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Antibacterial and Antifungal Studies of *Tagetes erectus* Leaf Extracts

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Five different crude extracts: petroleum ether, chloroform, ethyl ether, ethanol and aqueous extract of *Tagetes erectus* have been studied for both *in vitro* antibacterial and antifungal activites. The different extracts showed remarkable inhibitory action against various gram positive and gram negative bacteria and two fungal species.The methanolic extract of the leaves of *Tagetes erectus* was screened for antimicrobial activity. Antimicrobial activity was detected by observing the growth response of various microorganisms to the methanolic extract of *Tagetes erectus* which was placed in contact with them against the test organisms. Their microbiological assay is based on the comparison of inhibition of growth of microorganisms by measured concentration of plant extracts to be examined with that produced by known concentration of standard preparation of antibiotic having known activity. Positive antifungal activity was observed with methanolic extract against *Candida albicans*, no bacterial activity was observed

Key words: *Tagetes erectus*, Antimicrobial activity, Methanolic extract, organisms

Tagetes erectus (Compositae) is a traditional perennial herbaceous medicinal plant commonly known as African marigold or Sweet Cream Marigold. This plant has had medicinal purposes and it is thought to cure Stomach ache, parasites, diarrhea, liver illness, vomit, indigestion toothache and other illnesses. It is a small shrub, which grows to 1-2 m and it is used widely in our Traditional System of Medicine for curing various diseases like ulcers, laxation and in the treatment of eye diseases. The leaves are used in kidney troubles and in muscular pains and are applied on boils and carbuncles. Infusion of plant is used against rheumatism, cold and bronchitis[1]. In Unani medicine, a confection of tender leaves and purified sugar is prescribed in anuria, retention of urine and kidney troubles. The flowers contain pigments as Quercetagetin and quercetagetrin[2]. From the literature cited very few works has been carried out in this plant. Thus it was thought worthwhile to explore this plant for its therapeutic activity. The present study is therefore an attempt to assess efficacy of this indigenous herb in its different concentrations against various gram positive and gram negative bacteria and fungi.

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MATERIAL AND METHODS

Plant material

The leaves of *Tagetes erectus* were collected from the wild forest of Toranmal and were authenticated from proper sources.

Preparation of various extracts

Air-dried powdered leaves (1 kg) were exhaustively extracted by Soxhlet's apparatus successively by increasing order of polarity with petroleum ether, chloroform, ethyl acetate and ethanol. The aqueous extract was prepared by cold maceration of 250 g of the shade-dried leaf powder in 500ml of chloroform water (1:99) for 7 days. The various extracts obtained were filtered, concentrated, dried in vacuo and the residue stored in a refrigerator at 2-8°C for use in subsequent experiments[3].

Preliminary phytochemical screening

The dry extracts were subjected to various chemical tests[4] to detect the presence of different phytoconstituents. Preliminary phytochemical screening revealed the presence of alkaloids, carbohydrates, Flavonoids, phenols, steroids, saponins and tannins.

Antibacterial and antifungal studies

The various extracts were tested for their effect on gram +ve bacteria such as *Staphylococcus aureus, Bacillus subtilis* and gram – ve bacteria such as *Escherichia coli* and *Pseudomonas aeruginosa*. Fungi used for the present study were *Aspergillus niger* and *Candida albicans.* Minimum inhibitory concentration of the extracts was evaluated by cup plate diffusion method for antibacterial and antifungal activity [5, 6].

0.1 ml of overnight grown nutrient broth culture of the bacteria was transferred aseptically to sterile glass Petri dish. Sterile molten nutrient agar (45°C) was then poured, mixed uniformly rotating the plate and allowed to solidify. Cups were made out in the centre of the seeded nutrient agar plate using a sterile cork borer (6mm). The various extracts of the *Tagetes erectus* leaf of different concentrations viz. 50, 100, 200, 400 mg/

Table 1. Antibacterial Activity of *Tagetes erectus* Leaf Extract

Treatment	Conc. mg/ml	Zone of Inhibition (in mm)			
		Gram +ve		Gram –ve	
		S. aureus	*B. subtilis*	*E. coli*	*P. aeruginosa*
Pet. ether extract	50	09	08	09	07
	100	08	10	10	09
	200	10	09	12	11
	400	13	14	15	17
Chloroform extract	50	08	09	07	08
	100	10	10	08	10
	200	10	13	10	12
	400	12	16	11	13
Ethyl acetate extract	50	09	08	09	08
	100	12	11	08	10
	200	13	15	12	13
	400	17	19	13	15
Ethanolic extract	50	09	10	09	10
	100	13	16	14	13
	200	18	18	20	18
	400	21	20	24	22
Water extract	50	07	09	08	09
	100	08	10	10	11
	200	10	11	12	12
	400	12	16	14	15
Streptomycin	100	24	22	20	20

ml were made using dimethyl sulphoxide (DMSO) as a diluting solvent. The samples were added with a sterile micropipette to each of the cups[7, 8]. The plates were then incubated at 37°C for 24 hrs. Plates with cups containing only DMSO served as a control. Antibacterial actions of various extracts were compared with the known antibiotic like Streptomycin. The diameters of the inhibitory Zones were recorded after incubation and average values of these observations were recorded. Antibacterial activity of various extracts of *Tagetes erectus* leaf is given in Table 1.

In case of antifungal activity, the different fungal species were subcultured on sterile Sabouraud's broth. Suspensions of sub cultured organisms were made following the above-mentioned procedure adopted for antibacterial activity. The plates of fungi were incubated at 25°C for 3-4 days. Antifungal activity of various extracts of *Tagetes erectus* is given in Table 2.

RESULTS AND DISCUSSION

The five different crude extracts viz. petroleum ether, chloroform, ethyl ether, ethanol and aqueous extract of *Tagetes erectus* leaf were tested against various gram +ve and gram –ve bacteria. The results illustrated in Table 1 revealed the ethanolic extract of *Tagetes erectus* as most active against *S.aureus, E.coli* and *P. aeruginosa* in the dilution of 100 mg/ml. The ethyl acetate and chloroform extracts showed less activity than ethanol extract, but showed more activity than Pet. ether and water extracts. Table 2 revealed that the ethanolic and chloroform extracts are more active against *C. albicans* and *A. niger*, whereas pet. ether and ethyl acetate showed moderate activity. No activity was found in aqueous extract.

Thus, it can be concluded that while screening of various extracts of *Tagetes erectus* leaf against various gram +ve and gram –ve

Table 2. Antifungal Activity of *Tagetes erectus* Leaf Extract

Treatment	Conc. mg/ml	Zone of Inhibition (in mm)	
		C. albicans	*A. niger*
Pet. ether extract	50	10	11
	100	11	13
	200	12	16
	400	18	18
Chloroform extract	50	10	11
	100	12	13
	200	15	18
	400	19	23
Ethyl acetate extract	50	09	10
	100	11	12
	200	15	16
	400	19	21
Ethanolic extract	50	09	10
	100	13	16
	200	18	20
	400	22	25
Water extract	50	08	07
	100	09	11
	200	08	07
	400	10	09
Amphotericin	10	21	22

bacteria and fungi, ethanol extracts exhibited very satisfactory inhibitory activity. Further studies involving the isolation, characterization and purification of the chemical compounds of the plant and screening for antibacterial and antifungal may result in the development of a potent entity which will be of lower toxicity and a high therapeutic value to the mankind. These activities may be due to the presence of phytoconstituent present in the extract and the exact constituent responsible for the activity can be confirmed with the help of isolation techniques.

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