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Research Article

SCREENING AND EVALUATION OF BIOACTIVE COMPONENTS OF *TAGETES ERECTA L.* BY GC – MS ANALYSIS

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ABSTRACT

Herbs are considered to be the backbone of traditional medicines from Hispanic days. About 80% of the World's population depends on the traditional medicines for various ailments. With this background, the present investigation was concentrated on the screening of bioactive components of *Tagetes erecta L.* The GC-MS analysis of dried leaves and flower samples were carried out using GC-MS-QP 2010 model with methanol as solvent. Around 19 and 31 phytochemicals were registered in leaf and flower samples, respectively which have high therapeutic value in the commercial available drugs.

Keywords: Bioactive, extraction, GC – MS analysis, peak, therapeutic

INTRODUCTION

Medical plants having high therapeutic value are becoming popular in the area of medicine for its less expense, less side effects etc., compared to modern allopathic drugs. The traditional medicines in the last few decades emerged to have immense acknowledgements in terms for their potential therapeutic value and it is estimated that 80% of community depend on traditional medicine for their primary healthcare [1]. About 70% of Indian population (approximately 1.1 billion) are depending on non-allopathic system of medicine [2]. India is popularizied for its biodiversity (8%) of the World which is around 0.126% million species [3]. Today, Ayurvedic medicine relies on medicinal plants (natural origin) for its indigenous health care delivery system [4,5].

The genus *Tagetes* belongs to Asteraceae family is a medicinal and ornamental plant which has a high therapeutic value in the field of medicine [6] and they have proved to be an effective nematocide [7], phosphate solubilizer [8], cosmetics [9], food additives [10], dye [11], fodder [12], essential oil [13], pest control [14] etc. The essential oil of genus *Tagetes* are effective antibiotic, antimicrobial, antiparasitic, antiseptic, antispasmodic [15].

Preliminary phytochemical analysis with *Tagetes erecta* proved that the plant is highly rich in alkaloids, phenolic compounds, flavanoids, salicylic acid, terpenes etc. [16]. In the present investigation, authentication of bioactive compounds of *Tagetes erecta* was carried out by GC – MS analysis.

MATERIALS AND METHODS

Fresh flowering *Tagetes erecta* plants were collected and was washed thoroughly with running tap water (Leaves and Flowers) and were shade dried at room temperature. The dried leaves and flowers were finely powdered using an electric grinder and stored in air tight containers separately for future investigations.

GC – MS Data Analysis

Gas chromatography – Mass spectrometry (GC-MS) analysis of methanol extract of *Tagetes erecta* was performed using a GC-MS-QP 2010 [Shimadzu, Tokyo, Japan] model with the column length (30m), diameter (0.25mm) and film thickness (0.25µm) and the GS – MS condition during the investigation is represented in the Table 1. The methanol extract of *Tagetes erecta* was injected with syringe manually for total bioactive components of leaf and flower samples.

Table.1 GC – MS conditions during analysis

GC CONDITION	
Column Oven Temperature	: 70°C
Injector Temperature	240°C
Injection Mode	Split
Split Ratio	10
Flow Control Mode	Linear Velocity
Column Flow	1.55ml/min
Carrier Gas	Helium 99.9995% purity
Injection volume	1 microlitre
MS CONDITION	
Ion source temp	200 °C
Interface temp	240°C
Scan range	40 – 1000 m/z
Solvent cut time	3mins
MS start time	5(min)
MS end time	38 (min)
Ionization	EI (-70ev)
Scan speed	2000

RESULTS AND DISCUSSION

The methanol extract of leaf and flower samples of *Tagetes erecta* were injected for screening of total bioactive compounds in GC – MS analyser. About 19 numbers of bio compounds were identified from leaf extract samples. The retention time taken by the bioactive compounds of leaf sample varied from 16.015 to 27.349 and the area percentage varied from 0.72 to 16.45. The list of bioactive compounds from the leaf sample is tabulated in the Table 2 with retention time, area and area percentage. The methanol extract leaf sample chromatogram (Figure.1) registered Hepta, Hexa, Tetradecanoic acid, Butanoic acid 3,7 – Dimethyl 6 – Octenyl ester (RT – 16.015), Citronellyl isobutyrate (RT – 16.207), Phosphorothoic acid 0-0diethyl 0- (3,5,6 – Trichloro – 2 pridinyl) ester (RT – 17.297), Phytol (RT-18.493), 2 – Hydroxy-3-[(9E)-9-octa decenoyloxy] propyl (9) – 9- Octadecenoate (RT – 21.625), Celidoniol (RT – 25.956), Alpha – Tacopherol – beta – D – Mannoside (RT – 26.289), Stigmasterol (RT-27.349). Total peak area in the leaf sample was 51,70075, where the maximum area of 4, 25019 was registered with 15-Hydroxypentadecanoic acid and the minimum area of 37,410 was registered with Tetradecanoic acid, Ethyl ester with 0.72 area percentage. Around 43 bioactive phytochemicals were extracted from *Eupatorium odoratum* [18].

Table 2: Bioactive components of *Tagetes erecta l.* leaf extract

No. of Peak	Name of the Bioactive compound in	R. Time	Area	Area%
1.	Tetra decanoic Acid	15.091	376303	7.28
2.	2,6,10- Trimethyl 14 – ethylene – 14 – Pemtadecme	15.759	380429	7.36
3.	Butanoic acid, 3,7 – Dimethyl 6 – Octenyl ester	16.015	51140	0.99
4.	Citronellyl isobutyrate	16.207	93219	1.80
5.	Heptadecanoic acid, Methyl ester	16.706	71087	1.37
6.	9-Mexadecenoic acid	16.968	272134	5.26
7.	N – Hexadecanmic acid	17.194	1217115	23.54
8.	Phosphorothoic acid, 0,0-diethyl 0-(3,5,6 – Trichloro-2 pridinyl) ester	17.297	51248	0.99
9.	Tetradecanoic acid, Ethyl ester	17.368	37410	0.72
10.	15-Hydroxy penta decanoic acid	18.343	136803	2.65
11.	Hexcadecadienoic acid, Methyl ester	18.392	71557	1.38
12.	Phytol	18.493	851160	16.45
13.	9,12,15 – Octadecatrienoic acid, ethyl ester (2,2,2)	19,002	61533	1.19
14.	Cis – 9 – Hexa decenal	19.993	183312	3.55
15.	15-Hydroxy penta decanoic acid	20.156	425019	8.22
16.	2-Hydroxy – 3 – [(9E)-9- Octadecenoyloxy] Propyl (9E)-9- Octadecenoate	21.625	231252	4.47
17.	Celidoniol, Deoxy	25.956	256937	4.97
18.	Alpha – Tacopherol – buta – D – Mannoside	26.289	124891	2.42
19.	Stigmasterol	27.349	277526	5.37
			5170075	**100**

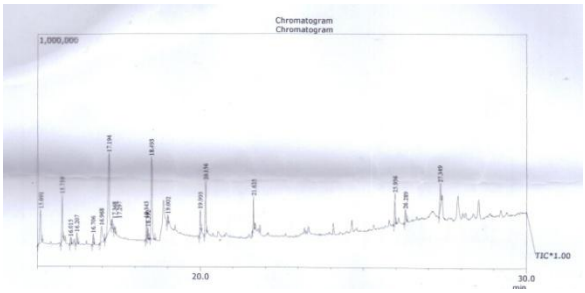

Fig.1 : Chromatogram of *Tagetes erecta l.* leaf extract

About 31 phytochemicals were identified from methanol extract sample of *Tagetes erecta.* The retention time of 31 phytochemicals ranged from 15.121 to 29.232 and the area percentage ranged from 0.44 to 14.44. The list of bioactive compounds from flower sample is tabulated in the Table 3 with retention time, area and area percentage. The methanol extract of flower sample chromatogram (Figure.2) registered Tetradecannoic acid (RT – 15.121), 2,6,10 – Trimethyl, 14 – ethylene – 14-Pentadene (RT – 15.759), Palmitic acid ethyl ester (RT-18.399), Phytol (RT-18.502), Celidoniol Deoxy (RT-23.243), Tetratriacontane (RT-23.957), Squalene (RT- 24.075), Nonacosane (RT- 24.650), Teratriacontane (RT – 25.312), Beta Tocopheral (RT – 25.674), Vitamin E (RT- 26.314), Stigmasterol (RT-27.368), Tetratriacontone (RT – 27.425), Norolean – 12 – Ene (RT-28.408), Methyl commate A (RT – 26.902), Stigmast – 4 – en – 3 – one (RT – 29. 232) etc. The total peak area of the flower sample was 14412209 with the maximum peak area was covered by Hexadecanoic acid (49,70763) and the minimum peak area was registered by Pentadecanoic acid (152421). GC – MS analysis of flower sample of Gautheria Fragratissima registered 15 bioactive constituents with 21.49% of Methoxy -1- buten – 3 yne [18].

When the two plant samples (Leaf and flower) were compared for phytochemicals, the flower sample showed a maximum of 31 phytochemical constituents than leaf sample with 19

phytochemicals. The common phytochemicals registered in both the samples were Tetradecannoic acid, Hexadecannic acid, 9,12m15 Octa decatrienoic acid, Stigmasteral, Phytol, Celidoniol, Deoxy etc.

Table 3 : Bioactive components of T*agetes erecta l.* flower extract

No. of Peak	Name of the Bioactive compound in flower	R. Time	Area	Area%
1.	Tetradecannoic acid	15.121	1309464	3.81
2.	2,6,40- Trimethyl, 14-ethylene – 14-Pentadena	15.759	373662	1.09
3.	Pentadecanoic acid	16.140	152421	0.44
4.	Hexadecanoic acid, Methyl ester	16.707	160140	0.47
5.	Cis -9 – Hexadecanoic acid	17.238	1295801	3.77
6.	Hexadecanoic acid	17.238	4970763	14.44
7.	Palmitic acid ethyl ester	17.372	212714	0.62
8.	15-Hydroxy penta decanoic acid	18.346	257465	0.75
9.	9,12,15-Octadecatrientoic acid methyl ester (z,z,z)	18,399	258294	0.75
10.	Phytol	18.502	780368	2.27
11.	7-Tetra decenal (z)	18.890	3832336	11.14
12.	Octadecanoic (Z)	19.996	546794	1.59
13.	9-Octadecenal (Z)	19.996	327835	0.95

14.	15-Hydroxypenta decanoic acid	20.160	522452	1.52
15.	2-Hydroxy – 3 [(9E)-9 Octadecenoyloxy] propyl (9E) -9- Octadecenoate	21.630	257084	0.75
16.	Celidoniol Desxy	23.243	246698	0.72
17.	Tetratriacontane	23.957	161223	0.47
18.	Squalene	24.075	236465	0.69
19.	Nonacosana	24.650	1790972	5.20
20.	Tetratriacontane	25.312	203412	0.59
21.	Beta – Tocopherol	25.674	661836	1.92
22.	21+-1-Benzopyran-6-01, 3,4 dihydro 2,7,8, Trimethyl -2- (4,8,12 –Trimethybri…)	25.783	439185	1.27
23.	Tetra tetra contane	25.972	2793081	8.12
24.	Vitamin E	26.314	3453522	10.04
25.	Stigmasterol	27.368	1501730	4.36
26.	Norolean – 12 – Ene	27.425	1314712	3.82
27.	Stigmast – 5 –EN-3-OL (3 Beta)	27.921	984287	2.86
28.	Norolean – 12 – Ene	28.408	1454589	10.14
29.	4.22 – Stigmastadiene -3-one	28.556	557642	1.62
30.	Methyl Commate A	26.902	788077	2.29
31.	Stigmast – 4-en-3-one	29.232	568182	1.65
			34412209	**100.0**

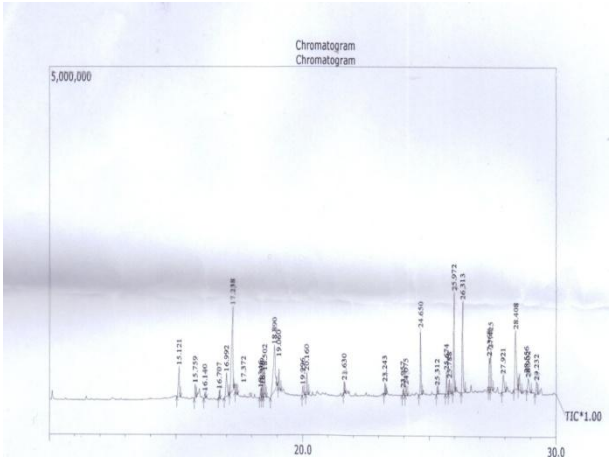

Fig. 2 : Chromatogram of *Tagetes erecta l*. flower extract

CONCLUSION

From the present investigation, *Tagetes erecta L.* samples (Leaf and Flower) revealed that they constitute a wide range of bioactive phytochemicals with high therapeutic values. The phytochemicals are used as antibacterial, antimicrobial, insecticides, nematicides and are highly effective in wound healing activities. Therefore it is suggested that further investigation on these phytochemicals will pave a way for the venture of cost effective drug with less side effect.

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