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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

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. citrinum*
	ARISTOLOCHIACEAE						
1.	*Aristolochia bracteata* Retz.	Kiramari	Leaves	Ethanol	—	—	—
	AMARYLLIDACEAE						
2.	*Amaryllis vittata* L'Herit	Red lillies	Bulbs	Ethanol	—	—	—
3.	*Amaryllis vittata* L'Herit	Red lillies	Leaves	Ethanol	—	—	—
4.	*Amaryllis vittata* L'Herit	Red lillies	Flowers	Ethanol	—	—	—
	CAPPARIDACEAE						
5.	*Capparis decidua* (Forssk) Edgew	Delha	Leaves	Ethanol	—	—	—
	COMPOSITAE						
6.	*Elephantopus scaber* Linn.	Gobhi	Leaves	Ethanol	—	—	—
7.	*Lactuca serriola* Linn.	Salad	Leaves	Ethanol	—	—	—
	EUPHORBIACEAE						
8.	Bridelia montana (DC) Willd	Gondni	Fruits	Ethanol	—	—	—
9.	*Jatropha curcas* Linn.	Jamal ghota	Seed cover	Ethanol	—	—	—
10.	*Jatropha curcas* Linn.	Jamal ghota	Seeds	Ethanol	—	—	—
11.	*Jatropha curcas* Linn.	Jamal ghota	Seeds	Pet. ether	—	—	—
12.	*Jatropha curcas* Linn.	Jamal ghota	Leaves	Ethanol	—	—	—
13.	*Euphorbia hirta* Linn.	Dudhi	Whole plant	Ethanol	—	—	—
14.	*Euphorbia thymifolia* Linn.	Choti-dudhi	Whole plant	Ethanol	—	—	—
	LEGUMINOSAE						
15.	*Trigonella foenum-graecum* Linn.	Methi	Seeds	Ethanol	—	—	—
16.	*Cassia fistula* Linn.	Amaltas	Flowers	Ethanol	—	—	—
17.	*Cassia fistula* Linn.	Amaltas	Leaves	Ethanol	—	—	—
18.	*Cassia fistula* Linn.	Amaltas	Leaves	Ethyl acet.	—	—	—
19.	*Cassia fistula* Linn.	Amaltas	Leaves	Pet. ether	—	—	—
20.	*Cassia fistula* Linn.	Amaltas	Leaves	Acetone	—	—	—
21.	*Cassia fistula* Linn.	Amaltas	Twigs	Ethanol	—	—	—
22.	*Cassia fistula* Linn.	Amaltas	Fruits	Ethanol	—	—	—
23.	*Cassia angustifolia* Vahl.	Sanna makki	Leaves	Methanol	—	—	—
24.	*Cassia angustifolia* Vahl.	Sanna makki	Fruits	Methanol	—	—	—
25.	*Cassia angustifolia* Vahl.	Sanna makki	Fruits	Ethyl acet.	—	—	—
26.	*Cassia angustifolia* Vahl.	Sanna makki	Fruits	Acetone	—	—	—
27.	*Cassia angustifolia* Vahl.	Sanna makki	Fruits	Pet. ether	—	—	—
28.	*Cassia holosericea* Fresen	Sanna sindhi	Leaves	Ethanol	—	—	—
29.	*Cassia holosericea* Fresen	Sanna sindhi	Leaves	Methanol	—	—	—
30.	*Cassia holosericea* Fresen	Sanna sindhi	Leaves	Acetone	—	—	—
31.	*Cassia holosericea* Fresen	Sanna sindhi	Leaves	Ethyl acet.	—	—	—
32.	*Leucaena leucocephala* (Lam.) de Wit.	Ipil-Ipil	Seeds	Ethanol	—	—	—
33.	*Leucaena leucocephala* (Lam.) de Wit.	Ipil-Ipil	Seed covers	Ethanol	—	—	—
34.	*Peltophorum pterocarpum* (DC) Backer ex K. Heyne	Yellow Poinciana	Flowers	Ethanol	++	++	+
35.	*Psophocarpus tetragonolobus* (Linn.) DC.	Winged bean	Seeds	Pet. ether	+	+	+

(Continued ...)

(Table 1, continued)

36.	*Psophocarpus tetragonolobus* (Linn.) DC.	Winged bean	Seeds	Ethanol	+	+	+
37.	*Albizia lebbeck* (Linn.) Benth.	Siris	Leaves	Ethanol	—	—	—
38.	*Acacia arabica* (Lam.) Willd.	Kikar	Bark	Ethanol	—	—	—
39.	*Caesalpinia crista* Linn.	Karanju	Leaves	Ethanol	+	+	—
	LILIACEAE						
40.	*Allium sativum* Linn.	Garlic(Lahsan)	Bulbs	Water	—	—	—
41.	*Allium sativum* Linn.	Garlic (Lahsan)	Bulbs	Ethanol	+	+	+
42.	*Allium sativum* Linn.	Garlic (Lahsan)	Bulbs	Crushed material used	+	—	—
43.	*Allium cepa* Linn.	Onion (Pyaz)	Fleshy scales	Ethanol	—	—	—
44.	*Aloe barbadensis* Mill.	Ghigawar	Leaves	Ethanol	+	+	—
	MELIACEAE						
45.	*Azadirachta indica* Linn. A.Juss.	Neem	Seeds (Neeboli)	Methanol	+	+	+
46.	*Azadirachta indica* Linn. A. Juss.	Neem	Flesh of fruits	Methanol	+	+	—
	MYRTACEAE						
47.	*Eucalyptus globulus* Labill.	Eucalyplus	Leaves	Methanol	—	—	—
	RUTACEAE						
48.	*Murraya koenigii* (Linn.) Spreng	Curry path	Leaves	Ethanol	—	—	—
	SOLANACEAE						
49.	*Withania somnifera* (Linn.) Dunal.	Asgand	Leaves	Ethanol	+	+	—
50.	*Withania somnifera* (Linn.) Dunal.	Asgand	Twigs	Ethanol	++	++	+
51.	*Withania coagulans* Dunal.	Panirband	Roots	Ethanol	+	+	—
52.	*Withania coagulans* Dunal.	Panirband	Fruits	Ethanol	++	+	++
53.	*Solanum miniatum* Benth. ex Willd.	Mako	Leaves	Ethanol	++	++	+
54.	*Solanum surattense* Burn.	Kateli	Roots	Ethanol	+	+	—
55.	*Solanum surattense* Burn.	Kandiari	Stem	Ethanol	+	—	—
	UMBELLIFERAE						
56.	*Trachyspermum ammi* (Linn.) Sprague	Ajwan	Seeds	Ethanol	++	++	++
	VERBENACEAE						
57.	*Clerodendrum indicum* (Linn.) O.Ktze.	Arni	Leaves	Ethanol	—	—	—
	ZINGIBERACEAE						
58.	*Zingiber officinale* Roscoein	Adrak	Rhizome juice	Ethanol	+	+	+

TABLE 2. GROWTH STIMULATORY ACTIVITY OF PLANTS

S. No.	Plant name	Common name	Part used	Extracting solvent	Stimulatory Activity		
					A. niger	*A. flavus*	*P. citrinum*
1.	*Allium sativum* Linn.	Garlic	Bulb pils	Pure juice	++	++	+
2.	*Acacia arabica* Willd.	Kikar	Bark	Ethanol	+	+	—
3.	*Bridelia montana* (DC) Willd.	Gondni	Fruits	Ethanol	++	++	++

(Continued....)

(Table 2, continued)

4.	*Cassia angustifolia* Vahl.	Sanna makki	Leaves	Methanol	+	+	--
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	+	+	—

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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