

**PHYTOCHEMICAL AND ANTIMICROBIAL ANALYSES OF ESSENTIAL OILS OF FAGONIA CRETICA L.**B. Aswarthappa^{1*}, Saivenkatesh Korlam², B. Thirupal Reddy², M. Vishnu Priya³, D. Ali Moulali⁴¹Department of Botany, Government Degree College, Kalyandurg, Anantapur, A.P., 515761²Department of Botany, P.V.K.N. Government College, Chittoor, A.P., 517002.³Department of Botany, Government Degree College, Madakasira, Anantapur, A.P., 515301.⁴Department of Botany, Government Degree &PG College, Anantapur, A.P., 515001.**Received 10 January 2015; Accepted 22 January 2015****ABSTRACT**

Fagonia cretica L. belongs to Zygophyllaceae is having very important and significant Phytochemicals. The entire plant of *Fagonia cretica* L. was shade dried, and the powder was subjected to hydrodistillation to get essential oils. Later the oils were chemically analysed. It showed compounds among which 20 are identified and 23 are yet to be identified. Some dried powder was extracted with different polar and non polar solvents by using Soxhelt apparatus. The extracts thus obtained were tested for their antimicrobial activity by using disc diffusion and cup plate methods against various pathogens. The methanol extract showed prominent antimicrobial activity.

Key words: *Fagonia cretica* L., Zygophyllaceae, antimicrobial activity, medicinal plants and Phytochemicals.

INTRODUCTION:

Medicinal plants have been curing various disorders in human beings from the time immemorial and are considered to be an integral part of Indian traditional medicine system. Medicinal plants constitute a major source of antibiotics to cure the infectious diseases especially caused by bacteria. Modern day synthetic drugs often show some harmful effects but the medicinal herbs were very safe and easy to access¹. Medicinal plant researchers, especially Ethnobotanists and natural drug based pharmacists have reported that a number of medicinal plants are capable of curing various diseases². Plant based antimicrobials have enormous therapeutic potentials as they serve the purpose with lesser side effects and are often associated with synthetic antimicrobials³. The present investigation has been aimed to evaluate the Biodynamic compound and antimicrobial activity of *Fagonia cretica* L.

The plant *Fagonia cretica* L. belongs to the family Zygophyllaceae is a sub erect or prostrate branching herb with woody base. Leaves are opposite 1-3 foliolate, leaflets are entire with spiny stipules very oftenly. Flowers are small, pink, solitary and pseudoaxillary. Stamens are 10 on the disc. Fruit is dehiscent cocci.⁴ The plant was collected from the black cotton soils of Anantapur. According to traditional knowledge, *Fagonia cretica* L. has medicinal potential especially against cancer and

tumours.

MATERIALS AND METHODS:

Fresh samples of the entire plant of *Fagonia cretica* L. were collected from the black cotton soils of Anantapur, especially adjacent to railway tracks. The entire plant material was washed with water to remove adhering dust particles and was shade dried at room temperature. The dried plant material was ground into powder. This powder was subjected to hydrodistillation and solvent extraction with various polar and non polar solvents in Soxhelt apparatus. The entire solvents and oils were used for phytochemical analysis and antimicrobial studies. Solvent extraction was carried out by conventional method by using the Soxhelt extractor. The dried powder of 500 mg was extracted with 2.5 L of Petroleum ether in Soxhelt apparatus. The extract was evaporated to dryness and extracted successively with Chloroform, Methanol and water. The fractions obtained were bio-assayed using *in vitro* cultures against selected pathogens.

GC-MS Analysis of the Essential oils of *Fagonia cretica* L.:

Oils are highly concentrated volatile and aromatic extracts of plants. They contain organic components such as Terpenes, Heterocyclic compounds and other natural elements. Oils are generally extracted from all parts of the plants. In living plants sometimes essential oils may be formed as metabolic products, in some cases, they seem to be a part of the plants immune system. Essential

oils are used to cure a number of diseases and to retain the general health⁵. Essential oils are well known to be immune stimulating, antiviral, antimicrobial, anti-infectious, antiseptic, antibacterial, antitumoral, antifungal, anticough and antitonsils. Human pathogenic microbial strains causing skin diseases can be cured by essential oils⁶. Hence, oil obtained by hydrodistillation method from the whole plant of *Fagonia cretica* L. were analysed for the separation of components by GC-MS analysis with the help of IICT, Hyderabad and results are given in the results discussion part.

RESULTS AND DISCUSSION:

The present investigation is attempted to evaluate the phytochemical analysis and antimicrobial activity of *Fagonia cretica* L.

The GC-MS analysis of *Fagonia cretica* L. revealed 43 existing compounds among which, 20 are identified (Table 1). The remaining 23 unidentified compounds require further studies. In the identified compounds, the most of the compounds are fatty acids and saponins which are said to be effective against brain diseases. According to traditional knowledge, *Fagonia cretica* L. has medicinal potential especially against cancer and tumours. Certain standard reports revealing that this plant extract has indicated the anticancer potential⁷. The presence of flavonoides in the leaves of *Fagonia cretica* L. confirmed its antimicrobial potential, as flavonoids are said to be more effective antimicrobial compounds.

Ahsam Hussain *et al.*, (2007) reported the cytotoxic and anti-tumour potential of *Fagonia cretica* L. against all the tumour inducing *Agrobacterium* strains and indicated that this plant has strong anti-cancerous potential⁸. In our present study of GC-MS analysis, 23 unidentified constituents were noticed which require further isolation and characterization of individual bioactive compound. This may help in further justification of its traditional use against cancer and tumour.

The extracts obtained from the whole plant of *Fagonia*

cretica L. were tested for antimicrobial activity against the growth of micro-organisms. The diameter of inhibition zone especially with minimum concentration of semipurified fraction indicates the efficacy of biodynamic compounds present in the respective fraction. The Petroleum ether, Chloroform, Methanol and water extracts have exhibited significant antimicrobial activity against all tested micro-organisms. *Micrococcus luteus* was resistant to Petroleum ether and methanol extracts. The minimum inhibitory concentrations for active extracts against each pathogen were determined and represented in the table-2.

All extracts (Petroleum ether, Chloroform, Methanol, Water) exhibited prominent antimicrobial activity against the eight microorganisms used for the study, from the values of zone of inhibitions exhibited by various extracts, it was observed that *Bacillus subtilis* was most sensitive to Chloroform (12 mm) and water extracts. Other organisms exhibited moderate zones for all extracts in between 9-12 mm.

The MIC value of Petroleum ether extract were 100 µg / ml each for *Bacillus subtilis*, *Enterococcus faecalis*, *Staphylococcus aureus* and *Proteus mirabilis* where as it was 150 µg / ml against *Klebsiella pneumoniae*. The Methanol extracts exhibited MIC values of 100 µg / ml against *Micrococcus luteus* and *Candida tropicalis*.

The plant *Fagonia cretica* L. have shown the presence of more unsaturated alcohols, fatty acids and terpenoids. The antimicrobial activity exhibited by the above plant extract may be attributed to the presence of these compounds and other pathogenic micro organisms that cause brain disorders.

The present report may further provide basis for the isolation of the remaining 23 unknown compounds from *Fagonia cretica* L. that may further help in working out a plan for curing brain and cancer diseases reported by the traditional healers.

TABLE 1: CHEMICAL CHARACTERIZATION OF THE ESSENTIAL OIL CONSTITUENTS OF WHOLE PLANT EXTRACT OF *Fagonia cretica* L.

Sr. No.	Name of the Compound	Molecular formula	Molecular weight	Compound type	Percentage of composition
1	1,6-octadien-3-1,3,7,dimethyl alcohol	C ₁₀ H ₁₈ O	154	Unsaturated alcohol	10.892
2	Alpha Terpenol	C ₁₀ H ₁₈ O	154	Non cyclic terpenoids	4.088
3	2H-Pyran-2one,4-methoxy-6-methyl ketone	C ₅ H ₁₀ O ₃	118	Lactone	1.087
4	2,6-Octadien-1-1,3,7-Dimethyl -(2)-	C ₁₀ H ₁₈ O	154	Acyclic terpenoid	1.487
5	Geraniol	C ₁₀ H ₁₈ O	154	Acyclic terpenoid	3.945
6	Beta ionone	C ₁₃ H ₂₀ O	192	Ketone	0.723
7	Dodecanoic acid methyl ester	C ₁₃ H ₂₆ O ₂	214	Fatty acid ester	2.943
8	Dodecanoic acid ethyl ester	C ₁₃ H ₂₈ O ₂	204	Fatty acid ester	0.879
9	Dodecanoic acid	C ₁₂ H ₂₄ O ₂	176	Fatty acid	12.398
10	Tetradecanal	C ₁₄ H ₂₈ O	212	Aldehyde	1.582
11	Tetradecanoic Acid, methyl ester	C ₁₅ H ₃₀ O ₂	242	Fatty acid ester	8.201
12	Tetradecanoic Acid, ethyl ester	C ₁₄ H ₃₂ O ₂	208	Fatty acid ester	2.207
13	Tetradecanoic Acid	C ₁₄ H ₂₈ O ₂	204	Fatty acid	14.515
14	9-Octadecyne	C ₁₀ H ₃₄	250	Alkyne	3.449
15	Hexadecanoic Acid, methyl ester	C ₁₇ H ₃₄ O ₂	270	Fatty acid ester	2.462
16	Hexadecanoic acid ethyl ester	C ₁₈ H ₃₆ O ₂	284	Fatty acid ester	0.191
17	9-octadecanoic acid, methyl ester	C ₁₉ H ₃₇ O ₂	297	Fatty acid ester	2.198
18	Ethyl oleate	C ₂₀ H ₃₈ O ₂	310	Fatty acid ester	1.741
19	2-Pentadecanone 6-10-14-trimethyl	C ₁₈ H ₃₆ O	268	Ketone	5.608
20	5,9,13-Penta decotrien-2-one,6,10,14-trimethyl	C ₁₈ H ₃₀ O	262	Ketone	0.412

TABLE 2: ANTIMICROBIAL ACTIVITY OF FAGONIA CRETICA L. (WHOLE PLANT)

Sr. No.	Name of The Microorganism	Petroleum Ether		Chloroform		Methanol		Water		Standard antibiotics
		ZI	MIC	ZI	MIC	ZI	MIC	ZI	MIC	
1	<i>Bacillus subtilis</i> (GP)	11	100	12	150	11	150	12	150	22a
2	<i>Enterococcus faecalis</i> (GP)	10	100	11	100	12	150	10	100	24a
3	<i>Micrococcus luteous</i> (GP)	--	--	11	100	12	100	12	150	24a
4	<i>Staphylococcus aureus</i> (GP)	10	100	12	100	12	150	10	150	22b
5	<i>Escherichia coli</i> (GN)	--	--	12	100	--	--	09	100	22b
6	<i>Klebsiella pneumonia</i> (GN)	11	150	--	--	--	--	11	100	28b
7	<i>Proteus mirabilis</i> (GN)	12	100	11	100	12	150	10	150	20c
8	<i>Candida tropicalis</i> (FS)	11	100	10	150	12	100	11	150	20c

ZI: Zone of Inhibition (10mg/ml); MIC: Minimum Inhibitory Concentration ($\mu\text{g/ml}$); a: Ampicillin 10 $\mu\text{g/disc}$; b: Tetracyclin 30 $\mu\text{g/disc}$; c: Vancomycin 30 $\mu\text{g/disc}$; GP: Gram Positive; GN: Gram Negative; FS: Fungal Species; "--" denotes resistant; microorganisms;

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