FT-IR analysis of methanol extract of leaves of *Mollugo lotoids*

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Abstract

Mollugo lotoids are otherwise called as *Glinus lotoids*, Thia plant is grow well in all types of soil. These plants are growing at ground level and creep on the ground. Seeds of this plant are traditionally used as anthelmintic for the prevalent tapeworm infestation. In the present investigation, the FTIR analysis of methanol leaf extract of these plants has the following bioactive phytocompounds such as - in amino acids, $=CH_2$ in vinyl compounds, 1,2,4-trisubst benzenes, 1,2,4-trisubst benzenes, CH-O-H cyclic alcohols, *t*-butyl in hydrocarbons, NO_2in sulfonamides, C-N in primary amides, COO^- in carboxylic acid salts, NH_2 in aminoacids, C≡C in alkynes (monosubst), N≡N in diazaonium salts, CH_3 and $–CH_2$ in Aliphatic compounds and OH in alcohol and phenols in fraction-I. The phytocompounds Cl-C=O in acid chlorides, C-I in indo compounds, Pyridines, C≡C-H in alkynes,- $(CH_2)_n$- in hydrocarbons, C-Cl in chloro compounds, CH_2 =C in vinilidenes, SO_3H in sulfonic acids, C-O-C in esters and lactones, SO_2 sulfonyl chlorides, C=O in β- diketones, C=O in ketones, C=C=C in allenes, -PH in phosphines, CH_3 and CH_2- in aliphatic compounds and OH in alcohols and phenols in fraction –II.

Key Words: Mollugo lotoides, Glinus lotoides,FT-IR, bioactive phytocompounds**,** anthelmintic.

Introduction

About three-quarters of the world population have used traditional medicine for their health care (Gilani and Atta-ur-Rahman, 2005). Plants have been an important part of sophisticated traditional medicine systems for thousands of years (Gurib-Fakim, 2006). Medicinal plants are gaining popularity because of several advantages such as fever side effects, better patient compliance, relatively low cost and high accessibility as well as high acceptability due to a long history of use (Veramani and Garg, 2002). The Indian subcontinent is a vast repository of medicinal plants that are used in traditional

medical treatments (Ballabh and Chaurasia, 2007).

Recent records reported that 80% of the people living in rural areas use medicinal herbs as primary healthcare system (Sakarkar and Deshmukh, 2011). In India, around 20,000 medicinal plants have been recorded however traditional communities are using only 7,000 - 7,500 plants for curing different diseases (Kamboj, 2000).*Glinus lotoides* (*Mollugo lotoides*) is one of the plant selected for the present study is indigenous to Ethiopia, It is used as anthelminthis (Pankhurst, 1965 and Kloos *et al*., 1978), antimicrobial (Abdel-Hameed, *et al.,* 2008), antifungal and antitumor medicines (Chopra *et al*., 1956) used to cure anal fistula, boils and wounds (Hamed *et al.*, 1996).

Materials and method

The fresh leaves of *Mollugo lotoides* collected from moisture agricultural land near vallimalai Murugan Temple, Vellore Tamilnadu were dried under shaded place in the laboratory for complete evaporation of moisture content. Thereafter, these dried leaves were grounded well in a mixy and make into fine powder. This fine powder of leaf was packed inside the thimble of the Soxhlet apparatus. The required amount of methanol was filled inside the bottom flask. The temperature of the solvent was set in the heating mantle. Few minutes after, the green colour extract come from the siphon was collected in a conical flask and dried under sunlight to evaporate the solvent. Then dried phytocompounds containing extract were stored for FT-IR study.

Biology of study plants

The plant *Glinus lotoides L* is locally known as "Mettere" is an annual or short- living perennial prostrate herb.This plant belongs to the family *Molluginaceae* which contains 16 genera and about100 species.

Description

The plant *Glinus lotoides* is a small annual herb grow with the branches of 20- 50cm long. All parts contain densely stellate-pubescent and short gray hairs. Leaves are barely petiolate or with stellate-hairy, arranged an opposite or whorl type on branches with to 1-3 cm long. The lamina is mostly very widely obovate to obovate, 8–23mm long, 7–14mm wide, margins entire, both dorsal

and ventral surfaces greyish-greencolor.Flowers are greenish in color with 5mm long and arranged as 3-8 clusters in the axillary region, shortly pedicelled, fascicled, sessile. Sepals are densely hairy in the outside. Stamens are 10-15 in number with some staminodes. Ovary contains 1-1.5mm long 5 styles. Seeds are small, brown or black color and present inside the ovoid capsule. Flowering and fruiting are present throughout years.

Distribution

This plant is native to Eurasia and Africa and mostly abundant in tropical, subtropical and warm temperature area worldwide such as Ethiopia, Sudan, Uganda, Egypt, India, Pakistan, and South America and in all mainland states of Australia.

Classification

Kingdom:Plantae

Order:Caryophyllales

Family:Molluginaceae

Genus:*Glinus*

Species:*G. lotoides*

Phytocompounds

Saponin:The plant *Glinus lotoides L* contains the following phytocompounds such as (1) 3-O-[ß-D-glucopyranosyl-(1→4)-α-L-arabinopyranosyl]-oleanolic acid- (28→1) - ß-D-glucopyranosyl ester, (2) 3-O-ß-L-arabinopyranosyl -22-O-ß-D- glucopyranosyl (4←1)-α-L-rhamnopyranosy l-15ß-hydroxyhopan-6-one (3) 3-O-ß-L-arabinopyranosyl-15-O-ß-D-glucopyranosyl-22ß-hydroyhopan-6-one (4) 3-O-ß-D- glucopyranosyl-(4←1)-ß-L-arabinopyranosyl-22ß-ydroxyhopan-6-one (5) 3-O-ß-L- arabinopyranosyl-22-α-L-rhamnopyranosyl-(1→4)-ß-D-lucopyranosyl-5ß-H-16-ß- hydroxyhopane (6) 3-O-ß-L-arabinopyranosyl-22-O-ß-d-glucopyranosyl-(1→4)-ß-D- glucopyranosylsyl-5ß-H-16-ß-hydroxyhopane (7) 3-O-β-D- xylopyranosyl -(1→2)-α- L- rhamnopyranosyl -6α-O-β-D-xylopyranosyl -22-β-O-β-D-glucopyranosyl-16β- hydroxyhopane (8) 3-O-β-D-xylopyranosyl -(1→2)-α-L- rhamnopyranosyl -22-β-O- β-D-glucopyranosyl-6α,16β-dihydroxyhopane (9) 3-O-D-xylopyranosyl-6α-O-β-D- xylopyranosyl -16β-O-β-D- xylopyranosyl-22β-

hydroxyhopane (10) 3-O-β-D- xylopyranosyl-16β-O-α-L-arabinopyranosyl-6α,22-β-dihydroxy hopane (11) 3-O-β- D-xylopyranosyl-6α-O-β-D-xylopyranosyl-16 β,22-β-dihydroxyhopane (12)3-O-β-D-xylopyranosyl-22-β-O-β-D-glucopyranosyl-16β-hydroxyhopan-6-one.

Flavonoids:Apigenin-7-O-glucoside, isovitexin, luteolin-7-O-glucoside, vicenin-2 and vitexin-2″-O-glucoside.

Isoflavonoids:5,7,2',4' - tetrahydroxy-6- (3,3-dimethylallyl) isoflavone; 5,7,4'-trihydroxy- 6,3'-di-(3,3-dimethylallyl) isoflavone and 5,7,2',4'-tetrahydroxy-6; 3'-di-(3,3- dimethylallyl) isoflavone.

Others:ß-amyrin, campesterol, α-spinasterol, ß-sitosterol and lupeol

Medicinal uses

Glinus lotoides are traditionally used as anthelminthic to prevent tapeworm infection. In Punjab region this plant is used to cure the diarrhoea, applied to itches and skin diseases by traditional native practitioners.

Fig -1 Plant *Mollugo lotoides* with leaves and flowers.

Results and discussion

Glinus lotoidesis are mostly distributed in tropical and subtropical region such as Ethiopia, Sudan, Uganda, Egypt, India, Pakistan and South Africa. In Ethiopia, the seeds of Glinus lotoides are traditionally used as anthelmintic for the prevalent tapeworm infestation (Djote, 1978; Endale et al., 1997, 1998), taenicidal activity ((Djote, 1978).Hence, in the present investigation,the FT-IR analysis made on the methanol extract of leaf of *Glinus lotoidesis showed* the following peak values such as 559.36, 640.37, 823.6, 1064.71,1240.23, 1357.89, 1415.75, 1598.99, 1610.56, 2133.27, 2351.23, 2935.66, 3402.43,3782.41, 3942.5 and 3986.86 in fraction-I indicates the existence of bands such as C-C-O- rocking,=CH_2 twistings, CH out-of-plane deformation, C-O stretch,Skeletal vibration,NO_2 antisym stretch,C-N Stretch (Amide III band), COO^- in antisym stretch,NH_2 Deformation-broad band,C≡C Stretch, N≡N in stretch- aq soln,CH antisym and sym stretching,-OH stretch (solids and liquids) -OH stretch (solids and liquids and -OH stretch (solids and liquids) and the functional groups such as - in amino acids,=CH_2 in vinyl compounds,1,2,4-trisubst benzenes CH-O-H cyclic alcohols,*t*-butyl in hydrocarbons,NO_2in sulfonamides,C-N in primary amides, COO^- in carboxylic acid salts, NH_2 in aminoacids, C≡C in alkynes (monosubst), N≡N in diazaonium salts, CH_3 and –CH_2 in Aliphatic compounds, OH in alcohol and phenols, OH in alcohol and phenols, OH in alcohol and phenols and OH in alcohol and phenols respectively. The peak values such as 563.21, 644.22, 723.31, 850.61, 1068.56, 1255.66, 1381.03, 4440.83, 1631.78, 1705.07,2357.01 2798.7, 2864.29, 2926.01, 3367.71, 3687.9, 378.41, 3842.2, 3861.49 and 3944.43 in fraction –II indicates the existence of Chain deformation (two bands),O-C-O bend,CH_2 rocking in methylene chains; intensity depends on chain length,Si-C in organosilicon compounds,SO_3H Sym stretch, C-O-C antisym stretch, SO_2 antisym stretch, CH_3 antisym deformation, C=O Stretch and enol form, C=O Stretch and fairly broad,-PH Stretch- sharp peak, -CH_3 Stretching modes,CH_3 and –CH_2 antisym and sym stretching, CH_3 and –CH_2 antisym and sym stretching,-OH Stretch (solids and liquids),OH Stretch (solids and liquids),OH Stretch (solids and liquids),OH Stretch (solids and liquids),OH Stretch (solids and liquids) and OH Stretch (solids and liquids) and the presence of bands related functional groups such as CnH_{2n+1} in alkyl

groups O-C-O in esters,-$(CH_2)_n$ – in hydrocarbons, Si-C stretch, SO_3H Sulfonic acids, C-O-C esters, lactones, SO_2 Sulfonyl chlorides,CH_3 Aliphatic compounds, C=O in β diketones, C=O Carboxylic acids,-PH in phosphines,-CH_3 attached to O or N,CH_3 and –CH_2 in aliphatic compounds,CH_3 and –CH_2 in aliphatic compounds,-OH in alcohol and phenols,-OH in alcohol and phenols,-OH in alcohol and phenols,-OH in alcohol and phenols,-OH in alcohol and phenols, and -OH in alcohol and phenols respectively. These results showed an agreement with the seeds of Glinus lotoides contain 10% crude saponin (Endale et al., 1998) and 14% oil (Biftu et al., 1979). The lipophilic compounds in the plant comprise fatty acids, glycosides of sitosterols, stigmasterol, flavonoids and waxes (Biftu et al., 1979) and five triterpenoidal saponines (Glinusides A, B, C, D and E) have been isolated from the n-butanol fraction of Glinus lotoides var. dicatamnoides (Hamed and El-Elmary, 1999).

Table-1. Peak values, band type and functional group for FTIR (Fourier Transform Infrared Spectroscopy) spectra of fraction I methanol extract of *Mollugo lotoid*

No	Peak value	Bonds	Functional group
1.	559.36	- rocking	- in amino acids
2.	640.37	$=CH_2$ twistings	$=CH_2$ in vinyl compounds
3.	823.6	CH out- of- plane deformation	1,2,4-trisubst benzenes
4.	1064.71	C-O stretch	CH-O-H cyclic alcohols
5.	1240.23	Skeletal vibration	*t*-butyl in hydrocarbons
6.	1357.89	NO_2 antisym stretch	NO_2in sulfonamides
7.	1415.75	C-N Stretch (Amide III band)	C-N in primary amides
8.	1598.99	COO^- in antisym stretch	COO^- in carboxylic acid salts
9.	1610.56	NH_2 Deformation;broad band	NH_2 in aminoacids
10.	2133.27	C≡C Stretch	C≡C in alkynes (monosubst)
11.	2351.23	N≡N in stretch; aq soln	N≡N in diazaonium salts
12.	2935.66	CH antisym and sym stretching	CH_3 and $–CH_2$ in Aliphatic compounds
13.	3402.43	-OH stretch (solids and liquids)	OH in alcohol and phenols
14.	3782.41	-OH stretch (solids and liquids)	OH in alcohol and phenols
15.	3942.5	-OH stretch (solids and liquids)	OH in alcohol and phenols
16.	3986.86		OH in alcohol and phenols

Table-2. Peak values, band type and functional group for FTIR (Fourier Transform Infrared Spectroscopy) spectra of fraction II methanol extract of *Mollugo lotoid*

No	*Peak value*	*Bonds*	*Functional group*
1.	426.27	Cl-C=O plane deformation	Cl-C=O in acid chlorides
2.	582.5	C-I Stretch	C-I in indo compounds
3.	634.58	plane ring deformation	Pyridines
4.	663.51	C≡C-H bending	C≡C-H in alkynes
5.	736.81	CH_2 rocking in methylene chains; intensity depends on chain length.	- $(CH_2)_n$- in hydrocarbons
6.	835.18	C-Cl stretch	C-Cl in chloro compounds
7.	896.9	CH_2 out-of-plane	CH_2 =C in vinilidenes
8.	1074.35	SO_3H sym stretch	SO_3H in sulfonic acids
9.	1257.59	C-O-C Antisym stretch	C-O-C in esters and lactones
10.	1382.96	SO_2 Antisym stretch	SO_2 sulfonyl chlorides
11.	1624.06	C=O stretch and enol form	C=O in β- diketones
12.	1712.79	C=O stretch ; 20cm^{-1} lower if unsaturated	C=O in ketones
13.	1897.95	C=C=C antisym stretch	C=C=C in allenes
14.	1921.1	C=C=C antisym stretch	C=C=C in allenes
15.	2360.87	-PH stretch and sharp peak	-PH in phosphines
16.	2864.29	CH antisym and sym stretching	CH_3 and CH_2- in aliphatic compounds
17.	2929.87	CH antisym and sym stretching	CH_3 and CH_2- in aliphatic compounds
18.	3385.07	-OH Strtech (Solids and Liquids)	OH in alcohols and phenols
19.	3705.26	-OH Strtech (Solids and Liquids)	OH in alcohols and phenols
20.	3776.62	-OH Strtech (Solids and Liquids)	OH in alcohols and phenols
21.	3826.77	-OH Strtech (Solids and Liquids)	OH in alcohols and phenols
22.	3851.85	OH Strtech (Solids and Liquids)	OH in alcohols and phenols

Fig-2.FTIR Pattern of fraction –I methanol extract of leaf of *Mollugo lotoides*

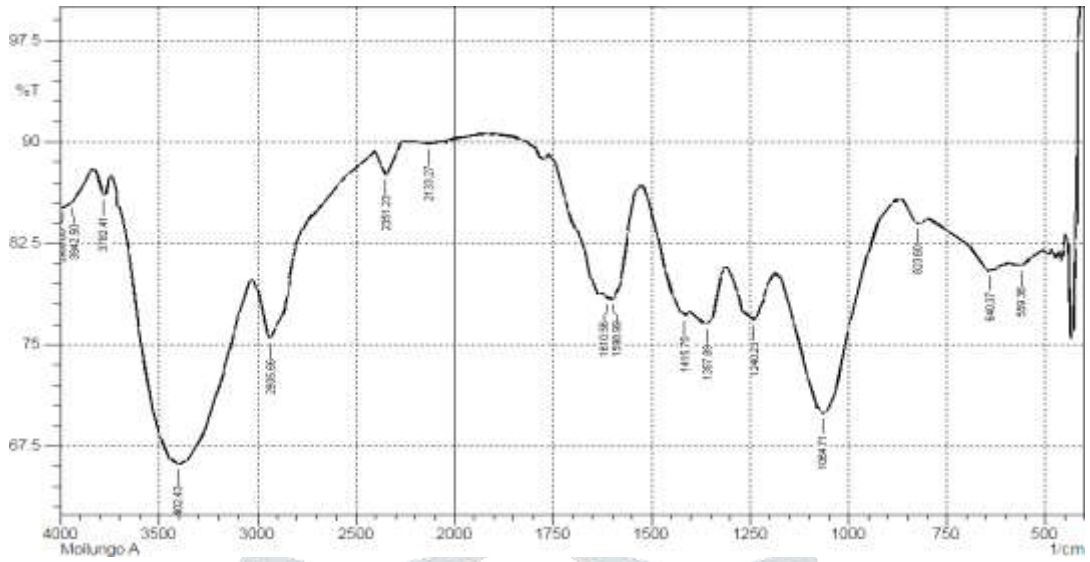
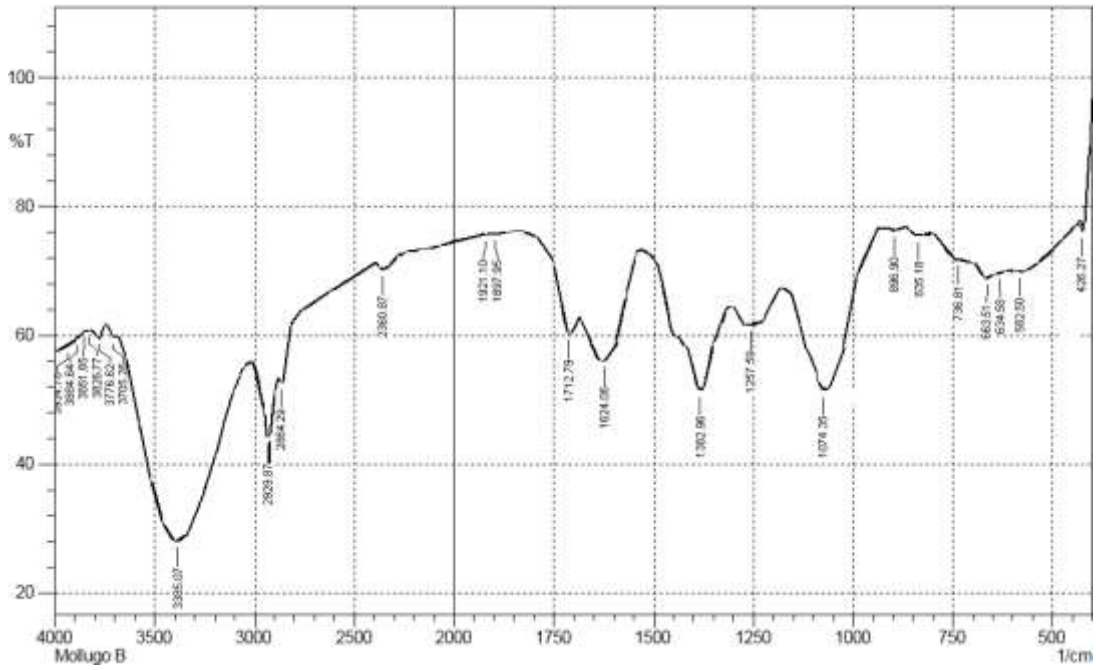


Fig -3.FTIR Pattern of fraction –II methanol extract of leaf of *Mollugo lotoides*



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