1164.34(m) and 1162.81(m), confirmed the existence of aliphatic amines in *E. pilosa* and *E. amabilis* [8]. The peaks at 718.96, 719, 729, 825.25 836.13 and 910.04 cm^{-1}

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validated the presence of alkylhalides in the studied extracts of *E. ambilis* and *E. pilosa* [3, 9, 22, 23]. The existence of 1°2°,amines in the studied extracts of *E. ambilis* and *E. pilosa* was identified by the peaks at 668.47 and 668.5 cm^{-1} [8, 28]. Successful implementation of FT-IR analysis revealed the functional components of *E. amabilis* and *E. pilosa* aerial and underground parts and identified the similarities and variation between the species and parts (aerial and underground). A insightful difference was observed between the aerial and underground parts of *E. amabilis* and *E. pilosa* (Table 1 and 2). Similarly insightful variations were noted among the various extracts of *E. amabilis* and *E. pilosa* aerial and underground parts.

CONCLUSION

FT-IR spectra of *E. amabilis* and *E. pilosa* crude extracts provide unique chemical "fingerprint" with absorption peaks which correspond to the frequencies of vibrations between the bonds of the atoms making up the material. The results of the present study have proven FT-IR spectroscopy as a valuable tool and chemotaxonomic parameter to distinguish *Eragrostis* species based on the functional groups.These profiles will be used as marker to reveal inter specific variation between *E. amabilis* and *E. pilosa* and difference in the chemical composition of aerial and underground parts of *E. amabilis* and *E. pilosa*. The observed result proved that the FT-IR spectroscopic profiles are valuable marker and these may be used as chemometrics to distinguish the species and crude drugs.

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