

A PHYTOCHEMICAL SURVEY OF THE HONG KONG MEDICINAL PLANTS

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332 species of plants from the colony of Hong Kong have been tested for the presence of alkaloids. 38 gave strong positive reactions.

THE Colony of Hong Kong possesses some 2,000 plant species, about 20 per cent of which are used in folk-medicine. Of the 332 medicinal species tested in this survey for the presence of alkaloids, 38 (11.4 per cent) gave strong positive reactions and the presence of alkaloids in these species is indicated. The occurrence in *Zanthoxylum avicennae*¹, *Z. nitidum*^{2,3}, *Ruta graveolens*⁴, *Nelumbo nucifera*⁵, *Justicia gendarussa*, *J. ventricosa*, *Anisomeles indica*, and *Murraya paniculata*, has been verified by detailed chemical examination in this laboratory.

The reader is referred to similar surveys carried out in Australia⁶, the United States^{7,8}, Russia⁹⁻¹³, Argentina¹⁴, North Borneo¹⁵, Papua and New Guinea¹⁶, Malaya¹⁷, and Hawaii¹⁸.

PROCEDURE

Fresh plant-material was obtained from herbalists whose supplies originate from the Island, the New Territories, and outlying islands, including Lan Tao. Tests were performed on two extracts.

Hydrochloric acid extract. Chopped plant material (about 2 g.) was covered with 5 per cent. hydrochloric acid in a specimen tube (1.5 cm. × 7.5 cm.) for 48 hours. Drops of the extract were tested separately with a drop of each of the alkaloid testing reagents.

Prollius extract. Extraction was carried out as for the acid extraction but with Prollius fluid¹⁹ substituted for hydrochloric acid. The decanted extract was allowed to evaporate on a watch-glass and the residue was taken up with two drops of 1 per cent hydrochloric acid. The acid solution was divided into three portions on a glass slide and tested with a drop of each of three alkaloid reagents.

Alkaloid reagents. The alkaloid reagents which were prepared as stated by Henry¹⁹ were: iodine—potassium iodide solution (I); Mayer's reagent (M); silicotungstic acid (S); phosphotungstic acid (P); and Dragendorff's reagent (D).

The strength of precipitate obtained in the tests was judged by eye and was recorded thus: xxxx, very strong precipitate; xxx, strong precipitate; xx, moderate precipitate; x, negligible precipitate; —, no precipitate

Plant extracts which in the main showed xxxx and xxx on testing were considered to contain alkaloids and those plants are designated *A* in

Table I. Using the method of Douglas and Kiang¹⁷, the following controls were made:

Solution	Concentration (w/v)	Precipitates with reagents				
		I	M	S	P	D
Brucine hydrochloride	1: 100	xxxx	xxxx	xxxx	xxxx	xxxx
	1: 500	xxx	xxx	xxx	xx	xxx
	1: 2,500	xx	xx	x	x	x
	1: 10,000	x	x	—	—	—
Quinine sulphate	1: 100	xxxx	xxxx	xxxx	xxxx	xxxx
	1: 500	xxx	xxx	xxx	xxx	xxx
	1: 2,500	xxx	xxx	xx	xx	xxx
	1: 10,000	xx	xx	x	x	xx

TABLE I*

* (l) refers to leaves; (s), stems; (r), root; (b), bark; (fl.), flower; (fr), fruit; (wp), whole plant or herb (sb), stem bark; (rb), root bark; (rw), root wood; (l, s), leaves and stems.

LIST OF PLANTS EXAMINED

- ACANTHACEAE—*Acanthoanax trifolius* L., (r); *Dicliptera chinensis* (Vahl.) Nees. (l); *Hydrophila salicifolia* Nees. (wp); *Hypoestes purpurea* (L.) Soland. (l); *Justicia gendarussa* Burm. f. (l) A, *Justicia ventricosa* Wall. (l) A, (s) A; *Lepidagathis incurva* Don. (wp); *Rhinacanthus communis* Nees. (l), (s).
- AGAVACEAE—*Agave angustifolia* Haw? (wp); *Sansevieria zeylanica* Willd. (l), (r).
- AMARANTHACEAE—*Alternanthera sessilis* R. Br., (r), (l, s); *Alternanthera versicolor* Regel, (wp); *Amaranthus spinosus* L. (l), (s), (r).
- AMARYLLIDACEAE—*Crinum asiaticum* L. (l) A; *Crinum asiaticum* L. var. *Sinicum* Baker (r) A; *Curculigo orchidioides* Gaertn., (r); *Lycoris radiata* Herb., (l); (r) A; *Zephyranthes carinata* Herb., (l) A; (r) A.
- ANACARDIACEAE—*Dracontomelon dao* (Blanco.) Merr., (l), (s); *Mangifera indica* L. (l); *Rhus hypoleuca* Champ., (l), (s).
- APOCYNACEAE—*Melodinus suaveolens* Champ., (fr); *Nerium indicum* Mill. (l), (s); *Strophanthus divaricatus* (Lour.) H. & A., (fr) A, (l), (sb) A.
- AQUIFOLIACEAE—*Ilex asprella* Champ., (l), (s); *Ilex rotunda* Thunb., (sb).
- ARACEAE—*Acorus gramineus* Soland. (l), (r); *Aglaonema modestum* Schott., (l), (s); *Alocasia odora* (Roxb.) Koch. (r); *Arisaema japonicum* Bl.? (s), (r); *Epipremnum pinnatum* (L.) Engler., (l), (s); *Lasia spinosa* (L.) Thw., (l), (s); *Pistia stratiotes* L., (wp); *Typhonium divaricatum* (L.) Decne., (r) A, (l, s); *Typhonium trilobatum* Schott.? (l, s), (bulb r).
- ARALIACEAE—*Acanthopanax trifoliatum* (L.) Merr., (l), (s); *Schefflera octophylla* (Lour.) Harms., (l).
- ASCLEPIADACEAE—*Toxicoparus wightianus* H. & A.? (l, s); *Tylophora ovata* Hook., (r) A, (l, s) A.
- BALSAMINACEAE—*Impatiens chinensis* L., (s, l).
- BAMBUACEAE—*Bambusa pervariabilis* McClure? (s); *Bambusa spp.*
- BOMBACACEAE—*Gossampinus malabarica* Merr., (l), (b).
- BURSERACEAE—*Canarium album* Rausch., (l), (s); *Canarium pimela* Koenig., (l), (s).
- CAESALPINIACEAE—*Bauhinia glauca* Wall., (l), (s); *Caesalpinia cristata* L. (seeds); *Caesalpinia vernalis* Champ., (wp); *Cassia occidentalis* L. (l), (r); *Cassia tora* L., (l, s), (r).
- CACTACEAE—*Hylocereus undatus* (Haw.) B. & R., (l), (s); *Opuntia dillenii* (Ker.) Haw., (s).
- CAPRIFOLIACEAE—*Lonicera confusa* DC., (l), (b); *Sambucus javanica* Reinw., (l), (s).
- CARYOPHYLLACEAE—*Polycarpaea corymbosa* Lam., (wp).
- CARICACEAE—*Carica papaya* L., (l).
- CHENOPODIACEAE—*Chenopodium ambrosioides* L., (l), s; *Achyranthes aspera* L., (wp).
- CHLORANTHACEAE—*Chloranthus glaber* Thunb., (wp).
- COMBRETACEAE—*Quisqualis indica* L., (l), (s).
- COMMELINACEAE—*Anilema malabarum* (L.) Merr., (wp); *Commelina nudiflora* L., (l, s); *Cyanotis kewensis* C. B. Clarke, (wp); *Rhoeo discolor* (L'Her.) Hance, (l).
- COMPOSITAE—*Artemisia vulgaris* L., (l); *Aster ageratoides* Turcq. (wp); *Bidens pilosa* L., (l, s), (r), (fl); *Blumea balsamifera* DC., (l, s); *Centipeda minima* A. Br. et Aschers., (l, s); *Chrysanthemum indicum* L., (l, s); *Chrysanthemum morifolium* Ram., (l, s); *Crossostephium chinense* (L.) Mak. ex Champ. & Schlecht., (wp); *Eclipta alba* (L.) Hassk., (wp); *Elephantopus scaber* L., (wp); *Emilia sonchifolia* (L.) DC., (wp) A; *Gynura crepidioides* Benth.? (wp); *Gynura divaricatus* (L.) DC., (l); *Gynura segetum* Merr., (l, s); *Inula cappa* DC., (l), (sb), (fl); *Laggera alata* Sch.-Bip., (l), (s), (s, l); *Pluchea indica* (L.) Less. (l, s); *Senecio scandens* Ham., (l), (s); *Solidago virgo-aurea* L., (wp); *Taraxacum officinale* Wigg., (l, s); *Vernonia cinerea* (L.) Less., (wp); *Vernonia patula* (Ait.) Merr., (wp); *Xanthium strumarium* L., (wp).
- CONNARACEAE—*Rourea microphylla* Planch., (l, s).
- CONVOLVULACEAE—*Convolvulus obscura* Ker., (wp); *Ipomoea pes-caprae* (L.) Roth., (l, s); *Merremia gemella* (Burm.) Hall. f., (wp); *Operculina turpethum* S. Manso., (l, s).
- CRASSULACEAE—*Kalanchoe laciniata* (L.) Pers., (l); *Kalanchoe pinnata* Pers., (l, s).
- CRUCIFERAE—*Capsella bursa-pastoris* Moench., (wp); *Nasturtium montanum* Wall., (wp).
- CUCURBITACEAE—*Melothria heterophylla* (Lour.) Cogn., (l, s), (s); *Momordica charantia* L., (wp).
- CYATHACEAE—*Cibotiva barometz* (L.) Sm., (s).
- CYPERACEAE—*Cyperus alternifolius* L., (l), (fl); *Cyperus malaccensis* Lam. ?, (l, r); *Cyperus rotundus* L., (wp).
- DILLENIACEAE—*Tetracera scandens* (L.) Merr., (l).
- DIOSCOREACEAE—*Dioscorea hispida* Dennst., (r) A.
- EBENACEAE—*Diospyros vaccinioides* Lindl., (s), (l), (fr).
- ELAEOCARPACEAE—*Elaeocarpus* sp. ? (l), (s).
- EUPHORBIACEAE—*Acalypha australis* L., (wp); *Bischofia trifoliata* (Roxb.) Hook., (l), (s); *Bridelia monoica* (Lour.) Merr., (l), (s); *Breynia fruticosa* (L.) Hook. f., (l), (s); *Claoxylon polot* (Burm.) Merr., (l), (s); *Croton crassifolius* Geisel., (wp); *Croton tiglium* L., (l); *Euphorbia antiquorum* L., (l); *Euphorbia hirta* L. var. *typica* L. C. Wheeler, (wp); *Euphorbia thymifolia* L., (l, s); *Glochidion eriocarpum* Cham., (l), (s); *Mallotus apelta* Muell., (l), (s), A; *Phyllanthus cochinchinensis* Spreng., (l, s); *Phyllanthus emblica* L., (l), (sb); *Phyllanthus urinaria* L., (wp); *Ricinus communis* L., (l), (s); *Sapium sebiferum* Roxb., (l, s); *Sauropus rostratus* Miq., (l).

SURVEY OF HONG KONG MEDICINAL PLANTS

TABLE I—continued

- GRAMINEAE—*Cymbopogon citratus* Stapf., (l); *Imperata cylindrica* (L.) Beauv., (r), (f); *Oryza sativa* L. (budding seed); *Phragmites communis* Trin., (s); *Pogonatherum panicum* (Lam.) Hack, (wp); *Saccharum officinarum* L., (s).
- GUTTIFERAE—*Garcinia multiflora* Champ., (l, s).
- HAMAMELIDACEAE—*Liquidambar formosana* Hance, (l), (sb).
- HYPERICACEAE—*Cratoxylon ligustrinum* (Spach.) Bl., (l, s); *Hypericum japonicum* Thunb., (wp).
- LABIATAE—*Anisomeles indica* (L.) O. Ktze., (l) A, (b) A?; *Coleus aromaticus* Benth., (l), (s); *Glechoma hederacea* L., (wp); *Leonurus sibiricus* L., (l, s), (r); *Mentha arvensis* L., (wp); *Mentha rotundifolia* Huds., (l, s); *Ocimum basilicum* L., (l, s); *Orthodon lanceolatum* (Benth.) Kudo, (wp); *Perilla frutescens* (L.) Britton, (l); *Teucrium viscidum* Bl., (wp).
- LAURACEAE—*Cassytha filiformis* L., (s) A; *Cinnamomum camphora* Sieb., (l), (s); *Cinnamomum japonicum* Sieb., (l), (s); *Litsea cubeba* (Lour.) Pers., (l), (b) A; *Litsea glutinosa* C.B. Rob., (l) A, (s) A; *Litsea rotundifolia* Hemst. var. *oblongifolia* Allen, (l), (sb).
- LILIACEAE—*Aloe vera* L. var. *chinensis* (Haw.) Berger, (wp); *Chlorophytum capense* Kuntze, (l), (r); *Cordyline fruticosa* A. Cheval., (l); *Dianella ensifolia* (L.) DC., (l); *Hemerocallis fulva* L., (l), (r).
- LOBELIACEAE—*Lobelia chinensis* Lour., (wp) A.
- LOGANIACEAE—*Gelsemium elegans* Bth., (l, s) A; *Strychnos angustiflora* Benth., (l) A, (s) A.
- LYCOPODIACEAE—*Lycopodium cernuum* L., (l, s), (r).
- LYTHRACEAE—*Lawsonia inermis* L., (l, s).
- MAGNOLIACEAE—*Magnolia coco* DC., (l) A, (s) A.
- MALVACEAE—*Abutilon indicum* (L.) G. Don, (l), (f), (b); *Hibiscus mutabilis* L., (l, s); *Hibiscus rosa-sinensis* L., (l), (s); *Sida acuta* Burm. f., (l, s); *Sida fallax* Walp., (wp); *Sida rhombifolia* L., (l, s).
- MELASTOMACEAE—*Melastoma dodecandrum* Lour., (l, s); *Melastoma sanguineum* Sims, (l, s).
- MELIACEAE—*Melia azedarach* L., (l), (s).
- MENISPERMACEAE—*Stephania hernandifolia* Walp., (l, s) A; *Stephania* sp., (wp) A; *Thinospora sinensis* Merr., (s).
- MIMOSACEAE—*Acacia confusa* Merr., (l); *Mimosa pudica* L., (wp); *Pithecolobium lucidum* Benth., (l, s).
- MORACEAE—*Artocarpus linganensis* Merr., (l), (sb); *Ficus hirta* Vahl., (l), (s); *Ficus hispida* L. f., (l), (s); *Ficus pumila* L., (l), (s); *Ficus pyriformis* Hook. & Arn., (l, s), (tendrils); *Ficus retusa* L., (tendrils); *Ficus wightiana* Benth., (l, s); *Morus alba*, (l, sb).
- MYRSINACEAE—*Ardisia crispa* A. DC., (l), (s), (r); *Ardisia punctata* Lindl., (l, s); *Embelia laeta* (L.) Mez., (l, s); *Embelia obongifolia* Hems., (l, s).
- MYRTACEAE—*Baeckea frutescens* L., (l, s); *Cleistocalyx operculatus* (Roxb.) Merr., (l, s); *Psidium guajava* L., (l, s); *Syzygium jambos* (L.) Alston, (l, s).
- PAPILIONACEAE—*Abrus cantoniensis* Hance, (l) A, (s) A?, (r) A; *Crotalaria saltiana* Andr., (l), (s); (l) A, (s) A; *Desmodium styracifolium* (Osb.) Merr., (wp); *Eriosma chinense* Vogel, (l, s), (rb); *Indigofera suffruticosa* Mill., (wp); *Millettia dielsiana* Harms., (l, s); *Millettia speciosa* Champ., (l), (sb); *Moghania prostrata* (Roxb.) Wang & Tang, (l, s), (r); *Ormosia emarginata* Bth., (l, s) A; *Phaseolus lunatus* L., (l, s); *Phyllodium pulchellum* (Bth.) Desv., (l, s) A; *Pteroloma triquetrum* Benth., (wp); *Pueraria thunbergiana* (S. & Z.) Benth., (s); *Smithia conferta* Sm., (l, s); *Zornia diphylla* Pers., (wp).
- NEPENTHACEAE—*Nepenthes mirabilis* (Lour.) Druce, (l, s).
- NYCTAGINACEAE—*Mirabilis jalapa* L., (r) A.
- NYMPHAEACEAE—*Nelumbo nucifera* Gaertn., (l) A, (fr).
- OLEACEAE—*Osmanthus fragrans* Lour., (l, s).
- ONAGRACEAE—*Jussiaea repens* L., (wp).
- ORCHIDACEAE—*Acampe multiflora* Lindl., (l); *Pholidota chinensis* Lindl., (l) A, (r).
- OXALIDACEAE—*Averrhoa carambola* L., (l), (s); *Oxalis repens* Thunb., (wp).
- PALMACEAE—*Areca catechu* Willd., (wp).
- PANDANACEAE—*Pandanus tectorius* Parkinson, (r); *Pandanus* sp., (l).
- PASSIFLORACEAE—*Passiflora foetida* L., (l), (s).
- PINACEAE—*Pinus massoniana* Lamb., (f); *Thuja orientalis* L., (l).
- PIPERACEAE—*Piper betle* L., (l); *Piper sarmentosum* Roxb., (l), (s).
- PLANTAGINACEAE—*Plantago major* L., (wp).
- PLUMBAGINACEAE—*Plumbago zeylanica* L., (l), (s).
- POLYGALACEAE—*Polygala chinensis* L., (l, s).
- POLYGONACEAE—*Polygonum chinense* L., (l, s); *Polygonum hydropiper* L., (l, s); *Polygonum pedunculare* Wall.?, (l, s); *Polygonum perfoliatum* L., (wp); *Polygonum plebeium* R. Br., (wp).
- POLYPODIACEAE—*Acrostichum aureum* L., (l, s); *Adiantum fabellulatum* L., (wp); *Athyrium lanceum* (Thunb.) Milde, (l), (s, r); *Odontosoria chinensis* (L.) J. Sm., (wp); *Pteris ensiformis* Burm., (wp); *Pteris semipinata* L., (wp); *Pyrrosia adnascens* (Forst.) Ching, (wp).
- PORTULACACEAE—*Portulaca oleracea* L., (l, s), (r); *Portulaca pilosa* L., (wp).
- PONTEDERIACEAE—*Eichornia crassipes* Solms., (wp).
- PUNICACEAE—*Punica granatum* L., (l, s).
- RANUNCULACEAE—*Clematis meyeniana* Walp., (l, s); *Ranunculus cantoniensis* DC., (l), (s).
- RHAMNACEAE—*Berchemia racemosa* S. & Z., (l, s).
- ROSACEAE—*Duchesnea indica* (L.) Foche, (wp); *Eriobotrya japonica* Lindl., (l); *Prunus mume* S. & Z., (s); *Prunus persica* (L.) Batsch., (l, s); *Pyrus sinensis* Lindl., (s); *Raphiolepis indica* Lindl., (l), (s), (rb) (f); *Rosa laevigata* Michx., (s), (r); *Rosa wichuraiana* Crep., (l, s); *Rubus parvifolius* L., (l, s), (rb); *Rubus reflexus* Kev., (l, s).
- RUBIACEAE—*Adina pilulifera* (Lam.) Franch., (l, b); *Gardenia jasminoides* Ellis, (l), (s); *Hedyotis acutangula* Champ., (l, s); *Hedyotis loganiodes* Benth., (l), (sb); *Lasianthus chinensis* Benth., (l); *Morinda umbellata* L., (l, s); *Mussaenda pubescens* Ait. f., (l, s); *Oldenlandia auricularia* F.-Muell., (l, s) A, (r) A?; *Oldenlandia hedyotideae* (DC.) Hand.-Mazz., (l), (s); *Paederia scandens* (Lour.) Merr., (l, s); *Psychotria rubra* (Lour.) Poir., (l, s); *Psychotria serpens* L., (wp); *Tricalysia viridiflora* (DC.) Matsum., (l, s).
- RUTACEAE—*Atalantia buxifolia* (Benth.) Oliv., (l, s); *Citrus grandis* (L.) Osbeck, (l, s); *Citrus limonia* Osbeck, (l); *Clausena lansium* (Lour.) Skeels, (l), (s), (rb), (rw); *Evodia lepta* (Spreng.) Merr., (l), (sb); *Glycosmis cirrifolia* Lindl., (l), (s); *Murraya paniculata* (L.) Jack, (l) A, (sb) A?; *Ruta graveolens* L., (wp) A; *Zanthoxylum avicennae* (Lam.) DC. (l) A, (s) A, (fr) A; *Zanthoxylum nitidum* (Lam.) DC., (l), A, (sb), A.
- SALICACEAE—*Salix babytonica* L., (l, s).
- SANTALACEAE—*Henslowia frutescens* Champ., (l), (s).
- SAPINDACEAE—*Cardiospermum halicacabum* L., (l, s); *Euphoria longan* (Lam.) Steud., (l), (s); *Sapindus mukorossi* Gaertn., (l), (s).
- SAXIFRAGACEAE—*Saxifraga stolonifera* Merrb., (wp).
- SAURURACEAE—*Houttuynia cordata* Thunb., (wp); *Saururus chinensis* (Lour.) Baill., (l), (s, r).

TABLE I—continued

- SCHIZALACEAE—*Lygodium japonicum* Swartz, (wp).
 SCHROPHULARIACEAE—*Adenosma glutinosum* (L.) Druce, (fl), (l), (s); *Bacopa monniera* (L.) Wettst., (wp);
Buchnera cruciata Han., (wp); *Scoparia dulcis* L., (wp).
 SELAGINELLACEAE—*Selaginella atroviridis* Spring, (wp); *Selaginella involvens* Spring, (wp).
 SMILACACEAE—*Heterosmilax quadricaudata* Maxim., (l), (r); *Smilax china* L., (l), (s); *Smilax glabra* Roxb.,
 (l), (s).
 SOLANACEAE—*Capsicum frutescens*, (l, s); *Datura metel* L., (l) A, (s) A; *Lycium chinense* Mill., (r).
 STERCULIACEAE—*Firmiana simplex* (L.) Wight, (l, s); *Helicteres angustifolia* L., (l), (b); *Pterospermum
 heterophyllum* Hance, (l), (s); *Sterculia nobilis* Sm., (l).
 SYMPOCOACEAE—*Symplocos lanatifolia* S. & Z., (l, s).
 TAMARICACEAE—*Tamarix chinensis* Lour., (l).
 TAXACEAE—*Podocarpus macrophylla* Don., (l), (sb).
 TERNSTROEMIAACEAE—*Eurya chinensis* R. Br., (wp).
 THYMELAEACEAE—*Wikstroemia indica* (L.) C. A. Mey, (l), (s).
 TILIACEAE—*Microcos paniculata* L., (l), (sb).
 ULMACEAE—*Trema orientalis* (L.) Bl., (l, s).
 UMBELLIFERAE—*Centella asiatica* (L.) Urban., (wp); *Hydrocotyl esibthorpioides* Lam., (wp).
 URTICACEAE—*Boehmeria nivea* Gaud., (l), (s); *Pouzolzia zeylanica* (L.) Benn., (wp).
 VERBENACEAE—*Avicennia marina* (Forsk.) Vierk., (l, s); *Callicarpa nudiflora* H. & A., (l), (s); *Clerodendron
 cryptophyllum* Turcz., (l), (s); *Clerodendron fortunatum* L., (l, s); *Clerodendron fragrans* Vent., (l), (s);
Clerodendron inerme Gaertn., (l, s); *Lantana camara* L., (l), (s); *Stachytarpheta jamaicensis* L., (l) A, (s);
Vitex negundo L., (l, s); *Vitex trifolia* L. var. *unifoliata* Schauer, (l, s).
 VIOLACEAE—*Viola inconspicua* Bl., (wp).
 VITACEAE—*Ampelopsis brevipedunculata* (Max.) Koehne., (l, s); *Ampelopsis cantoniensis* (H. & A.) Planch,
 (l, s); *Vitis flexuosa* Thunb., (l, s), (wp).
 ZINGIBERACEAE—*Alpinia* sp.? (r); *Curcuma zedoaria* (Berg.) Rose, (r) A.

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