

## STUDIES ON THE BACTERIOSTATIC PROPERTIES OF WILD, MEDICINAL PLANTS OF KARACHI REGION. PART I

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**Abstract.** The present communication deals with the bacteriostatic properties of the ethanolic extracts of wild, medicinal plants of this region. Experiments were conducted on sixty plants of seventeen families against fourteen different bacteria. Results of the tests have been described. *Abutilon indicum* (L.) Swt., *Juglans regia* L., *Mimosa hamata* Willd., *Prosopis glandulosa* Torr., *Trigonella occulta* Delile, *Vernonia cinerascens* Schultz. Bip. and *Withania somnifera* (L.) Dunal were found to be active against all the bacteria tested.

For centuries plants have been used throughout the world as drugs and remedies for various diseases. In our subcontinent administration of decoction of plants is still in practice. Ample data, pertaining to the medicinal properties of herbs of this subcontinent is available (Watt,<sup>1</sup> Nadkarni<sup>2</sup> and Chopra<sup>3</sup>). A few surveys have also been conducted on such plants of this country (Malik,<sup>4</sup> Asad *et al.*,<sup>5</sup> Baquar<sup>6</sup> and Tasnif and Said<sup>7</sup>). The available data categorises only those plants which were commonly used in Unani and Ayurvedic systems. Detailed studies pertaining to the antibacterial activity of the plants and the prospects of their uses and systematic study on the basis of a scientific experimentation deserve further attention. The presence of antibacterial substances and their efficacy on various pathogenic organisms was, therefore, investigated in higher plants.

### Material and Methods

**Collection and Extraction of Plants:** Sixty members of seventeen different families were collected during 1970-71 in their flowering season from different areas of Karachi. Two types of plants were collected (i) most abundantly grown wild plants which were not reported previously as of medicinal importance and (ii) those commonly sold by herb sellers and reported to be of medicinal value.

Different parts of fresh, undried plants were chopped separately, then soaked in ethanol (90%). Crude extracts were obtained by percolation. Extracts were filtered out first at 48 hr and then thrice after every 24 hr. The pooled extracts were concentrated by distilling out ethanol under reduced pressure.

**Medium.** Nutrient agar, nutrient broth and blood agar.

**Method.** Experiments were conducted on fourteen bacteria. Bacteriostatic activity of extracts of the plants was observed by agar cavity method.<sup>8</sup> For this purpose 20 ml of molten sterile agar was poured in sterile petri dishes of 8.5 to 9.0 cm dia, which were swabbed with 24 hr old broth culture of the organism after agar had solidified. Cavity of 1.1 cm dia was made in the centre with the help of a sterilized cork borer. Cavities were filled with 0.3 ml of 4% solution (w/v) in 90% ethanol. Controls of the tests were run with all the organisms, using 90% ethanol.

Petri dishes were incubated at 37°C. Zones of inhibition of growth were measured after 24 hr.

### Results and Discussion

Results pertaining to the bacteriostatic tests of plants showing activity against various organisms, are summarised in the table. Controls did not show any zone inhibition.

TABLE. ZONES OF INHIBITION MEASURED IN cm OBTAINED BY ETHANOLIC EXTRACT OF PLANTS AGAINST BACTERIA.

<i>Acanthaceae</i>	
<i>Blepharis scindica</i> (Asad) T. And.—B1, A4, C7, B13	
<i>Apocynaceae</i>	
<i>Vinca rosea</i> (Sadabahar) Linn.—	
(i) shoot—C3, A7, B11, B14	
(ii) root—C2, C4, B5, B8, B9, B10, C11, B13, B14	
<i>Aristolochiaceae</i>	
<i>Aristolochia bracteata</i> (Kiramari) Retz.—	
C1, C2, A4, C5, C6, B7, C8, B9, B10, C11, B12, C13, C14	
<i>Boraginaceae</i>	
<i>Cordia rothii</i> (Gundni) Rom & Schultz.—	
(i) shoot—C7, B9, B11, B13	
(ii) fresh fruits—B13	
<i>Heliotropium ophioglossum</i> , Stocks.—	
(i) B1, C2, B5, C6, A7, B8, C10, B11	
<i>H. ramosissimum</i> Sieber	
C1, B2, C3, C6, B7, C9, C10, B13	
<i>H. strigosum</i> Willd.—B1, C2, B5, C6, C7, B8, C9, C12	
<i>Trichodesma amplexicaule</i> Roth.—	
B5, B6, B8, B9, B10, C13	
<i>Chenopodiaceae</i>	
<i>Salsola baryosma</i> (Lanan) (R&S) Dandy.—	
B2, C3, B4, C5, B6, C7, C8, B9, B10, C11, C13, C14	
<i>Capparidaceae</i>	
<i>Cleome brachycarpa</i> (Panwar) Vahl.—	
B1, C2, C3, B4, B5, C6, B11	

## Compositae

*Eclipta alba* (Bhangra) Linn. Hassk.—  
C2, B3, C5, B7, B8, B9, C10, C11, B12,  
B13

*Inula grantioides* (Naro) Boiss.—

C1, C5, C8, C9, C10, C12

*Laurea nudicaulis* (Jangli gohbi) Linn. Hk.f.—  
B1, C8, B11

*Pulicaria angustifolia* DC.—

A2, C5, C6, C7, C8, B9, B12

*Vernonia cinerascens* Schultz. Bip.—

B1, A2, B3, C4, B5, B6, C8, C9, A10, B11,  
B12, B13, B14

## Convolvulaceae

*Convolvulus glomeratus* (Paddi) Choisy.—

B1, B2, B3, B6, C7, B8, C12, C13

*C. pluricaulis* (Dodak) Choisy.—B9, C11, C14

*Ipomea pilosa* (Roxb.) Swt.—B4, B7, C14

*I. pescaprae* (Do-patti-Lata) Linn. Swt.—B7, C11

## Cucurbitaceae

*Coccinia cordifolia* (Kanduri) Linn. Cogn.—

B1, C2, C7, C8, B9, B10, B11

*Cucumis prophetarum* (Chotee indrayan) Linn.

(i) shoot—A11

(ii) Fresh fruit B7, B9, B10

## Euphorbiaceae

*Euphorbia hirta* (Dodhi) Forsk.—B9, C10

*E. prostrata* Ait.—

C1, C2, A5, B7, B8, B9, B10, C11, C14

## Juglandaceae

*Juglans regia* (bark-Dandasa) Linn.—

B1, B2, C3, B4, A5, C6, B7, B8, A9, B10,  
B11, B12, B13, C14

## Malvaceae

*Abutilon indicum* (Kanghi) Linn. Swt.—

A1, A2, B3, A4, A5, A6, A7, A8, A9,  
A10, A11, A12, A13, A14

*Abutilon pakistanicum* Jafri & Ali.—C1, C10, B7

*Gossypium stocksii*. Mast.—C4, C5, A8, C9

*Sida grewiioides* (Ball) Guill.—C1, C2, B4

## Mimosaceae

*Acacia arabica* Babul) Lamak, Willd.—

(i) shoot—B1, C4, A7, B8, B9, C13, C14

(ii) legumes—C1, B2, C3, A4, C6, B8, C9, C11,  
B12, C14

*Mimosa hamata* (Willd.)—

(i) shoot—B1, B2, A3, B4, C5, B6, B7, A8, A9,  
B10, B11, B12, B13, B14

(ii) roots—B1, C2, C3, B4, C5, C6, C7, C9, C10,  
B11, C12, C13.

*Prosopis glandulosa* (Torr.)

(i) shoot—B1, B2, A3, B4, A5, A6, A7, B8, B9,  
B10, B11, A12, B13, B14

(ii) stem bark—B2, B3, A4, C5, B6, C7, B8, B9,  
A10, B11, B12, B13, B14

(iii) fresh legumes—B2, C3, A4, C5, C6, C8, B9,  
B10, B11, C12, B13, C14

(iv) dried legumes—B1, B2, B3, A4, B5, B6, B7,  
A8, B9, B10, B11, B12,  
B13, B14

## Papilionaceae

*Indigofera cordifolia* (Musa-Kani) Heyne.—

C3, A5, B7, A8, C9, C12, B13, C14

*I. linifolia* (Torki) Retz.—

B1, C2, C11, A13

*I. paucifolia* (Sarphonka) Del.—

B8, C9, B11, C14

*Psoralea plicata*

(i) shoot—B2, A5, B7, B8, A9, B11, A13

(ii) root—C1, C2, C4, C5, A7, C11, C13, C14

*Rhynchosia memnonia* (Del) DC.—

C1, C3, A4, C5, B6, B7, C8, B9, B10,  
C11, A13, C14

*Sesbania grandiflora* (L.) Pers.—

B1, C7

*Trigonella occulta* (Janglimethi) Delile.—

C1, B2, C3, B4, C5, B6, C7, C8, C9, C10,  
C11, C12, C13, C14

## Rhamnaceae

*Ziziphus nummularia* (Jharberi) Wt. & Arn. (Burm. f.)

B2, B4, C8, C9, C11, C13

## Solanaceae

*Datura alba* (safed datura) Nees.—

(i) shoot—B8

(ii) dried fruits—C2, B4, B6, B9, A12

*D. metel* (Uda dhatura) Roxb.—

B2, C3, C4, C5, C6, C8, C9, B10, C11, C13,  
C14

*Lycium europeum* (Koh-tori) Linn.—

B8, C9, C10

*Physalis minima* (Akanj) Linn.—

(i) shoot—B1, B8, A9, B11, A14

(ii) fresh fruits—C1, C7, B9, B10, C11

*Solanum surattense* (Katch) Burm.—

(i) shoot—B4, B5

(ii) fruits—C2, B3, C4, B7, C8, B13, C14

*Withania somnifera* (Asgand) (L.) Dunal.—

(i) shoot—C1, B2, C3, A4, A5, B6, B7, A8,  
A9, B10, B11, C12, A13, B14

(ii) root—C1, B2, C3, B4, A5, C6, B7, B8, B10,  
B11, B13, B14

## Zygophyllaceae

*Fagonia cretica* (Damahan) Linn.

—B2, B3, B4, A6, B7, B8, B11, B14

Details of the topographical figures used in the table are as follows:

Activities of plants have been categorised according to the dia of inhibition zones shown by extracts.

Inhibition zones with an average dia of 5.0 to 8.5 cm are represented by A.

Inhibition zones with an average dia of 3.0 to 4.9 cm are represented by B.

Inhibition zones with an average dia of 1.5 to 2.9 cm are represented by C.

Numbers 1-14 represent the names of organisms as follows:

1, *Salmonella typhosa*; 2, *S. para A*; 3, *S. para B*; 4, *Shigella dysenteriae*; 5, *S. flexneriae*; 6, *Escherichia coli*; 7, *Klebsiella pneumoniae*; 8, *Streptococcus faecalis*; 9, *Vibrio cholera* EITor; 10, *V.C. Inaba*; 11, *Staphylococcus aureus*; 12, *S. albus*; 13, *Diplococcus pneumoniae*; 14, *Corynebacterium diphtheriae*.

Few plants such as *A. indicum*, *A. arabica*, *E. hirta*, *E. prostrata*, *F. cretica*, *G. stocksii*, *J. regia* bark, *P. minima*, *Pulicaria* sp. and *S. grewoides* have been reported to possess antidiysenteric property.<sup>2,3</sup> When tested against *S. dysenteriae* and *S. flexneriae*, only *A. indicum*, *A. arabica*, *F. cretica*, *J. regia* bark and *S. grewoides* showed activity against the former organism. Besides these reported plants, *A. bracteata*, *B. scindica*, *P. glandulosa*, and *R. memnonia* showed 'A' category zones against *S. dysenteriae*. *A. indicum*, *E. prostrata*, *I. cordifolia*, *P. glandulosa*, *P. plicata* and *W. somnifera* showed 'A' category zone against *S. flexneriae*.

*F. cretica* was considered to be useful in cholera.<sup>3</sup> During the present study it showed no zone of inhibition against either of the test organism, i.e. *Vibrio cholerae* ElTor and *V.C. Inaba*, while *A. indicum*, *J. regia*, bark, *M. hamata*, *P. minima*, *P. plicata* and *W. somnifera*, which were not reported previously to possess any such activity, showed 'A' category zone against the former organism; similarly *A. indicum*, *P. glandulosa* stem bark and *W. somnifera* also showed 'A' category zone against the latter organism.

*A. indicum*, *A. arabica*, *H. ophioglossum* and *V. rosea* shoot showed 'A' category zones against *K. pneumoniae*. *A. indicum*, *I. linifolia*, *P. plicata*, *R. memnonia* and *W. somnifera* showed 'A' category zones against *D. pneumoniae*. These plants were nowhere reported to possess antibacterial activity against this organism.

*A. indicum* was observed to be highly active against *C. diphtheriae*, *S. typhosa* and *S. para* 'A'. Similarly *P. angustifolia* showed 'A' category zone against *S. para* A while *M. hamata* shoots; and *P. glandulosa* shoot showed 'A' category zones against *S. para* B.

*A. indicum* and *C. prophetarum* showed 'A' category zone against *S. aureus*. *A. indicum*, *F. cretica* and *P. glandulosa* showed 'A' category zone against *E. coli* and *A. indicum*, *G. stocksii*, *I. cordifolia*, *M. hamata* and *W. somnifera* exhibited 'A' category zone against *S. faecalis*.

*Chenopodium album*, *Cichorium intybus*, *C. pluri-caulis*, *C. phorphetarum* (shoot), *E. hirta*, *I. pescarpae*, *L. europeum*, *S. nigrum*, *Taverniera nummularia*, *T. terrestris* and *X. strumarium* were found to have no bacteriostatic activity against the bacteria tested. Wild plants such as *Abutilon bidentatum*, *H. scindicus*,

*I. rumicifolia*, *R. patula*, *S. grandiflora* and *Z. simplex* were inactive against the above discussed organisms.

The above experimental data opens a wide field for exploration and many plants could easily be selected for various other aspects. The applicability of some of the findings for therapeutic utility an elaborate study pertaining to various antibacterial tests *in vitro* and *in vivo*, isolation of active components, toxicology and clinical trials is to be carried out.

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