

Research Article

Screening of Iranian plants for Antimicrobial Activity III

M. H. SALEHI SURMAGHI, GH. AMIN

Department of pharmacognosy, School of pharmacy ,Tezom , Izm
Medical Sciences University of Tehran

ABSTRACT

Third part of Iranian plants were screened for antimicrobial activity. Of 109 species representing 44 families, 3 were active against *Klebsiella pneumoniae*, 1 active against *proteus vulgaris*, 1 active against *Shigella sonnei*, 2 active against *Vibrio cholerae*, 1 active against *Escherichia coli*, 6 active against *Staphylococcus aureus* , 21 active against *Bacillus anthracis* and 2 active against *Salmonella paratyphi A*.

The previous paper of this series recorded the results of antimicrobial activity of 267 species of Iranian plants (1-2). The present paper reports the results of antimicrobial activity of 109 species representing 44 families collected from different parts of Iran. Methanolic extracts of the plants were tested for antimicrobial activity against 9 organism (Table 1), and the results of antimicrobial activity are presented (Table 2).

Address correspondence To :
Dr. R. salehi - surmaghi
Department of pharmacognosy,
school of pharmacy, medical
sciences university of
Tehran.
Tehran, IRAN.

Experimental

The plant samples were collected from different parts of Iran, namely: Tehran Karadj, kashan, Sahand, Kandavan and Damavand (2-5). The plants were identified at the herbarium of the Department of pharmacognosy, Medical Sciences University of Tehran where the voucher specimens are deposited.

Extraction procedures in this investigation and methods used for identification were reported earlier (1).

Results and discussion

In this investigation we have screened antimicrobial activity of 109 species of Iranian plants, representing 44 different families. Of 109 species tested, we found 26 species gave positive results against one or more microorganism. The results were encouraging as 24% of the species showed antimicrobial activity. 37 species were positive against *Klebsiella pneumoniae*, *proteus vulgaris*, *Shigella sonnei*, *Staphylococcus aureus*, *Bacillus anthracis* and *Salmonella paratyphi A*. It is interesting to note that none of the species showed activity against *pseudomonas*.

Material and Methods

The dried plant materials were ground into fine powders and extracted in a Soxhlet extractor with 80% Methanol. The solvent was removed under reduced pressure to produce crude extracts.

Antimicrobial activity screening:

The crude extracts were tested at a concentration of 100 µg/ml against bacteria listed in Table 1, using the general procedure described by Mitscher et al. (6). Each bacterium was cultured in agar at 37°C, and after 2 days the growth of bacteria was measured.

Table 1. Organisms used in screening of plants for antimicrobial activity.

| No. | Organisms | ATCC NO. | Classification |
|-----|-------------------------------|----------|----------------|
| 1 | <i>Klebsiella pneumoniae</i> | 5056 | Gram negative |
| 2 | <i>pseudomonas aeruginosa</i> | 25619 | Gram negative |
| 3 | <i>proteus vulgaris</i> | 232 | Gram- negative |
| 4 | <i>Shigella sonnei</i> | 9774 | Gram negative |
| 5 | <i>Salmonella paratyphi A</i> | 5702 | Gram negative |
| 6 | <i>Vibrio cholerae</i> | 7254 | Gram negative |
| 7 | <i>Escherichia coli</i> | 9002 | Gram negative |
| 8 | <i>Saphylococcus aureus</i> | 356 | Gram positive |
| 9 | <i>Bacillus anthracis</i> | 8234 | Gram positive |

Table 2. Iranian plants tested for antimicrobial activity

| Species | No. | Date of plant Collection part | mo/yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|-----|----------------------------------|-------|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| AIZOACEAE | | | | | | | | | | | | |
| <i>Mesembrianthemun nodiflorum</i> L. | 268 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| AMARANTHACEAN | | | | | | | | | | | | |
| <i>Aerva persica</i> (Burm. f.) Merr. | 269 | 5/84 | Wa | - | - | - | - | - | + | - | - | + |
| ANACARDIACEAE | | | | | | | | | | | | |
| <i>Pistacia atlantica</i> Desf. | 270 | 5/82 | L | - | - | - | - | - | - | - | - | + |
| ASCLEPIADACEAE | | | | | | | | | | | | |
| <i>Cynanchum acutum</i> L. | 271 | 7/83 | W | - | - | - | - | - | - | - | - | - |
| <i>Pentatropis spirialis</i> (Forsk.) Decne | 272 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| BERBERIDACEAE | | | | | | | | | | | | |
| <i>Leontice minor</i> Boiss. | 273 | 4/83 | W | - | - | - | - | - | - | - | - | - |
| BORAGINACEAE | | | | | | | | | | | | |
| <i>Anchusa italica</i> Retz | 274 | 6/84 | Wa | - | - | - | - | - | - | - | + | - |
| <i>Heliotropium bacciferum</i> Forsk. | 275 | 3/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Myosotis pseudopropinqua</i> M. Pop. | 276 | 5/83 | W | - | - | - | - | - | - | - | - | - |
| CAPPARIDACEAE | | | | | | | | | | | | |
| <i>Cleom coluteoides</i> Boiss. | 277 | 6/84 | Wa | - | - | - | - | - | - | - | - | - |
| CARYOPHYLLACEAE | | | | | | | | | | | | |
| <i>Acanthophyllum microcephalum</i> Boiss. | 278 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Saponaria officinalis</i> L. | 279 | 10/83 | W | - | - | - | - | - | - | - | - | - |
| CHENOPODIACEAE | | | | | | | | | | | | |
| <i>Atriplex canescens</i> James | 280 | 6/83 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Chenopodium botrys</i> L. | 281 | 6/82 | Wa | - | - | - | - | - | + | - | - | - |
| <i>Eurotia lanata</i> C. Koch | 282 | 6/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Salsola brayosma</i> (Roem. et schut) Dandg | 283 | 3/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Salsola persica</i> Bge. | 284 | 8/84 | Wa | - | - | - | - | - | - | - | - | - |

Table 2. Iranian plants tested for antimicrobial activity (Continued)

| Species | No. | Date of plant Collection part | mo/yr | | | | | | | | | |
|---|-----|----------------------------------|-------|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| COMPOSITAE | | | | | | | | | | | | |
| <i>Achillea conferta</i> DC. | 285 | 8/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Achillea santolina</i> L. | 286 | 5/83 | W | - | - | - | - | - | - | - | - | - |
| <i>Acroptilon repens</i> (L) DC. | 287 | 5/82 | W | - | - | - | - | - | - | - | - | - |
| <i>Arctium lappa</i> L. | 288 | 10/82 | W | - | - | - | - | - | - | - | - | - |
| <i>Artemisia Herba - alba</i> Asso. | 290 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Carthamus oxyacantha</i> M.B. | 291 | 8/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Centaurea depressa</i> M. B. | 292 | 5/77 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Centaurea virgata</i> subsp. <i>squarrosa</i> (Willd.) Gugler | 293 | 8/84 | Wa | - | - | - | - | + | - | - | - | - |
| <i>Cichorium pumilum</i> Jacq. | 294 | 8/84 | Wa | - | - | - | - | - | - | - | + | - |
| <i>Echinops robustus</i> Bge. | 295 | 9/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Filago arvensis</i> L. | 296 | 6/77 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Grindelia Robusta</i> Nutt | 297 | 4/83 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Heteropappus altiacus</i> (Willd.) Novopkr | 298 | 9/28 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Jurinea macrocephala</i> DC. | 299 | 9/84 | Wa | - | - | - | - | - | - | - | + | + |
| <i>Launaea acanthodes</i> (Bioss.) O. Kuntze | 300 | 9/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Onopordon Acanthium</i> L. | 301 | 8/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Pulicaria gnaphalodes</i> (Vent) Boiss. | 302 | 5/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Steptorrhampus persicus</i> (Boiss.) O.& B. Fedtsch | 303 | 5/82 | Wa | - | - | - | - | - | - | - | - | - |
| CONVOLVULACEAE | | | | | | | | | | | | |
| <i>Convolvulus sericeus</i> Barm | 304 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| CRUCIFERAE | | | | | | | | | | | | |
| <i>Barbarea plantaginea</i> DC. | 305 | 5/83 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Crambe Kotschyana</i> Boiss. | 306 | 5/82 | Wa | - | - | - | - | - | - | - | - | - |
| EPHEDRACEAE | | | | | | | | | | | | |
| <i>Ephedra ciliata</i> Fish et Mey | 307 | 11/83 | Wa | - | - | - | - | - | - | - | - | - |
| EUPHORBIACEAE | | | | | | | | | | | | |
| <i>Chrozophora hierosolymitana</i> Spreng | 308 | 9/83 | W | - | - | - | - | - | - | - | - | - |

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|--|-----|----------------------------------|-------|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| <i>Euphorbia Aellenii</i> Rech. F. | 309 | 5/84 | Wa | - | - | - | - | - | - | - | + | - |
| <i>Euphorbia helioscopia</i> L. | 310 | 5/83 | W | - | - | - | - | - | - | - | - | + |
| <i>Euphorbia indica</i> Lam. | 311 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Euphorbia stocksiana</i> Boiss. | 312 | 5/82 | Wa | - | - | - | - | - | - | - | - | - |
| FRANKENIACEAE | | | | | | | | | | | | |
| <i>Frankenia pulverulenta</i> L. | 313 | 5/84 | Wa | - | - | - | - | - | - | - | - | + |
| FUMARIACEAE | | | | | | | | | | | | |
| <i>Fumaria parviflora</i> Lam | 314 | 5/82 | Wa | - | - | - | - | - | - | - | - | - |
| GRAMINEAE | | | | | | | | | | | | |
| <i>Cymbopogon olivieri</i> Boiss. Bor. | 315 | 4/76 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Phragmites australis</i> (Cav.) Trin. | 316 | 7/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Setaria viridis</i> (L.) P. Beauv. | 317 | 7/83 | Wa | - | - | - | - | - | - | - | - | + |
| IRIDACEAE | | | | | | | | | | | | |
| <i>Iris iberica</i> Hoffm. | 318 | 6/82 | Wa | - | - | - | - | - | - | - | - | - |
| LABIATAE | | | | | | | | | | | | |
| <i>Eremostachys codonocalyx</i> Rech. F. | 319 | 4/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Hymenocrater elegans</i> Bunge | 320 | 5/82 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Lamium amplexicaule</i> L. | 321 | 4/83 | W | - | - | - | - | - | - | - | - | - |
| <i>Marrubium crassidens</i> Boiss. | 322 | 5/83 | W | - | - | - | - | - | - | - | - | - |
| <i>Mentha longifolia</i> (L.) Huson | 323 | 5/83 | W | - | - | - | - | - | - | - | - | - |
| <i>Nepeta bracteata</i> Benth | 324 | 5/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Nepeta satureioides</i> Boiss. | 325 | 5/83 | Wa | - | - | - | - | - | - | - | - | - |
| <i>phlomidosema parviflorum</i> (Benth.) Vued. | 326 | 5/83 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Salvia limbata</i> C. A. Mey | 327 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Salvia nemorosa</i> L. | 328 | 8/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Salvia spinosa</i> L. | 329 | 5/82 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Teuicm Polium</i> L. | 330 | 9/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Ziziphora clinopodioides</i> Lam. | | | | | | | | | | | | |
| <i>Subsp. rigidia</i> Rech. F. | 331 | 5/83 | Wa | - | - | - | - | - | - | - | - | - |

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| | | | | | | | | | | | | |
| LAURACEAE | | | | | | | | | | | | |
| <i>Laurus nobilis</i> Cav. | 332 | 7/80 | L | - | - | - | - | - | - | - | - | - |
| LEGUMINOSAE | | | | | | | | | | | | |
| <i>Acacia nubica</i> Benth | 333 | 3/76 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Alhagi camelorum</i> Fisch | 334 | 8/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Astragalus siliquosus</i> Boiss. | 335 | 6/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Coronilla varia</i> L. | 336 | 6/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Medicago sativa</i> L. | 337 | 7/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Onobrychis sativa</i> Lam. | 338 | 6/82 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Parkinsonia aculeata</i> L. | 339 | 3/83 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Sesbania sesban</i> Merrill | 340 | 3/84 | Fl | - | - | - | - | - | - | - | - | - |
| <i>Sophora alopecuroides</i> L. | 341 | 5/83 | W | - | - | - | - | - | - | - | - | - |
| LILIACEAE | | | | | | | | | | | | |
| <i>Aloe littoralis</i> parl. | 342 | 3/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Gagea reticulata</i> (pall.) Schutt | 343 | 4/83 | Wa | - | - | - | - | - | - | - | - | - |
| MALVACEAE | | | | | | | | | | | | |
| <i>Althea officinalis</i> L. | 344 | 10/83 | R | - | - | - | - | - | - | - | - | - |
| MELIACEAE | | | | | | | | | | | | |
| <i>Melia indica</i> Brand. | 345 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| MORACEAE | | | | | | | | | | | | |
| <i>Ficus benghalensis</i> L. | 346 | 5/84 | Wa | - | - | - | - | - | - | - | - | + |
| MYRTACEAE | | | | | | | | | | | | |
| <i>Callistemon viminalis</i> G. Done | 347 | 2/82 | Wa | + | - | + | - | - | - | + | - | + |
| <i>Eucalyptus campaspe</i> S. Moore | 348 | 2/82 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Eucalyptus gilli</i> Maiden | 349 | 2/82 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Eucalyptus oleosa</i> F. Muell | 350 | 2/82 | Wa | + | - | - | - | + | - | - | - | + |

Table 2. Iranian plants tested for antimicrobial activity (Continued)

| Species | No. | Date of plant Collection part | mo/yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|-----|----------------------------------|-------|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| NYCTAGINACEAE | | | | | | | | | | | | |
| <i>Commicarpus stenocarpus</i> (Chiov.) Cufod. | 351 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| OLEACEAE | | | | | | | | | | | | |
| <i>Jasminum sambac</i> Soland. | 352 | 3/83 | W | - | - | - | - | - | - | - | - | - |
| PAPAVERACEAE | | | | | | | | | | | | |
| <i>Papaver dubium</i> L. | 353 | 5/82 | Wa | - | - | - | - | - | - | - | + | - |
| PHYTOLACCACEAE | | | | | | | | | | | | |
| <i>Pohytacca americana</i> L. | 354 | 12/82 | Fr,L | - | - | - | - | - | - | - | - | - |
| PLANTAGLNACEAE | | | | | | | | | | | | |
| <i>Plantago lanceolata</i> L. | 355 | 8/84 | Wa | - | - | - | - | - | - | - | - | + |
| POLYGONACEAE | | | | | | | | | | | | |
| <i>Polygonum aviculare</i> L. | 356 | 6/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Rheum ribes</i> L. | 357 | 5/82 | L | - | - | - | - | - | - | - | - | + |
| PORTULACACEAE | | | | | | | | | | | | |
| <i>Portulaca oleracea</i> L. | 358 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| RANUNCULACEAE | | | | | | | | | | | | |
| <i>Consolida persica</i> (Boiss.) Grossh | 359 | 5/83 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Potentilla neglecta</i> Baug | 360 | 10/83 | R | - | - | - | - | - | - | - | - | - |
| RESEDACEAE | | | | | | | | | | | | |
| <i>Reseda aucheri</i> Boiss. | 361 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| RHAMNACEAE | | | | | | | | | | | | |
| <i>Paliurus Spina - Christi</i> Mill. | 362 | 8/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Ziziphus Spiana Christi</i> (L.) Willd. | 363 | 3/84 | Wa | - | - | - | - | - | - | - | - | - |

Table 2. Iranian plants tested for antimicrobial activity (Continued)

| Species | No. | Date of plant Collection part | mo/yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|-----|----------------------------------|-------|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| ROSACEAE | | | | | | | | | | | | |
| <i>Amygdalus lycioides</i> Spach | 364 | 4/83 | Wa | - | - | - | - | - | - | - | - | + |
| <i>Poterium sanguisorba</i> L. | 365 | 6/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Rosa iberica</i> Stev. | 366 | 6/84 | Wa | - | - | - | + | - | - | - | + | + |
| RUBIACEAE | | | | | | | | | | | | |
| <i>Galium verum</i> L. | 367 | 9/84 | Wa | - | - | - | - | - | - | - | - | - |
| RUTACEAE | | | | | | | | | | | | |
| <i>Haplophyllum pedicellatum</i> Bge. & Boiss. | 368 | 4/81 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Ruta graveolens</i> L. | 369 | 10/83 | Wa | - | - | - | - | - | - | - | - | - |
| SALICACEAE | | | | | | | | | | | | |
| <i>Salix amophylla</i> Boiss | 370 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| SOLANACEAE | | | | | | | | | | | | |
| <i>Datura stramonium</i> L. | 371 | 10/82 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Lycium shawii</i> Roemer | 372 | 5/84 | Wa | - | - | - | - | - | - | - | - | - |
| TAMARICACEAE | | | | | | | | | | | | |
| <i>Tamarix aphylla</i> (L.) Karsten | 373 | 5/84 | Wa | - | - | - | - | - | - | - | - | + |
| UMBELLIFEREA | | | | | | | | | | | | |
| <i>Eryngium bungei</i> Boiss. | 374 | 7/84 | Wa | - | - | - | - | - | - | - | - | - |
| <i>Foeniculum vulgare</i> Gaertn. | 375 | 70/82 | Wa | - | - | - | - | - | - | - | - | - |
| ZYGOPHYLACEAE | | | | | | | | | | | | |
| <i>Peganum harmala</i> L. | 376 | 5/83 | Wa | - | - | - | - | - | - | - | - | - |

* Fl : Flower; Fr: Fruit; L: Leaves; W:Whole plant; Wa: Whole above ground.