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## STUDIES ON ANTIFUNGAL PROPERTIES OF INDIGENOUS PLANTS FROM THE KARACHI REGION. Part II

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The antifungal properties of 58 extracts from 32 plants belonging to 14 families from the Karachi region have been studied. The plant families include: Aristolochiaceae, Amaryllidaceae, Capparidaceae, Compositae, Euphorbiaceae, Leguminosae, Lilliaceae, Meliaceae, Myrlaceae, Rutaceae, Solanaceae, Umbellifereae, Verbenaceae, and Zingeberaceae. The test organisms used were Aspergillus niger, A. flavus and Penicillium citrinum. Eleven of the plant extracts tested showed antifungal activity. Besides inhibitory activities some of the extracts indicated strong stimulatory effects with the test organisms.

Key words: Antifungal, Antibacterial, Plant extracts.

#### Introduction

The presence of antifungal and antibacterial substances in the higher plants is well stablished [1-6]. However, in spite of many screening programmes for detection and isolation of antibiotics from plant sources, there are few antifungal drugs currently available and these require improvement in their effectiveness. The incidence of mycotic disease is very high due to the warm and humid conditions of Karachi region. Therefore, we consider that such studies are badly needed since there exists considerable scope for new and more effective fungicides from natural sources.

The present studies are a continuation of our previous investigation on antifungal properties of indigenous plants from the Karachi region [7].

#### **Materials and Methods**

The plants included in the present studies were those (a) having reputed medicinal value and (b) wild plants growing abundantly in this region. These plants were collected from Karachi and its suburbs in their flowering and fruiting stages. The parts of the plants used during these studies include roots, stems, leaves, flowers, fruits, seeds and some times an extract of the whole plant.

The preparation of plant extracts and the samples for testing have already been described in our previous publication [7]. The procedure used for evaluating the antifungal activity was described by Leven *et. al.* [8]. The test organisms used include *A. niger*, van tieghem, *A. flavus* Link and *P. citrinum* Thom isolated from citrus fruits.

The inhibitory results obtained in our experiments are presented in Table 1, while Table 2 gives the stimulatory effects of the extracts.

#### **Results and Discussion**

The results of the antifungal activity of 58 extracts from 32 plants, distributed among 14 families are presented in Table 1.

The plant extract which possessed inhibition zones (Method described by Leven *et. al.* [8] 15 mm or more in diameter against one or more test organisms were considered strongly active and represented by ++, whereas less than 15 mm zones of exhibition are indicated by +. A strong antifungal activity was exhibited by only 5 of all the plant extracts tested, namely *Solanum nigrum*, *Withania coagulans*, *W. somnifera*, *Trachyspermum ammi* and *Peltophorum pterocarpus*. Extracts of 6 other plants showed a lower antifungal activity. These plants are: *Allium sativum*, *Aloe-vera tournex*, *Azadirachta indica*, *Psophocarpus tetragonolobus*, *Solanum xanthocarpum* and *Zingiber officinale*.

It is well established that certain phytochemicals e.g. Anthranoids [9] Saponins [10] and Alkaloids [11] exhibit significant antifungal properties. Some of the plant extracts used in our experiments also exhibited different levels of antifungal activity. It was also noticed that the antifungal activity depends on the solvent used. For example the antifungal activity was usually enhanced when a 90% ethanol extract was tested. This situation may be explained partly by the fact that polyphenolic compounds like tannins, alkaloids, sapo-nins and antheranoids present in the plants parts are antifungal and soluble in ethanol. Moreover, ethanol is a polar solvent and it has a greater capability of hydrolyzation of different compounds which render extracts more effective.

It has also been observed that certain parts contain more active antifungal activity as compared to other parts of the same plants. For example in *Withania somnifera*, there is

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TABLE 1. RESULTS OF THE ANTIFUNGAL TESTS.

S. No.	Family/Botanical names	Common name	Part used	Extracting solvent	Antifungal activity against			
					A. niger	A. flavus	P. citrinu	un
	ARISTOLOCHIACEAE							
	Aristolochia bracteata Retz.	Kiramari	Leaves	Ethanol		<u></u>	3. <u></u> .	
			Louves	Duranor				
	AMARYLLIDACEAE	Ded Lillion	Bulbs	Ethanal				
	Amaryllis vittata L'Herit	Red lillies Red lillies	Leaves	Ethanol Ethanol	-			
	Amaryllis vittata L'Herit							
	Amaryllis vittata L'Herit	Red lillies	Flowers	Ethanol		ar sere	i forma de la	
	CAPPARIDACEAE							
	Capparis decidua (Forssk) Edgew	Delha	Leaves	Ethanol		to a provident s	ed sont	
	COMPOSITAE							
	Elephantopus scaber Linn.	Gobhi	Leaves	Ethanol	A 10	ing and an		
	Lactuca serriola Linn.	Salad	Leaves	Ethanol				
	EUPHORBIACEAE							
	Bridelia montana (DC) Willd	Gondni	Fruits	Ethanol				
	Jatropha curcas Linn.	Jamal ghota	Seed cover	Ethanol		20.201	mayau -	
).	Jatropha curcas Linn.	Jamal ghota	Seeds	Ethanol	10.1.1	Andrain 199		
	Jatropha curcas Linn.	Jamal ghota	Seeds	Pet. ether				
2	Jatropha curcas Linn.	Jamal ghota	Leaves	Ethanol		2,4.9	ANUAR	
	Euphorbia hirta Linn.	Dudhi	Whole plant	Ethanol	de Curo	and taking a	\$ G. 15876	
	Euphorbia thymifolia Linn.	Choti-dudhi	Whole plant			A. 6. M.	Chest 12	
•	LEGUMINOSAE	Chief duality	Dis gas	Dunanor			apost M.	
		Mathi	bruge/	Etheral				
	Trigonella foenum-graecum Linn.	Methi	Seeds	Ethanol	(STR21) 2	a co <del>ag</del> elan	enoshi <del>r it</del>	
•	Cassia fistula Linn. Cassia fistula Linn.	Amaltas Amaltas	Flowers	Ethanol	1020	with the state of the	in the second	
:	Cassia fistula Linn.	Amaltas	Leaves	Ethanol	79 .AJR56	Personal and the second	MUSINGO	
•	Cassia fistula Linn.	Amaltas	Leaves	Ethyl acet.	That s	an <u>atan</u> usi I	S. Called	
•	and the second se	Amaltas	Leaves	Pet. ether	P P m,	$(A^{*}) \overline{A^{*}} $	C. C. Martin	
•	Cassia fistula Linn.		Leaves	Acetone	·	LIN TO AE	DABE	
•	Cassia fistula Linn.	Amaltas	Twigs	Ethanol	rees (Einn	DEPRESSION CH	Trach)3	
•	Cassia fistula Linn.	Amaltas	Fruits	Ethanol		NACEAR	AASTV	
	Cassia angustifolia Vahl.	Sanna makki	Leaves	Methanol	ni Demis	inai marina	- Chrode	
•	cassia angustijotta tam.	Sanna makki	Fruits	Methanol		1. 1913.07	1	
•	Cassia angustifolia Vahl.	Sanna makki	Fruits	Ethyl acet.		الاردار <u>همی</u> (۱۹۹۰) محمد الارد ال		
•	Cassia angustifolia Vahl. Horado R	Sanna makki	Fruits	Acetone	845 <u>4-3</u> 02	ana ffa	190111977	
	Cassia angustifolia Vahl.	Sanna makki	Fruits	Pet. ether				
•	Cassia holosericea Fresen Cassia holosericea Fresen	Sanna sindhi	Leaves	Ethanol			·	
•		Sanna sindhi	Leaves	Methanol				
	Cassia holosericea Fresen	Sanna sindhi	Leaves	Acetone				
•	Cassia holosericea Fresen	Sanna sindhi	Leaves	Ethyl acet.				
•	Leucaena leucocephala (Lam.) de Wit.		Seeds	Ethanol		10.22	Phan	
•	Leucaena leucocephala (Lam.) de Wit.		Seed covers	Ethanol				
	Peltophorum pterocarpum	Yellow	Flowers	Ethanol	++	++	+	
	(DC) Backer ex K. Heyne	Poinciana	Court states	D				
i.	Psophocarpus tetragonolobus	Winged bean	Seeds	Pet. ether	• + bfl	trabica Wi	Acacia a	
	(Linn.) DC.							

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(Table 1, continued)

(I able	I, continuea)							
36.	Psophocarpus tetragonolobus	Winged bean	Seeds	Ethanol	+	+	+	
	(Linn.) DC. legendunA genroetted							
37.	Albizia lebbeck (Linn.) Benth.	Siris	Leaves	Ethanol	-			
38.	Acacia arabica (Lam.) Willd.	Kikar	Bark	Ethanol			-	
39.	Caesalpinia crista Linn.	Karanju	Leaves	Ethanol	+ (7)	AIH+O.JO	++*(151)	
	LILIACEAE							
40.	Allium sativum Linn.	Garlic(Lahsan)	Bulbs	Water	EAR *	DAGELIY!	ALN A	
41.	Allium sativum Linn.	Garlic (Lahsan)	Bulbs	Ethanol	troff	Center al	the second	
42.	Allium sativum Linn.	Garlic (Lahsan)	Bulbs	Crushed	traff.	Lastan (il	Magaza .	
17				material use	d in the			
43.	Allium cepa Linn.	Onion (Pyaz)	Fleshy	Ethanol		eren <del>de</del> menos	079.675	
			scales				an a	
44.	Aloe barbadensis Mill.	Ghigawar	Leaves	Ethanol	+	+	and for a	
	MELIACEAE							
45.	Azadirachta indica Linn. A.Juss.	Neem	Seeds	Methanol	401-1 X84	+	+	
	ent i en en en alatigada		(Neeboli)					
46.	Azadirachta indica Linn. A. Juss.	Neem	Flesh of	Methanol	+ 🔅	4.54	HT II	
			fruits https://					
	MYRTACEAE							
47.	Eucalyptus globulus Labill.	Eucalyplus	Leaves	Methanol		the state of the	<u>la</u> tropi	
	RUTACEAE	64.671					her dit.	
48	Murraya koenigii (Linn.) Spreng	Curry path	Leaves	Ethanol	- J-0	<u>d pagan</u> a B		
10.			Louvos					
40	SOLANACEAE	A Poor Start	ulate inthe	Ethonal	A. C. M.	in him his		
49.	Withania somnifera (Linn.) Dunal.	Asgand	Leaves	Ethanol	· +	no tom	UPG0	
50.	Withania somnifera (Linn.) Dunal.	Asgand	Twigs	Ethanol	++	++ 	+	
51.	Withania coagulans Dunal.	Panirband	Roots	Ethanol	+	+ (19.2 p. 40)	Gavao	
52.	Withania coagulans Dunal.	Panirband	Fruits	Ethanol	++		++	
53.	Solanum miniatum Benth. ex Willd.	Mako	Leaves	Ethanol	++	* <b>+</b> +	+	
54.	Solanum surattense Burn.	Kateli	Roots	Ethanol	+	hoda Euro	Castra	
55.	Solanum surattense Burn. UMBELLIFERAE	Kandiari	Stem	Ethanol	+	ni niyañ	(Lan C	
56.	Trachyspermum ammi (Linn.) Sprague	Aiwon	Seeds	Ethanol		and a second		
50.		Ajwali	Secus	Eulanoi	++	a <b>++</b>	++	
	VERBENACEAE		Sec. Mater					
57.	Clerodendrum indicum (Linn.) O.Ktze.	Arni	Leaves	Ethanol	1	de <del>co</del> stes	e e <del>a c</del>	
	ZINGIBERACEAE					a hadir ia		
58.	Zingiber officinale Roscoein	Adrak	Rhizome	Ethanol	+	90 (j <b>+</b> 95)70	( <b>4</b> /5923)	
			juice					
	- (. <sup>1</sup> /M21)-	11 Lat. 1	nabart brans		Na Sector I	as investor	1	8
			nibula katas					
	TABLE 2	. Growth Stimula	TORY ACTIVITY	of Plants				
S.	Plant name	Common	Part	Extracting	Stimulatory Activity			
		name	used	I DE EN CIUMAN		A. flavus		um
No.		The Martin	(9583)	1		(4, 14, 14 B.	MUL9107 F	XE
No.								
No.	Allium sativum Linn.	Garlic	Bulb pils	Pure juice	++	++	-21720) +	
	Allium sativum Linn. Acacia arabica Willd.	Garlic Kikar	Bulb pils Bark	Pure juice Ethanol	++	++ +	+	

(Continued....)

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(Table 2, continued)

4.	Cassia angustifolia Vahl.	Sanna makki	Leaves	Methanol	+	020¥0X	AT <u>A</u>
5.	Cassia angustifolia Vahl.	Sanna makki	Fruits	Ethanol	++	++	+
6.	Cassia holosericea Fresen.	Sanna sindhi	Leaves	Pet. ether	+	+	
7.	Cassia holosericea Fresen.	Sanna sindhi	Leaves	Ethyl acet.	+	+	+
8.	Capparis decidua Edgew.	Delha	Leaves	Ethanol	++	+	+
9.	Elephantopus scaber Linn.	Cabbage	Leaves	Ethanol	+	+	
10.	Lectuca serriola Linn.	Salad	Leaves	Ethanol	+	+	den -

more antifungal activity in the twigs as compared to the leaves, while in *W. coagulans* there is more antifungal activity in fruits as compared to roots. Therefore, we conclude that most likely one part of the same plant contains larger quantities of antifungal chemicals as compared to the other parts.

Besides antifungal properties, 10 plants have shown stimulatory activities with the test organisms. Such stimulatory activities caused by the plant extracts indicate the presence of growth promoting components, e.g. auxins or phytoalexins etc. The activity of such plants has been shown in Table 2.

On the basis of present investigations it is concluded that there exists a great potential in the search of new and more potent antifungal substances from the natural sources.

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<sup>24</sup> Dyrs 9 moutrionis octual or age; 3(c and 4th epimer configuous throughout: gential planet nearer to dod of bedy than to epimere, Unionicola Halderman 1842 (Fig. 29-32);

Acetabula nor stailed
 12. Central opening envered by a single openetium bing 200-300 acetabulatic currentian nition largely enclosed
 341 and 4th columnet distributant process of P-4 short at

- Outlist, Pyoractists Product (1716) (eng. 26-27).
- Genital openities not converted by a single operculara, bases and by paired valves; Genital valves cach issaring 20-60 arealabula; Valves not enclosed by 3rd and 4th epimene distictorselym.coss of P-4 inng and signider. Hydrodroma Koch 1527 (fine, 18-20).

 15 Pairs of stalked genuch accudula; claws per timus Provzia Picevic; 1876 (Pic, 40–44).

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