

Biological Evaluation of Some Saudi Arabian Plants

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Abstract—Alcoholic extracts of twenty-one Saudi Arabian plants have been evaluated for their biological activities. Many of the plant extracts were observed to have weak activities against central nervous system. *Rhazya stricta* showed antimicrobial activity. However, any extract with antitumor activity could not be detected.

Biological evaluation of a number of plants have been carried out in many laboratories. Some of the reports were concerned with screening of antineoplastic¹⁻⁵), antimicrobial⁶⁻⁸), antidiabetic⁹), and pharmacodynamic¹⁰), as well as neuropharmacological effects¹¹). Biological screening of plant samples on various activities has also been reported¹²⁻¹⁶).

In this report, we describe on the preliminary screening of Saudi Arabian plants as an approach to the search for those which have biological activities, such as neuropharmacological, antitumor and antimicrobial activities. Phytochemical investigation on the plants involved in this report has previously been reported¹⁷). This survey comprises twenty-one species of fifteen families.

MATERIALS AND METHODS

Preparation of plant extracts—The plants collected during January to February 1976 were air-dried, coarsely crushed and then were extracted twice with 95% methanol at room temperature. The filtrates were concentrated under reduced pressure in a water-bath below 40°, defatted with *n*-hexane and the methanolic layers were evaporated to dryness. These dried extracts were used for test samples as suspensions in 0.5% CMC-saline solution.

Acute toxicity—dd strain male mice weighing 20-25 g were used. Various doses of the suspension were injected intraperitoneally into mice and the maximum dose which did not kill two mice within 72 hrs was observed.

Antitumor evaluation of extracts—dd strain mice weighing 20-25 g were used and the

tumor cells are Sarcoma 180 and Ehrlich ascites carcinoma. Each 0.2 ml of cell suspension in physiological saline containing 10^6 tumor cells was transplanted intraperitoneally in the mouse. Treatment began 24 hrs later and was undertaken by daily intraperitoneal injections of the suspension of plant extract for 7 successive days. Group of seven mice each was utilized for the tumors and group of fourteen, for the control.

Effectiveness was described in terms of percent prolongation of life over control groups. The mean survival time of each group was calculated according to the protocol of National Cancer Institute¹⁸⁾. An increase in survival time of 25%, or more, over the controls was taken as being significant.

In order to establish initial results as valid, the extracts which produced greater than a 25% increase in survival time were retested twice. Extracts which failed to give greater than a 25% activity in both retests were considered as negative with respect to antitumor activity.

Antimicrobial evaluation—The extracts were screened *in vitro* for inhibition of the growth of *Staphylococcus aureus* and *Escherichia coli*, using filter paper disk method.

The extracts were dissolved in ethanol, dropped an amount of the solution corresponding to 500 μg of extracts on each disk (6 mm in diameter), dried in room temperature aseptically, and placed on the nutrient broth agar plate. After incubation at 37° for 24 hrs, the radius of zone of inhibition by the sample was measured in millimeters.

General mouse behavior evaluation—Behavioral and symptomatic changes of mice by the plant samples were observed as a screen for pharmacological activity, according to S. Irwin^{19,20)}.

The aqueous suspensions of the extracts were prepared with 0.5% CMC-saline and were injected intraperitoneally.

A dose of 500 mg/kg was administered to each of three mice. Additional dose, either higher or lower, were given on the basis of changes that were seen in the animal after this first injection.

The observation was recorded on a standard check list at appropriately spaced intervals. This list covers 30 behaviors and symptoms, briefly classified as awareness, mood, activity, CNS excitation, posture, motor incoordination, muscle tone, reflexes and autonomic changes.

RESULT

The results of biological evaluation are tabulated in Table I.

In antitumor evaluation, several extracts were initially active, but were failed to confirm the activity in subsequent retests.

In antimicrobial evaluation, most of the extracts showed no activity. However, the extract of *Rhazya stricta* showed considerable antimicrobial activity against *Staphyl. aureus* and *Escheri. coli*. In mouse behavior evaluation, a variety of interesting activities has been exhibited in which most of them affected the central nervous system. CNS stimulant activities

Table I—Results of the biological evaluation of plant extracts

Plant name	Plant part ^{a)}	Antitumor activity			Antibacterial activity		Mouse behavior		Acute toxicity (LD ₅₀ , mg/kg ip)
		Dose (mg/kg ip)	Sarcoma 180 (T/C) ^{b)}	Ehrlich carcinoma (T/C)	<i>Staph. aureus</i>	<i>Esch. coli</i>	Dose range (mg/kg ip)	Activity	
Apocynaceae <i>Rhazya stricta</i>	lf, st, fl	250	86	111	10 ^{d)}	10	125-250	SMi(w) Cv(w)	500
Asclepiadaceae <i>Calotropis procera</i>	lf, st	500	100	101	In ^{e)}	In	250-750	SMd(w) Wr Hp(w)	1000
<i>Pergularia tomentosa</i>	wp	250	130 ^{c)}	128 ^{c)}	In	In	250-1000	AG(w) Tr(w) Cv SRi(w) Btd(w) GTd(w) Hp(w) (g)	1000
Boraginaceae <i>Heliotropium ramosissimum</i>	wp	500	116	114	In	In	250-750	SMd(w) Wr Hp(w)	1000
Capparaceae <i>Capparis cartilaginea</i>	lf, st	500	103	86	In	In	250-1000	SMd(w) Wr Hp	1000
<i>Cleome trinervia</i>	wp	500	121	118	In	In	500-750	nil	1000
Caryophyllaceae <i>Gymnocarpus decandrum</i>	wp	125	113	122	In	In	250-500	SMi(w) Tr(w) Wr	500
Chenopodiaceae <i>Salsola baryosma</i>	lf, st, fl	250	95	100	In	In	500-1000	SMd AG Hp BTd	1000
Compositae <i>Anvillea garcini</i>	lf, st	125	86	128 ^{c)}	In	In	250-500	SMd(w) Pp(w) TRd	500
<i>Pulicaria crispa</i>	wp	125	115	124	In	In	250-500	SMd Wr	500
Cruciferae <i>Diptloxaxis harra</i>	wp	500	122	108	In	In	500-1000	SMi Tr Cv Al	1000
<i>Zille spinosa</i>	wp	250	117	124	In	In	500-750	nil	1000
Euphorbiaceae <i>Euphorbia kahirensis</i>	wp	250	113	120	In	In	500-1000	SMd Rd P Hp	1000
Labiatae <i>Lavandula coronopifolia</i>	wp	250	90	127 ^{c)}	In	In	500-1000	Rd Hp(w) GTd(w)	1000
<i>Teucrium oliverianum</i>	lf, st, rt	500	111	89	In	In	500-1000	nil	1000
Moraceae <i>Ficus salicifolia</i>	lf, st	500	113	104	In	In	500-1000	SMi(w) Cv(w)	1000
Resedaceae <i>Reseda stenostachya</i>	lf, st, fl	250	103	133 ^{c)}	In	In	250-500	SMd(w) AG(w) Rd(w)	500
Solanaceae <i>Lycium arabicum</i>	lf, st	500	122	100	In	In	500-1000	Wr Hp	1000
Umbelliferae <i>Ducrosia ismaelis</i>	wp	500	111	86	12	In	500-1000	SMi ST Tr Cv	1000

Zygophyllaceae												
<i>Peganum harmala</i>	wp	250	97	109	In	In	250-500	SMi	ST	Cv	SRi	500
<i>Zygophyllum</i> sp.	lf,st	250	93	92	In	In	500-1000	nil				1000

- a) bk, bark; fl, flower; lf, leaf; rt, root; st, stalk; wp, whole plant.
 b) T/C, the mean survival time of the treated group over the mean survival time of the control group $\times 100$
 c) Negative result after retest.
 d) Diameter (mm) of inhibited zone with 500 μg /disk of a sample.
 e) In, Inactive.
 f) AG, abnormal gait; Al, alertness; BTd, decrease of body tone; Cv, convulsion; Gr, grooming; GTd, decrease of grip tone; Hp, hypothermia; P, passivity; Pp, palpebral ptosis; Rd, decrease in respiration rate; SMd, decrease in spontaneous movement; SMi, increase in SM; SR, startle response, ST, Straub's tail; TRd, decrease in touch response; Tr, tremor; Wr, writhing. (w) in each response indicates "weak" activity in the evaluation.
 g) Initial CNS depressant activity was followed by SRi, Tr and Cv.

were shown in the plants such as *Diplotaxis harra*, and *Peganum harmala*, and the activities also shown weakly in *Rhazya stricta*, *Gymnocarpus decandrum*, and *Ficus salicifolia*. On the other hand, CNS depressant activities were shown in *Salsola baryosma* and *Euphorbia kahirenris* and weak activities also shown in *Calotropis procera*, *Capparis cartilaginea*, *Heliotropium ramosissimum*, *Lavandula coronopifolia* and *Reseda stenostachya*. Weak CNS depressant and CNS stimulant activities were shown in *Pergularia tomentosa*, and weak CNS depressant activity with autonomic activity was also shown in *Anvillea garcini*.

DISCUSSION AND CONCLUSION

Twenty-one plants from fifteen families which are indigenous in the Kingdom of Saudi Arabia are included in this report.

All of the plants have not been tested with the extracts made of whole plants, but with those of their parts, and being evaporated *in vacuo* biological active components would also be volatiled. Thus, this result could not necessarily cover all the activities of the whole plants.

Comparison these activities with the phytochemical investigation made some interests in respect to alkaloid. *Rhazya stricta*, *Pergularis tomentosa* and *Peganum harmala* which were positive in alkaloid tests showed any CNS activities and especially *Rhazya stricta* showed also potential antimicrobial activity. However, no activities against ascites tumor could be detected in any of the extracts in subsequent retest stages.

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