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HPTLC FINGER PRINTING OF *Tinospora Cordifolia* AND *Trigonella Foenum Graecum* EXTRACTS

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ABSTRACT

The plates are developed using solvent systems with toluene-ethyl acetate-formic acid (7:3:0.05) for ethanolic extract at different concentration say 10 µL and 15 µL in each plate respectively. Then the plates are scanned using camag'scanner at 254 nm & 366 nm. The third plate is derivitized with vannilin sulphuric acid and scanned at 520 nm. The Rf values and peak areas are shown along with finger print chromatogram in Fig.18 (a), (b), (c). Similarly HPTLC plates of *Trigonella foenum graecum* using solvent system with chloroform, methanol and formic acid (8:2:0.5) are used. Its Rf values in different nm are shown in the Fig.19 (a), (b), (c). The contamination or any impurity during plant collection for the preparation of drugs can be identified if thereis any change in Rf values, peak areas and no of peaks. These HPTLC chromatograms finger prints are very much needful for authentication of the study plants.

Key Words-: Chromatogram, HPTLC, Ethanolic extract, *Trigonella foenum graecum, Tinospora cordifolia*

INTRODUCTION

The plant parts including leaves, roots, rhizomes, stems, barks, flowers, fruits, grains or seeds, employed in the control or treatment of a disease condition and therefore contains chemical components that are medically active. These non-nutrient plant chemical compounds or bioactive components areoften referred to as phytochemicals („phyto-„from Greek - phyto meaning „plant") or phytoconstituents and are responsible for protecting the plant against microbial infections or infestations by pests (Rios*et al.*, 2005, Adekunle and Adekunle , 2009).The phytochemistry is the study of natural products. Phytochemicals have been isolated and characterized from fruits such as grapes and apples, vegetables such as broccoli and onion, spices such as turmeric, beverages such as green teaand red wine, as well as many other

sources.Natural products have been an integral part of the ancient traditional medicine systems, e.g. Chinese,Ayurvedic and Egyptian (Sarker*et al*, 2007). Over the years they have assumed a very central stage in modern civilization as natural source of chemotherapy as well as amongst scientist in search for alternative sources of drugs. In the developing world about 3.4 billion people depend on plant-based traditional medicines. About 88 per cent of the world‟s population depends on traditional medicine for their primary health care. According to the World Health Organization, a medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi synthesis.

MATERIALS AND METHODS

PLANT COLLECTION AND AUTHENTICATION

Tinospora cordifolia leaves are collected from near Glocal University campus Saharanpur and *Trigonella foenum graecum* seeds are collected from local market, Saharanpur, Uttar Pradesh India.

HPTLC finger printing of *Tinospora cordifolia* and *Trigonella foenumgraecum* extracts

HPTLC finger print analysis

The extract of the sample is dissolved with respective solvent ethanol used for extraction. The sample extract (25 µL) is applied for the thin layer chromatography and High performance thin layer chromatography study with suitable solvent system for *Tinospora cordifolia* Toluene: Ethyl acetate: Formic acid (7:3:0.5) for *Trigonella foenum graecum* chloroform: Methanol: formic acid (8:2: 0.5). After development the plates are allowed to dry in air and examined under UV- 254 nm, 366 nm and visible light after derivatized using vanillin sulphuric acid at 520 nm. R_f value of the spots are recorded.(WHO, 1998; stahl, 1969; Saraswathi 2003; Arunadevi *et al.,* 2015).

RESULTS AND DISCUSSION

One of the important techniques used in phytochemical study is HPTLC finger print analysis for authentication and standardization of the study plants. The plates are developed using solvent systems with toluene-ethyl acetate-formic acid (7:3:0.05) for ethanolic extract at different concentration say 10 µL and 15 µL in each plate respectively. Then the plates are scanned using camag'scanner at 254 nm & 366 nm. The third plate is derivitized with vannilin sulphuric acid and scanned at 520 nm. The Rf values and peak areas are shown along with finger print chromatogram in Fig.18 (a), (b), (c). Similarly HPTLC plates of *Trigonella foenum graecum* using solvent system with chloroform, methanol and formic acid (8:2:0.5) are used. Its Rf values in different nm are shown in the Fig.19 (a), (b), (c). The contamination or any impurity during plant collection for the preparation of drugs can be identified if thereis any change in Rf values, peak areas and no of peaks. These HPTLC chromatograms finger prints are very much needful for

authentication of the study plants. (Arunadevi et al., 2015)

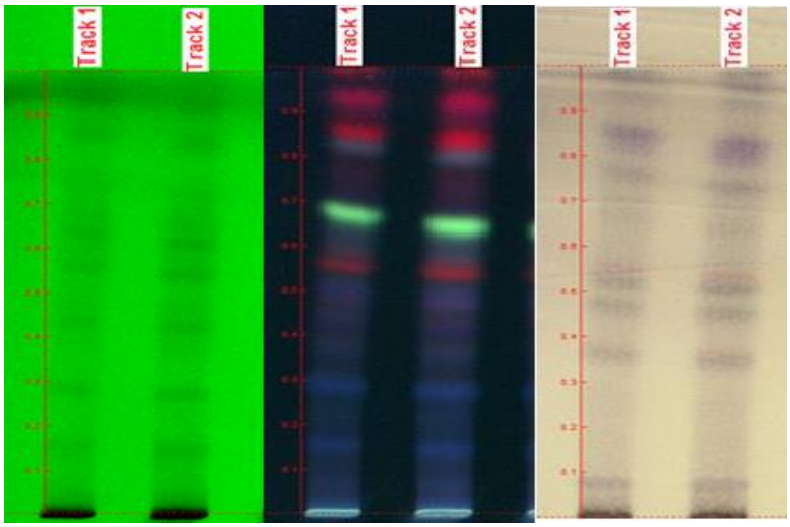
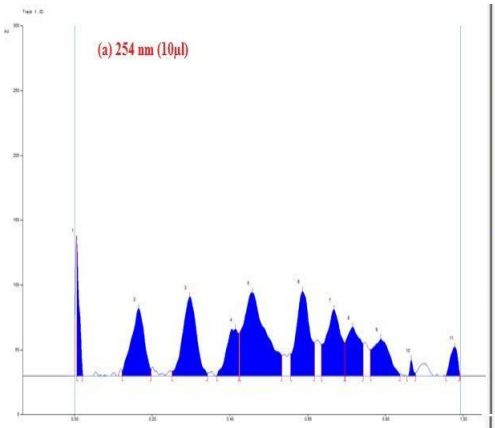


Fig.18 TLC Photo documentation of ethanol extract of *Tinospora cordifolia*

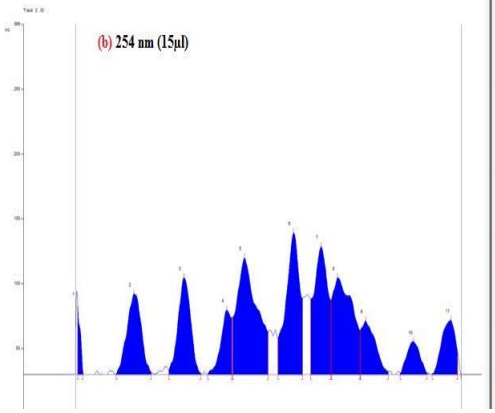
Solvent system: Toluene: Ethyl acetate: Formic acid (7:3:0.5)

Track 1- Sample A ethanol extract- 10µl, **Track 2-** Sample A ethanol extract- 15µl.



Track 1, ID:

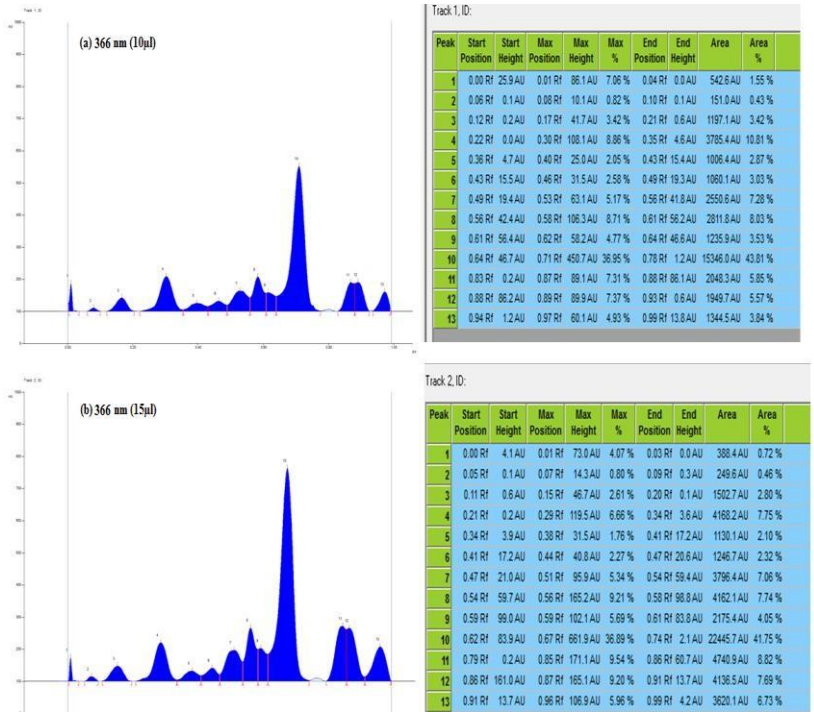
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	105.3 AU	0.01 Rf	105.3 AU	19.61 %	0.02 Rf	2.3 AU	576.4 AU	4.02 %
2	0.12 Rf	4.0 AU	0.17 Rf	52.0 AU	9.68 %	0.20 Rf	5.5 AU	1516.8 AU	10.57 %
3	0.25 Rf	3.5 AU	0.30 Rf	61.2 AU	11.40 %	0.34 Rf	2.0 AU	1856.7 AU	12.94 %
4	0.37 Rf	0.4 AU	0.41 Rf	36.3 AU	6.77 %	0.42 Rf	32.8 AU	957.5 AU	6.67 %
5	0.43 Rf	33.3 AU	0.46 Rf	64.4 AU	11.99 %	0.53 Rf	16.1 AU	3215.7 AU	22.41 %
6	0.56 Rf	17.0 AU	0.59 Rf	65.4 AU	12.18 %	0.62 Rf	25.7 AU	1941.2 AU	13.53 %
7	0.64 Rf	24.4 AU	0.67 Rf	51.3 AU	9.55 %	0.70 Rf	25.8 AU	1664.8 AU	11.60 %
8	0.70 Rf	26.1 AU	0.72 Rf	37.8 AU	7.04 %	0.74 Rf	25.0 AU	1130.2 AU	7.88 %
9	0.76 Rf	20.2 AU	0.79 Rf	28.6 AU	5.33 %	0.84 Rf	1.4 AU	1048.1 AU	7.30 %
10	0.86 Rf	0.0 AU	0.87 Rf	12.4 AU	2.31 %	0.88 Rf	2.4 AU	79.3 AU	0.55 %
11	0.96 Rf	0.0 AU	0.98 Rf	22.3 AU	4.16 %	0.99 Rf	3.4 AU	364.0 AU	2.54 %



Track 2, ID:

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	54.9 AU	0.01 Rf	54.9 AU	7.59 %	0.02 Rf	1.2 AU	321.6 AU	1.42 %
2	0.11 Rf	0.2 AU	0.15 Rf	62.2 AU	8.61 %	0.20 Rf	1.9 AU	2014.4 AU	8.86 %
3	0.24 Rf	3.8 AU	0.28 Rf	74.7 AU	10.34 %	0.32 Rf	0.7 AU	2110.0 AU	9.28 %
4	0.34 Rf	0.3 AU	0.39 Rf	49.6 AU	6.86 %	0.40 Rf	43.7 AU	1155.1 AU	5.08 %
5	0.41 Rf	44.0 AU	0.44 Rf	89.9 AU	12.45 %	0.50 Rf	33.1 AU	4123.2 AU	18.14 %
6	0.52 Rf	28.2 AU	0.56 Rf	109.2 AU	15.12 %	0.59 Rf	58.9 AU	3315.0 AU	14.58 %
7	0.61 Rf	58.3 AU	0.63 Rf	98.6 AU	13.65 %	0.66 Rf	57.2 AU	3044.6 AU	13.39 %
8	0.66 Rf	57.7 AU	0.68 Rf	74.8 AU	10.35 %	0.73 Rf	34.2 AU	3315.1 AU	14.58 %
9	0.73 Rf	34.4 AU	0.75 Rf	41.3 AU	5.72 %	0.81 Rf	2.1 AU	1312.7 AU	5.78 %
10	0.84 Rf	1.2 AU	0.87 Rf	25.4 AU	3.52 %	0.91 Rf	1.3 AU	747.8 AU	3.29 %
11	0.92 Rf	0.5 AU	0.97 Rf	41.8 AU	5.79 %	0.99 Rf	17.3 AU	1270.7 AU	5.59 %

Fig.18(a) HPTLC fingerprint profile of *Tinospora cordifolia* extract scanning at254 nm (a) Track 1 (10 µl) (b) Track 2 (15 µl)



Track 1, ID:

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	25.9 AU	0.01 Rf	86.1 AU	7.06 %	0.04 Rf	0.0 AU	542.6 AU	1.55 %
2	0.06 Rf	0.1 AU	0.08 Rf	10.1 AU	0.82 %	0.10 Rf	0.1 AU	151.0 AU	0.43 %
3	0.12 Rf	0.2 AU	0.17 Rf	41.7 AU	3.42 %	0.21 Rf	0.6 AU	1197.1 AU	3.42 %
4	0.22 Rf	0.0 AU	0.30 Rf	108.1 AU	8.86 %	0.35 Rf	4.6 AU	3785.4 AU	10.81 %
5	0.36 Rf	4.7 AU	0.40 Rf	25.0 AU	2.05 %	0.43 Rf	15.4 AU	1006.4 AU	2.87 %
6	0.43 Rf	15.5 AU	0.46 Rf	31.5 AU	2.58 %	0.49 Rf	19.3 AU	1060.1 AU	3.03 %
7	0.49 Rf	19.4 AU	0.53 Rf	63.1 AU	5.17 %	0.56 Rf	41.8 AU	2550.6 AU	7.28 %
8	0.56 Rf	42.4 AU	0.58 Rf	106.3 AU	8.71 %	0.61 Rf	56.2 AU	2811.8 AU	8.03 %
9	0.61 Rf	56.4 AU	0.62 Rf	58.2 AU	4.77 %	0.64 Rf	46.6 AU	1235.9 AU	3.53 %
10	0.64 Rf	46.7 AU	0.71 Rf	450.7 AU	36.95 %	0.78 Rf	1.2 AU	15346.0 AU	43.81 %
11	0.83 Rf	0.2 AU	0.87 Rf	89.1 AU	7.31 %	0.88 Rf	86.1 AU	2048.3 AU	5.85 %
12	0.88 Rf	86.2 AU	0.89 Rf	89.9 AU	7.37 %	0.93 Rf	0.6 AU	1949.7 AU	5.57 %
13	0.94 Rf	1.2 AU	0.97 Rf	60.1 AU	4.93 %	0.99 Rf	13.8 AU	1344.5 AU	3.84 %

Track 2, ID:

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	4.1 AU	0.01 Rf	73.0 AU	4.07 %	0.03 Rf	0.0 AU	388.4 AU	0.72 %
2	0.05 Rf	0.1 AU	0.07 Rf	14.3 AU	0.80 %	0.09 Rf	0.3 AU	249.6 AU	0.46 %
3	0.11 Rf	0.6 AU	0.15 Rf	46.7 AU	2.61 %	0.20 Rf	0.1 AU	1502.7 AU	2.80 %
4	0.21 Rf	0.2 AU	0.29 Rf	119.5 AU	6.66 %	0.34 Rf	3.6 AU	4168.2 AU	7.75 %
5	0.34 Rf	3.9 AU	0.38 Rf	31.5 AU	1.76 %	0.41 Rf	17.2 AU	1130.1 AU	2.10 %
6	0.41 Rf	17.2 AU	0.44 Rf	40.8 AU	2.27 %	0.47 Rf	20.6 AU	1246.7 AU	2.32 %
7	0.47 Rf	21.0 AU	0.51 Rf	95.9 AU	5.34 %	0.54 Rf	59.4 AU	3796.4 AU	7.06 %
8	0.54 Rf	59.7 AU	0.56 Rf	165.2 AU	9.21 %	0.58 Rf	98.8 AU	4162.1 AU	7.74 %
9	0.59 Rf	99.0 AU	0.59 Rf	102.1 AU	5.69 %	0.61 Rf	83.8 AU	2175.4 AU	4.05 %
10	0.62 Rf	83.9 AU	0.67 Rf	661.9 AU	36.89 %	0.74 Rf	2.1 AU	22445.7 AU	41.75 %
11	0.79 Rf	0.2 AU	0.85 Rf	171.1 AU	9.54 %	0.86 Rf	60.7 AU	4740.9 AU	8.82 %
12	0.86 Rf	181.0 AU	0.87 Rf	165.1 AU	9.20 %	0.91 Rf	13.7 AU	4136.5 AU	7.69 %
13	0.91 Rf	13.7 AU	0.96 Rf	106.9 AU	5.96 %	0.99 Rf	4.2 AU	3620.1 AU	6.73 %

Fig.18(b) HPTLC fingerprint profile of *Tinospora cordifolia* extract scanning at366 nm (a) Track 1 (10 µl) (b) Track 2 (15 µl)

Track 1, ID:

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	108.8 AU	0.01 Rf	133.7 AU	8.23 %	0.03 Rf	0.1 AU	1347.7 AU	3.32 %
2	0.06 Rf	0.4 AU	0.08 Rf	195.7 AU	12.05 %	0.11 Rf	0.1 AU	3484.6 AU	8.59 %
3	0.13 Rf	0.0 AU	0.14 Rf	11.3 AU	0.69 %	0.16 Rf	0.2 AU	123.8 AU	0.31 %
4	0.16 Rf	0.5 AU	0.18 Rf	18.8 AU	1.16 %	0.19 Rf	10.2 AU	254.6 AU	0.63 %
5	0.22 Rf	0.1 AU	0.27 Rf	60.5 AU	3.73 %	0.31 Rf	1.8 AU	1957.4 AU	4.82 %
6	0.34 Rf	0.2 AU	0.40 Rf	222.3 AU	13.69 %	0.44 Rf	28.3 AU	8225.9 AU	20.27 %
7	0.45 Rf	29.4 AU	0.50 Rf	135.5 AU	8.34 %	0.53 Rf	60.3 AU	5070.2 AU	12.50 %
8	0.53 Rf	61.5 AU	0.55 Rf	146.9 AU	9.04 %	0.56 Rf	11.0 AU	3323.4 AU	8.19 %
9	0.57 Rf	113.1 AU	0.57 Rf	169.2 AU	10.42 %	0.58 Rf	54.7 AU	1808.7 AU	4.46 %
10	0.58 Rf	155.4 AU	0.59 Rf	167.2 AU	10.30 %	0.64 Rf	32.1 AU	3668.4 AU	9.04 %
11	0.67 Rf	18.0 AU	0.72 Rf	43.8 AU	2.70 %	0.73 Rf	0.1 AU	1267.7 AU	3.12 %
12	0.73 Rf	3.2 AU	0.74 Rf	59.4 AU	3.66 %	0.76 Rf	22.3 AU	671.4 AU	1.65 %
13	0.77 Rf	34.5 AU	0.81 Rf	116.6 AU	7.18 %	0.84 Rf	30.9 AU	3940.0 AU	9.71 %
14	0.84 Rf	31.3 AU	0.90 Rf	115.7 AU	7.12 %	0.95 Rf	2.7 AU	5028.8 AU	12.39 %
15	0.96 Rf	0.5 AU	0.98 Rf	27.6 AU	1.70 %	0.99 Rf	21.7 AU	402.5 AU	0.99 %

Track 2, ID:

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	15.0 AU	0.01 Rf	98.6 AU	5.17 %	0.03 Rf	0.1 AU	1016.7 AU	1.81 %
2	0.06 Rf	0.7 AU	0.08 Rf	157.5 AU	8.25 %	0.10 Rf	1.8 AU	3081.7 AU	5.49 %
3	0.11 Rf	0.3 AU	0.13 Rf	13.0 AU	0.68 %	0.14 Rf	4.9 AU	196.5 AU	0.35 %
4	0.16 Rf	6.3 AU	0.18 Rf	21.1 AU	1.11 %	0.20 Rf	0.1 AU	401.1 AU	0.71 %
5	0.21 Rf	0.3 AU	0.27 Rf	72.4 AU	3.79 %	0.30 Rf	0.4 AU	2292.4 AU	4.08 %
6	0.32 Rf	0.2 AU	0.38 Rf	261.6 AU	13.71 %	0.42 Rf	39.5 AU	9857.8 AU	17.55 %
7	0.42 Rf	40.0 AU	0.47 Rf	147.2 AU	7.72 %	0.50 Rf	81.1 AU	5964.8 AU	10.62 %
8	0.51 Rf	82.0 AU	0.53 Rf	195.2 AU	10.23 %	0.55 Rf	77.8 AU	4723.1 AU	8.41 %
9	0.55 Rf	179.1 AU	0.56 Rf	214.9 AU	11.26 %	0.58 Rf	92.6 AU	5001.7 AU	8.90 %
10	0.59 Rf	95.5 AU	0.59 Rf	113.0 AU	5.92 %	0.61 Rf	42.9 AU	1711.7 AU	3.05 %
11	0.64 Rf	37.5 AU	0.68 Rf	73.7 AU	3.86 %	0.71 Rf	7.9 AU	2733.0 AU	4.87 %
12	0.72 Rf	9.6 AU	0.73 Rf	66.6 AU	3.49 %	0.73 Rf	49.6 AU	714.5 AU	1.27 %
13	0.74 Rf	50.9 AU	0.77 Rf	207.1 AU	10.85 %	0.80 Rf	56.5 AU	6199.2 AU	11.04 %
14	0.80 Rf	57.3 AU	0.86 Rf	185.9 AU	9.74 %	0.91 Rf	25.2 AU	10296.9 AU	18.33 %
15	0.93 Rf	19.5 AU	0.96 Rf	80.6 AU	4.22 %	0.98 Rf	1.2 AU	1976.3 AU	3.52 %

Fig.18.(c) : HPTLC fingerprint profile of *Tinospora cordifolia* extract scanning at520 nm (a) Track 1 (10 µl) (b) Track 2 (15 µl)

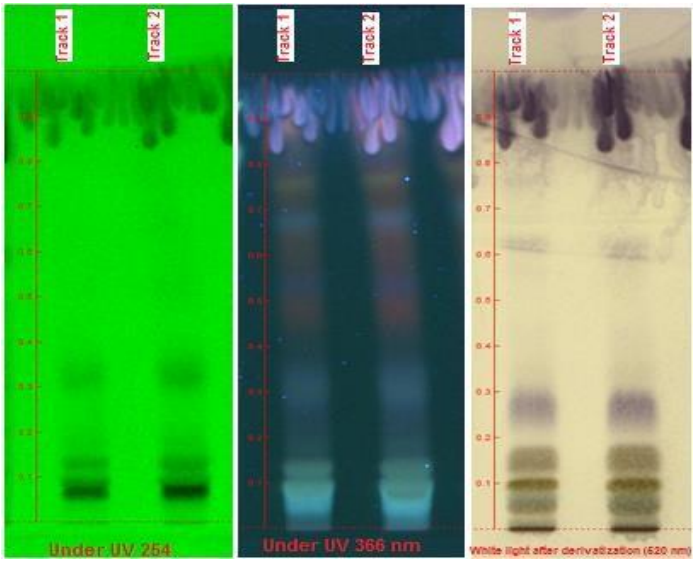
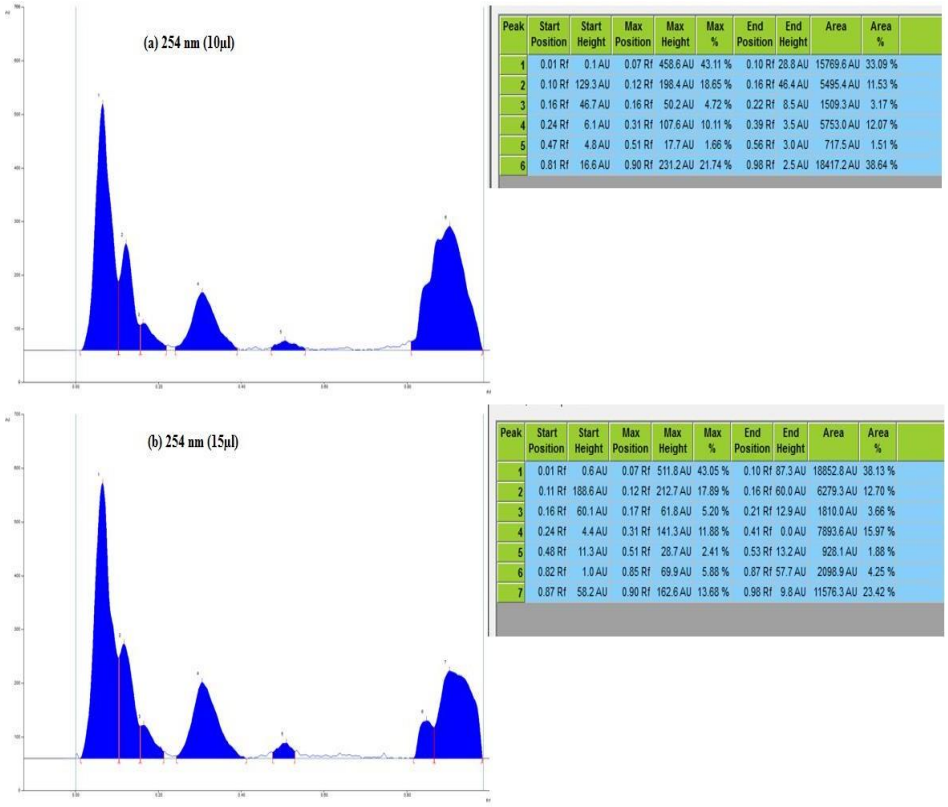


Fig.19 : TLC Photo documentation of ethanol extract of *Trigonella foenum graecum*

Solvent system: Chloroform: Methanol: Formic acid (8:2:0.5)

Track 1- Sample B ethanol extract- 10µl, **Track 2-** Sample B ethanol extract- 15µl.

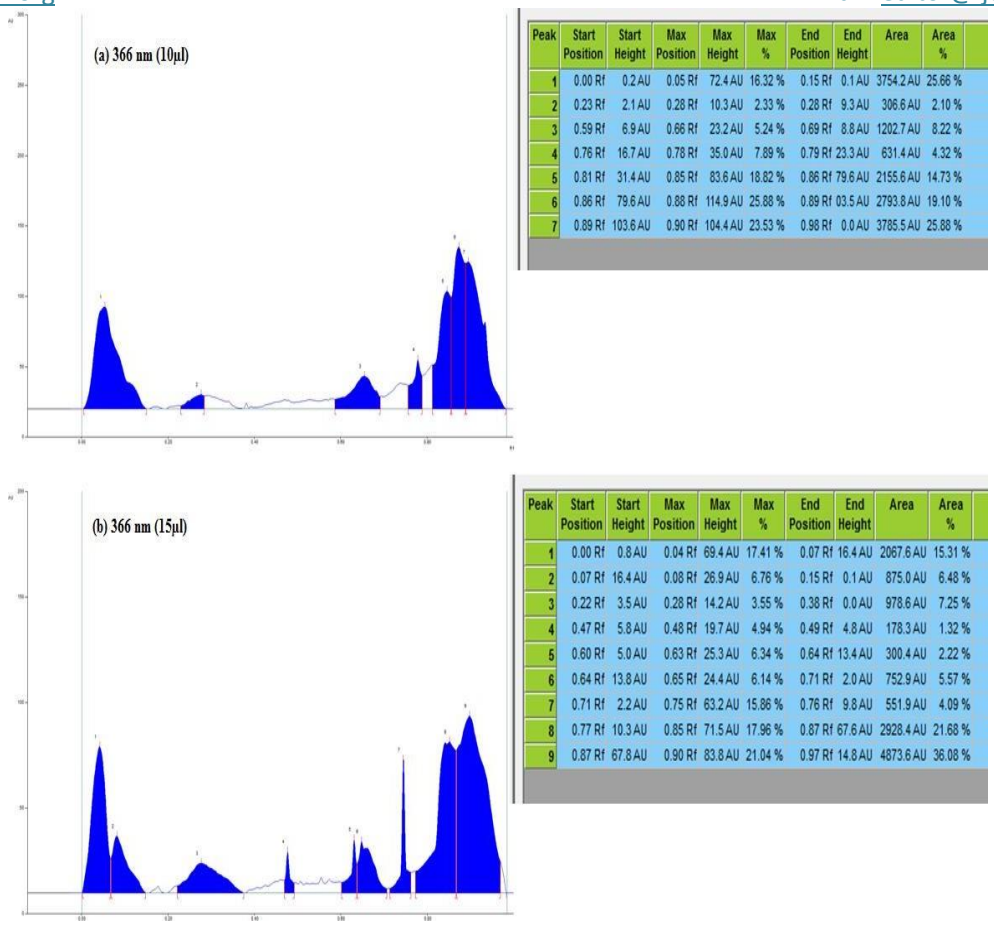
Fig.19.a : HPTLC fingerprint profile of *Trigonella foenum graecum* extractscanning at 254 nm (a) Track



Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	0.1 AU	0.07 Rf	458.6 AU	43.11 %	0.10 Rf	28.8 AU	15769.6 AU	33.09 %
2	0.10 Rf	129.3 AU	0.12 Rf	198.4 AU	18.65 %	0.16 Rf	46.4 AU	5495.4 AU	11.53 %
3	0.16 Rf	46.7 AU	0.16 Rf	50.2 AU	4.72 %	0.22 Rf	8.5 AU	1509.3 AU	3.17 %
4	0.24 Rf	6.1 AU	0.31 Rf	107.6 AU	10.11 %	0.39 Rf	3.5 AU	5753.0 AU	12.07 %
5	0.47 Rf	4.8 AU	0.51 Rf	17.7 AU	1.66 %	0.56 Rf	3.0 AU	717.5 AU	1.51 %
6	0.81 Rf	16.6 AU	0.90 Rf	231.2 AU	21.74 %	0.98 Rf	2.5 AU	18417.2 AU	38.64 %

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	0.6 AU	0.07 Rf	511.8 AU	43.05 %	0.10 Rf	87.3 AU	18852.8 AU	38.13 %
2	0.11 Rf	188.6 AU	0.12 Rf	212.7 AU	17.89 %	0.16 Rf	60.0 AU	6279.3 AU	12.70 %
3	0.16 Rf	60.1 AU	0.17 Rf	61.8 AU	5.20 %	0.21 Rf	12.9 AU	1810.0 AU	3.66 %
4	0.24 Rf	4.4 AU	0.31 Rf	141.3 AU	11.88 %	0.41 Rf	0.0 AU	7893.6 AU	15.97 %
5	0.48 Rf	11.3 AU	0.51 Rf	28.7 AU	2.41 %	0.53 Rf	13.2 AU	928.1 AU	1.88 %
6	0.82 Rf	1.0 AU	0.85 Rf	69.9 AU	5.88 %	0.87 Rf	57.7 AU	2098.9 AU	4.25 %
7	0.87 Rf	58.2 AU	0.90 Rf	162.6 AU	13.68 %	0.98 Rf	9.8 AU	11576.3 AU	23.42 %

1 (10 µl) (b) Track 2 (15 µl)

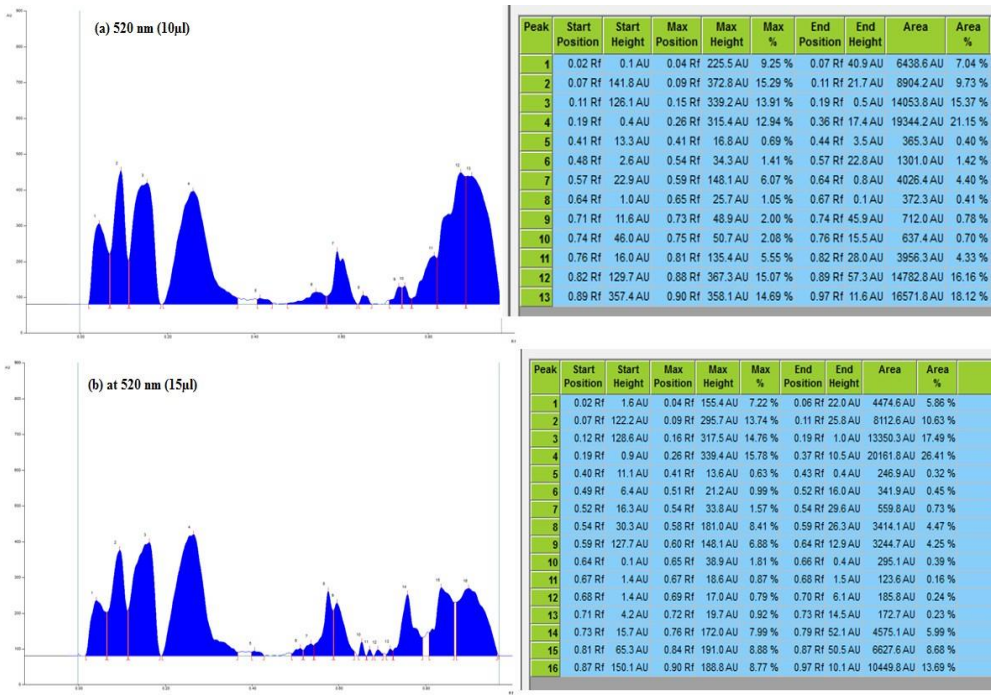


Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	0.2 AU	0.05 Rf	72.4 AU	16.32 %	0.15 Rf	0.1 AU	3754.2 AU	25.66 %
2	0.23 Rf	2.1 AU	0.28 Rf	10.3 AU	2.33 %	0.28 Rf	9.3 AU	306.6 AU	2.10 %
3	0.59 Rf	6.9 AU	0.66 Rf	23.2 AU	5.24 %	0.69 Rf	8.8 AU	1202.7 AU	8.22 %
4	0.76 Rf	16.7 AU	0.78 Rf	35.0 AU	7.89 %	0.79 Rf	23.3 AU	631.4 AU	4.32 %
5	0.81 Rf	31.4 AU	0.85 Rf	83.6 AU	18.82 %	0.86 Rf	79.6 AU	2155.6 AU	14.73 %
6	0.86 Rf	79.6 AU	0.88 Rf	114.9 AU	25.88 %	0.89 Rf	03.5 AU	2793.8 AU	19.10 %
7	0.89 Rf	103.6 AU	0.90 Rf	104.4 AU	23.53 %	0.98 Rf	0.0 AU	3785.5 AU	25.88 %

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	0.8 AU	0.04 Rf	69.4 AU	17.41 %	0.07 Rf	16.4 AU	2067.6 AU	15.31 %
2	0.07 Rf	16.4 AU	0.08 Rf	26.9 AU	6.76 %	0.15 Rf	0.1 AU	875.0 AU	6.48 %
3	0.22 Rf	3.5 AU	0.28 Rf	14.2 AU	3.55 %	0.38 Rf	0.0 AU	978.6 AU	7.25 %
4	0.47 Rf	5.8 AU	0.48 Rf	19.7 AU	4.94 %	0.49 Rf	4.8 AU	178.3 AU	1.32 %
5	0.60 Rf	5.0 AU	0.63 Rf	25.3 AU	6.34 %	0.64 Rf	13.4 AU	300.4 AU	2.22 %
6	0.64 Rf	13.8 AU	0.65 Rf	24.4 AU	6.14 %	0.71 Rf	2.0 AU	752.9 AU	5.57 %
7	0.71 Rf	2.2 AU	0.75 Rf	63.2 AU	15.86 %	0.76 Rf	9.8 AU	551.9 AU	4.09 %
8	0.77 Rf	10.3 AU	0.85 Rf	71.5 AU	17.96 %	0.87 Rf	67.6 AU	2928.4 AU	21.68 %
9	0.87 Rf	67.8 AU	0.90 Rf	83.8 AU	21.04 %	0.97 Rf	14.8 AU	4873.6 AU	36.08 %

Fig.19.b: HPTLC fingerprint profile of *Trigonella foenum graecum* extract scanningat 366 nm (a) Track 1 (10 µl) (b) Track 2 (15 µl)

Fig.19.c : HPTLC fingerprint profile of *Trigonella foenum graecum* extract scanningat 520 nm (a) Track 1 (10 µl) (b) Track 2 (15 µl)



Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.02 Rf	0.1 AU	0.04 Rf	225.5 AU	9.25 %	0.07 Rf	40.9 AU	6438.6 AU	7.04 %
2	0.07 Rf	141.8 AU	0.09 Rf	372.8 AU	15.29 %	0.11 Rf	21.7 AU	8904.2 AU	9.73 %
3	0.11 Rf	126.1 AU	0.15 Rf	339.2 AU	13.91 %	0.19 Rf	0.5 AU	14053.8 AU	15.37 %
4	0.19 Rf	0.4 AU	0.26 Rf	315.4 AU	12.94 %	0.36 Rf	17.4 AU	19344.2 AU	21.15 %
5	0.41 Rf	13.3 AU	0.41 Rf	16.8 AU	0.69 %	0.44 Rf	3.5 AU	365.3 AU	0.40 %
6	0.48 Rf	2.6 AU	0.54 Rf	34.3 AU	1.41 %	0.57 Rf	22.8 AU	1301.0 AU	1.42 %
7	0.57 Rf	22.9 AU	0.59 Rf	148.1 AU	6.07 %	0.64 Rf	0.8 AU	4026.4 AU	4.40 %
8	0.64 Rf	1.0 AU	0.65 Rf	25.7 AU	1.05 %	0.67 Rf	0.1 AU	372.3 AU	0.41 %
9	0.71 Rf	11.6 AU	0.73 Rf	48.9 AU	2.00 %	0.74 Rf	45.9 AU	712.0 AU	0.78 %
10	0.74 Rf	46.0 AU	0.75 Rf	50.7 AU	2.08 %	0.76 Rf	15.5 AU	637.4 AU	0.70 %
11	0.76 Rf	16.0 AU	0.81 Rf	135.4 AU	5.55 %	0.82 Rf	28.0 AU	3956.3 AU	4.33 %
12	0.82 Rf	129.7 AU	0.88 Rf	367.3 AU	15.07 %	0.89 Rf	57.3 AU	14782.8 AU	16.16 %
13	0.89 Rf	357.4 AU	0.90 Rf	358.1 AU	14.69 %	0.97 Rf	11.6 AU	16571.8 AU	18.12 %

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.02 Rf	1.6 AU	0.04 Rf	155.4 AU	7.22 %	0.06 Rf	22.0 AU	4474.6 AU	5.86 %
2	0.07 Rf	122.2 AU	0.09 Rf	295.7 AU	13.74 %	0.11 Rf	25.8 AU	8112.6 AU	10.63 %
3	0.12 Rf	128.6 AU	0.16 Rf	317.5 AU	14.76 %	0.19 Rf	1.0 AU	13350.3 AU	17.49 %
4	0.19 Rf	0.9 AU	0.26 Rf	339.4 AU	15.78 %	0.37 Rf	10.5 AU	20161.8 AU	26.41 %
5	0.40 Rf	11.1 AU	0.41 Rf	13.6 AU	0.63 %	0.43 Rf	0.4 AU	246.9 AU	0.32 %
6	0.49 Rf	6.4 AU	0.51 Rf	21.2 AU	0.99 %	0.52 Rf	16.0 AU	341.9 AU	0.45 %
7	0.52 Rf	16.3 AU	0.54 Rf	33.8 AU	1.57 %	0.54 Rf	29.6 AU	559.8 AU	0.73 %
8	0.54 Rf	30.3 AU	0.58 Rf	181.0 AU	8.41 %	0.59 Rf	26.3 AU	3414.1 AU	4.47 %
9	0.59 Rf	127.7 AU	0.60 Rf	148.1 AU	6.88 %	0.64 Rf	12.9 AU	3244.7 AU	4.25 %
10	0.64 Rf	0.1 AU	0.65 Rf	38.9 AU	1.81 %	0.66 Rf	0.4 AU	295.1 AU	0.39 %
11	0.67 Rf	1.4 AU	0.67 Rf	18.6 AU	0.87 %	0.68 Rf	1.5 AU	123.6 AU	0.16 %
12	0.68 Rf	1.4 AU	0.69 Rf	17.0 AU	0.79 %	0.70 Rf	6.1 AU	185.8 AU	0.24 %
13	0.71 Rf	4.2 AU	0.72 Rf	19.7 AU	0.92 %	0.73 Rf	14.5 AU	172.7 AU	0.23 %
14	0.73 Rf	15.7 AU	0.76 Rf	172.0 AU	7.99 %	0.79 Rf	52.1 AU	4575.1 AU	5.99 %
15	0.81 Rf	65.3 AU	0.84 Rf	191.0 AU	8.88 %	0.87 Rf	50.5 AU	6627.6 AU	8.68 %
16	0.87 Rf	150.1 AU	0.90 Rf	188.8 AU	8.77 %	0.97 Rf	10.1 AU	10449.8 AU	13.69 %

CONCLUSION

The present study for the two study plants *Tinospora cordifolia* and *Trigonella foenum graecum* which includes and in depth analysis of various physico-phytochemical, qualitative phyto constituents, elements present qualitatively and quantitatively are seen. By using the two study plants extracts individually, the synthesis of silver nano particles and its anti-microbial study are studied. Authentication and standardization of study plants by HPTLC finger print analysis. *In vitro* and *in vivo* screening methods are followed for studying antioxidant potential. By using spectral techniques one or more phytoconstituents are isolated and the structures are elucidated.

REFERENCES

Agarwal R, Sethiya N. K and Mishra S. H, Anti-diabetic activity of alkaloids of *Aervalanata* roots o streprozotocin-nicotinamide induced type-II Diabetes in rats *J. Pharm. Biol.*, **51**(5) :(2013)635-642.

Aher V. D and Wahi A, Pharmacological study of *Tinospora cordifolia*as an immunomodulator, *Int. J. Curr. Pharm. Res.* **2**(4): (2020) 52-54.

Aiyelaagbe O. O, Osamudiamen P. M. Phytochemical screening for active compounds in *Mangiferaindica*., *Plant. Sci. Res.* **2**:(2009) 11-13.

Aktar S, Sayed M. A, Islam M. R, Roy B and Hossain M. A, Growth Regulatory activities of different extracts of *Tinospora cordifolia* on some vegetable seeds with their chemical investigation. *J. Environ. Sci. & Natural Resources*, **5**(1):(2019) 133 – 140.

Chakraborty S, Banerjee D, Ray I and Sen A, Dtetection of bio marker in breath: A step towords noninvsaive diabetes monitoring, *Curr. Sci.*, **94 (2):** (2008) 237-242.

Chanda S.V, Parekh J and Karathia N, Evaluation of antibacterial activity and phytochemical analysis of Bauhinia variegate L, Bark. *African J. Biomed. Res.*, **9 :**(2006) 53-56.

Chandra Mohan S, Balamurugan V, ThiripuraSalini S and Rekha R. Metal ion chelating activity and hydrogen peroxide scavenging activity of medicinal plant Kalanchoepinnata. *J. Chem. Pharmaceutical Res.* **4**(1): (2019)197-202.

Chandra R, Dwivedi V, Shivam K and Jha A. K, Detection of antimicrobial activity of *Oscimumsanctum* (Tulsi) &*Trigonella foenum graecum* (Methi) against some selected bacterial & fungal strains, *Res. J. Pharma. Bio. Chem.Sci.* **2** (4): (2021) 809–813.

Firn R, Nature's Chemicals, 2020, Oxford, Oxford University Press, 74-75.

Firshein R, Diabetes Mellitus and multiple therapeutic approaches of phytochemicals
: Present status and future prospects , *Current Science India*,**83:**(2001) 30-38.

Flammang A M, Cifone M A, Erexson G L, Stankowski L F., Jr Genotoxicity testing of a fenugreek extract. Food Chem. Toxicol.,42(11): (2014)1769–1775.

Frei B, Molecular and biological mechanism of antioxidant action, J. FASEB,
13(1999): 963-964.

Gad M. Z, El-Sawalhi M.M, Ismail M.F and El-Tanbouly N. D, Biochemical study of the anti-diabetic action of the Egyptian plants fenugreek and balanites, *Molecular and Cellular Biochemistry*, **281(**1-2) (2006)173–183.

Ganesh Chandra Jagetia and Shaival Kamala ksha Rao, Evaluation of cytotoxic effects of dichloromethane extract of guduchi (*Tinospora cordifolia m*iers ex

Hook F & THOMS) on cultured HeLa cells evidence-based, *Complementary and Alternative Medicine*, **3**(2): (2006) 267-272.

Gang Li, Guangxiang Luan, Yanfeng He, et al., "Polyphenol Stilbenes from Fenugreek (Trigonellafoenum-graecum L.) Seeds Improve Insulin Sensitivity and Mitochondrial Function in 3T3-L1 Adipocytes," Oxidative Medicine and Cellular Longevity, Article ID 7634362, http://doi.org/10.1155/2022/7634362.

Gangan V D Pradhan P, Sipahimalani A T and Banerji A, Cordifolisides A, B, C: norditerpene furan glycosides from Tinospora cordifolia. , **37**(3): (1994)781-6.

Gao L, Cai G and Shi X , β-Ecdysterone induces osteogenic differentiation in mouse mesenchymal stem cells and relieves osteoporosis. *Biol Pharm Bull.* **31**(12): (2008) 2245-2249.

Gopinath V, Mubarakali D, Priyadarshini S, Meera Priyadharshini N, Thajuddin N and Velusamy P, Biosynthesis of silver nanoparticles from *Tribulus terrestris* and its antimicrobialactivity:a novel biological approach, *Colloids and surfaces B*: *Biointerfaces*, **96**(2019) 69-74.

Green L. C, Wagner D. A, and Glogdwski J,Analysis of nitrate, nitrite and [15 N] nitrate in biological fluids, *Analytical Biochem.,* **126** (01): (1982) 131-138.

Gupta L. H, Badole S. L, Bodhankar S. L, Sabharwal S. G, Anti-diabetic potential of alpha-amylase inhibitor from the seeds of *Macrotyloma uniform* in streptozotocin nicotinamide -induced diabetic mice, *J. Pharmaceutical Biology*, **49**(2):(2021) 182-189.

Gupta R, Sharma A. K, Sharma M. C, Dobhal M. P and Gupta R. S, Evaluation of anti-diabetics and anti-oxidant potential of lupeol in experimental hyperglycaemia, *J.Natural Product Res.*, **26**(12):(2019) 1125-1129.

Gupta R, Sharma V, Ameliorative effects of *Tinospora cordifolia* root extract on histopathological and biochemical changes induced by aflatoxin-B1 in mice kidney. *Toxicol Int.*, **18**(2): (2021) 94-98.

Halliwell B and Gutteridge J. M. C, Roll of free radical s and catalytic metal ions in human disease, An

Overview Methods Enzymol, **186**: (1990) 1-85.

Hamid A. Z, Nissar A. S, Shariq R. M, Bashir A, Farooq A. D, Khan A. R, Copper, Zinc, Magnesium levels in non-insulin dependent diabetes mellitus. *Postgrad. Med. J.* **74 :** (1998) 665-668.

Hamsa T. P and Kuttan G, *Tinospora cordifolia* ameliorates urotoxic effect of cyclophosphamide by modulating GSH and cytokine levels. *Exp. Toxicol. Pathol.*, **64**(4): (2019) 307-14.

Hannan J .M. A Rokeya B, Faruqueetal O, Effect of soluble dietary fibre fraction of *Trigonellafoenumgraecumon*glycemic, insulinemic, lipidemic and platelet aggregation status of Type 2 diabetic model rats, *J. Ethnopharmacology,* **88 (**1)(2003) 73–77.

Harborne J B, Phytochemicals methods: A Guide to modern techniques of plant analysis,3rd ed. New York, Chapman and Hall, (1998) 1-150.

Hayal M. M, Sarwar S, Anjum S, Uzair M, Rasheed H. M. F, Jabeen Q Choudhary B. A and Ashraf M, Anti-diabetic and spasmolytic potential of

Farsetiahamiltonii Roy from chdistandesert , *J. Ethnopharmacology*., **156**

(2014): 347-352.