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FUNGITOXIC PROPERTIES OF *OCIMUM CANUM*[1]

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ABSTRACT

The antifungal screening of leaves of nineteen taxa was made against storage fungi—*Aspergillus flavus*, *A. versicolor* and *Fusarium moniliforme* by inverted petriplate method. The vapours of *O. canum*, collected in the form of a yellow oil were found to exhibit strong toxicity. The minimum inhibitory concentration of the oil was found to be 3000 ppm.

INTRODUCTION

During a recent study conducted by Misra (1979), *Aspergillus flavus*, *A. versicolor* and *Fusarium moniliforme* have been found to be amongst the chief fungi causing losses in the storage of various foodstuffs. The application of many inorganic or organic fungicides have been recommended to control the losses. However, application of many of them has been cautioned due to their toxicity, carcinogenicity and teratogenicity. The recent reports on the possibility of the use of higher plants and their constituents have indicated their fruitfulness in providing harmless fungicides (Fawcett and Spencer, 1970). Therefore, a project was undertaken to screen higher plants for their fungitoxic constituents against such pathogens.

MATERIALS AND METHODS

The leaves of various taxa were washed and pulverised in a mortar along with some water (1 : 1 ratio, W/V) and the squeezed pulp was subjected to antifungal testing against the test fungi—*A. flavus*, *A. versicolor* and *F. moniliforme* by inverted petriplate method as described by Peach and Tracey (1955). The fungitoxicity of the extracts were recorded in terms of per cent mycelial inhibition by the formula followed by Dixit *et al.* (1978).

The volatile antifungal fraction of the active plant was collected in the form of a yellow oil by hydro-distillation through Clevenger's apparatus. Important physico-chemical properties of the oil were estimated by the methods suggested by Guenther (1972). The minimum inhibitory concentration (MIC) and antifungal spectrum of the oil were tested by the poisoned food technique as adopted by Dikshit *et al.* (1979). The fungistatic/fungicidal activity of the oil was confirmed according to Garber and Houston (1959).

RESULTS

Of the nineteen taxa screened, absolute fungitoxicity was exhibited by the leaves of *Ocimum canum* (Table I). The MIC of the oil against all the three fungi was found to be 3000 ppm (Table II) at which it exhibited fungistatic activity. However, at higher concentrations, it proved to be fungicidal (Table III). The oil exhibited wide range of activity, inhibiting all the fungi tested at different concentrations (Table IV). The physico-chemical pro-

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TABLE I

SCREENING OF PLANTS FOR THEIR ANTIFUNGAL ACTIVITY

Plant taxa	Family	Percent Inhibition		
		A. flavus	*A. versicolor*	*F. moniliforma*
1. *Ageratum haustomianum* Mill.	Asteraceae	76.6	86.6	70.0
2. *Amaranthus spinosus* Linn.	Amaranthaceae	80.0	76.6	80.3
3. *Anisomeles ovata* R.Br.	Labiatae	56.3	70.0	66.0
4. *Artemisia vulgaris* Linn.	Asteraceae	00	56.6	40.3
5. *Callistemon lanceolatus* DC.	Myrtaceae	70.5	81.5	62.8
6. *Clerodendrum inerme* Goeerth.	Verbenaceae	50.1	83.3	40.3
7. *Cannabis sativa* Linn.	Cannabinaceae	80.9	92.1	82.8
8. *Cassia fistula* Linn.	Caesalpiniaceae	40.1	52.6	62.3
9. *Cassia occidentalis* Linn.	Caesalpiniaceae	50.6	78.9	91.4
10. *Euphorbia geniculata* Ovteg.	Euphorbiaceae	80.0	76.6	83.3
11. *Hyptis suaveolens* (L) Poit.	Labiatae	70.9	85.5	65.7
12. *Iberis amara* Linn.	Cruciferae	93.3	83.3	97.5
13. *Ipomoea fistulosa* Mart. Ex. Choisy	Convolvulaceae	38.3	45.4	56.9
14. *Lantana indica* Roxb.	Verbenaceae	36.6	92.1	64.0
15. *Lippia alba* (III) N.E.Br.	Verbenaceae	ç0.4	66.6	60.0
16. *Melia azadiracta* Linn.	Meliaceae	83.3	83.3	85.7
17. *Mentha spicata* Linn.	Labiatae	83.3	85.3	88.7
18. *Ocimum canum* Sins.	Labiatae	100	100	100
19. *Sapindus imarginatus* Linn.	Sapindaceae	80.0	76.6	80.3

TABLE II

MINIMUM INHIBITORY CONCENTRATION OF THE OIL OF OCIMUM CANUM

Concentration of the oil (ppm)	Percent Inhibition of Growth		
	A. flavus	*A. versicolor*	*F. moniliforme*
1000 ..	92.0	90.0	92.5
2000 ..	97.0	96.5	98.0
3000 ..	100	100	100
4000 ..	100	100	100
5000 ..	100	100	100

TABLE III

FUNGISTATIC/FUNGICIDAL PROPERTIES OF THE OIL OF OCIMUM CANUM

Concentration of the oil (ppm)	Percent Inhibition of Growth					
	Treated plates			Reinoculated plates		
	A. flavus	*Al. versicolor*	*F. moniliforme*	*A. flavus*	*A. versicolor*	*F. moniliforme*
3000 ..	100	100	100	80.2	84.6	87.0
4000 ..	100	100	100	91.0	93.7	99.7
5000 ..	100	100	100	95.3	98.3	100
6000 ..	100	100	100	100	100	100
7000 ..	100	100	100	100	100	100

TABLE IV

FUNGITOXIC SPECTRUM OF THE OIL OF OCIMUM CANUM

Pathogen	Percent Inhibition		
	5000 ppm	3000 ppm	1000 ppm.
1. *Absidia ramosa* ..	100	100	100
2. *Alternaria alternata* ..	100	100	100
3. *Alternaria brassicae* ..	100	100	56.2
4. *Alternaria solani* ..	100	100	100
5. *Aspergillus fumigatus* ..	100	100	80.0
6. *Aspergillus flavus* ..	100	100	90.0
7. *Aspergillus flavipes* ..	100	100	80.0
8. *Aspergillus versicolor* ..	100	100	90.0
9. *Cephalosporium sacchari* ..	100	100	83.3
10. *Chaetomium globosum* ..	100	100	100
11. *Cladosporium cladosporioides*	100	100	100
12. *Colletotrichum gleosporioides*	100	100	27.7
13. *Colletotrichum tinosporae* ..	100	100	100
14. *Curvularia lunata* ..	100	100	100
15. *Fusarium moniliforme* ..	100	100	44.0
16. *Fusarium oxysporum* ..	100	100	79.0
17. *Fusarium solani* ..	100	100	68.3
18. *Drechslera state of Cochliobolus carbonum* ..	100	100	100
19. *Drechslera graminea* ..	100	100	100
20. *Drechslera maydis* ..	100	100	100
21. *Drechslera turcica* ..	100	100	100
22. *Pestalotia versicolor* ..	100	100	65.2
23. *Phoma* sp. ..	100	100	88.8
24. *Paecilomyces* sp. ..	100	100	80.0
25. *Macrophomina phaseolina* ..	100	100	75.0
26. *Talaromyces* sp. ..	100	100	100
27. *Trichoderma viride* ..	100	100	100
28. *Tritirachium roseum* ..	100	100	100

TABLE V

PHYSICO-CHEMICAL PROPERTIES OF THE OIL OF *OCIMUM CANUM*

Property	
Specific gravity ..	0.9665
Phenol Test. ..	Nil
Acid number	Nil
Ester number ..	44.77
Saponification value ..	44.77
Refracting Index ..	1.478 at 20°C
Specific Rotation ..	+ 7.6704°
Percent Recovery of the oil ..	1.4

perties of the oil were determined and are given in Table V.

DISCUSSION

Rao *et al.* (1971) recorded antifungal activity in the essential oil of *Ocimum canum* against several fungi pathogenic to sugarcane. However, he did not make detailed investigations on its fungitoxic properties. In the present investigation, its detailed fungitoxic properties have also been studied. The oil of radish flowers (Nehrash, 1961) is active at a higher concentration as compared to that of *Ocimum canum*, which also showed both the fungicidal and fungistatic nature at different concentrations in contrast to the fungicidal nature of oils of *Cedrus deodara* and *Mentha arvensis* (Dikshit *et al.*, 1979). Further, unlike the oils of *Psoralea corylifolia* and *Feronia elephantum*, which showed narrow range of activity (Grover and Tirumala Rao, 1978; Sharma *et al.*, 1978), the oil of *Ocimum canum* exhibited broad range of activity. However, it proved highly toxic to 13 fungi including some human pathogens.

As the plant is a common weed and grows abundantly throughout the plains of India, it may be exploited for its oil which may prove a cheap source for the protection of foodstuffs and spices from storage fungi as well as for the cure of human diseases.

Further studies regarding *in vivo* efficacy of the oil are in progress.

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