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A New Phytochemical Survey of Malaya[1]——Chemical Screening

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Reported here (Table II) are the results of screening of Malayan plants from 82 families, representing 169 genera and 226 species, for presence of alkaloids, saponins, and steroids and triterpenes. Results of ensuing detailed chemical investigations on some plants are summarized (Table I), and the potentials of others discussed.

While many plants of the rich Malayan flora have long found use in folk medicine,[3] it is only recently that systematic studies have been undertaken with the aim of discovering substances of pharmaceutical interest. A phytochemical survey of Malaya was initiated in 1957 by the University of Malaya (then in Singapore) in collaboration with the Malayan Government Department of Chemistry. The earlier results of chemical[4-7] and pharmacological[7] screening of some Malayan plants have been reported. Since 1965, the University of Malaya, Kuala Lumpur, has taken over this survey. This paper outlines the organisation of the new systematic survey and presents the first set of results of screening tests.

Experimental Methods

Collection and Identification——By far the greatest number of species of the flora of Malaya is to be found in the forests. There is seldom a forest area with one or a few dominant species; more often many species occur together in a small area. The basic survey has therefore been organised in the forest.

Six different floristic areas of forest have so far been selected. The survey of each area is planned in four stages. (a) A one chain square quadrat is laid out and all trees of five inch girth and over are numbered and measured. (b) With the assistance of the local foresters, the numbered trees are given Malay names. (c) The survey team makes initial collections, and, for accurate identification, subsequent visits are made when the trees are in flower or fruit. (d) Further chain-square quadrats are laid out beside the original one, up to a total area of an acre, and new species encountered are numbered and collected.

Apart from the basic survey, general collections are made in areas which do not lend themselves to systematic treatment by means of quadrats. In this way the entire flora of the country will be very efficiently covered.

Chemical Tests——The procedures adopted in the screening tests for alkaloids and saponins were in accordance with those described by Douglas, *et al.*[5] and Simes, *et al.*[8] The crude residue of the chloroform extract of plant material was treated with dilute hydrochloric acid (2N). The acid extract was tested for alkaloids using Bouchardat, Dragendroff and Meyer reagents while the residue left after extraction with acid

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Family	Species	Parts	Chemical tests for		
			Alkaloids	Saponins	Steroids Triterpenes
Aizoaceae	*Sesuvium portulacastrum* (L.) L.	W	2+	–	–
Alangiaceae	*Alangium griffithii* (Clarke) Harms.	B, L	–	–	–
		F, Wd	1+	–	–
Anacardiaceae	*Campnosperma auriculata* Hk. f.	L, S	–	–	–
	Campnosperma montana Laut.	L, S	–	–	–
	Mangifera caesis Jack. ex Wall.	S, L	1+	+	–
Ancistrocladaceae	*Ancistrocladus tectorius* (Lour.) Merr.	S, L	2+	+	–
Annonaceae	*Drepanthus pruniferus* Maing.	B, L	–	–	–
		F, S	1+	–	–
	Xylopia ferruginea Hk. f. & Th.	L, S	1+	+	–
Apocynaceae	*Allamanda catharica* L.	S, L	1+	–	–
	Alstonia macrophylla Wall.	S, L	3+	+	–
	Lochnera rosea Reichb.	L, S	4+	–	+
Araliaceae	*Aralia ferox* Miq.	W	–	+	–
	Aralia montana Bl.	S, L	–	+	–
		F	1+	–	–
Aristolochiaceae	*Apama corymbosa* Soler.	S, L	1+	–	–
Asclepiadaceae	*Calotropis gigantea* (Willd.) Dryand ex Ait. f.	S, L	–	–	–
		Sd	1+	–	+
	Hoya coronaria Bl.	W	–	–	–
Bixaceae	*Bixa orellana* L.	S, L	–	–	–
Bombacaceae	*Durio zibethinus* Murr.	B, Wd	1+	–	+
		Pc, Sd	1+	–	–
		L, Pp	–	–	–
Boraginaceae	*Cordia cylindrostachya* Roem. & Schutt.	S, L	–	–	–
	Ehretia buxifolia Roxb.	W	–	–	–
Burseraceae	*Dacryodes rugosa* (Bl.) H. J. Lam. (glabrous)	S, L	–	+	+
	Dacryodes rugosa (Bl.) H. J. Lam. (hairy)	S, L	–	–	–
Caesalpiniaceae	*Cassia alata* L.	S	–	+	–
		Pod, Sd, L	–	–	–
	Saraca thaipingensis Cantley	S, L	–	–	–
Campanulaceae	*Laurentia longiflora* (L.) Petermann	W	3+	–	+
Clusiaceae	*Garcinia parvifolia* (Miq.) Miq.	S, L	1+	–	–
Commelinaceae	*Aneilema nudiflora* R. Br.	W	–	–	–
	Forrestia mollis Hassk.	W	–	–	–
Compositae	*Elephantopus tomentosus* L.	W	1+	–	–
	Tridax procumbens L.	W	–	–	–
	Vernonia arborea Buch.-Ham.	S, L	–	–	–
	Wedelia triflora (L.) DC.	S, L	–	–	–
Convolvulaceae	*Ipomoea pes-caprae* Roth.	S, L, F	–	–	–
	Ipomoea stolonifera (Cyr.) Gmel.	W	–	–	–
Cucurbitaceae	*Hodgsonia capniocarpa* Ridl.	L, S, F	–	–	–
Cunoniaceae	*Weinmannia blumei* Planch.	S, L	–	–	–
Cyperaceae	*Scleria sumatrensis* Retz.	W	–	–	–
	Thoracostachyum bancanum Kurz.	W	–	–	–
Dilleniaceae	*Dillenia suffruticosa* (Griff.) Mart.	S, L, F	–	–	+
	Tetracera scandens (L.) Merr.	S, L	–	–	–
		F	1+	–	–
Dioscoreaceae	*Dioscorea laurifolia* Wall.	W	–	–	–
Dipterocarpaceae	*Balanocapus heimii* King	B, Wd	–	2+	–
	Dryobalanops aromatica Gaertn. f.	B, L, Wd	–	+	+
	Hopea pubescens Ridl.	L. B, Wd	–	2+	+
	Shorea acuminata Dyer	B, L, Wd	–	+	+
	Shorea bracteolata Dyer	S, L	–	+	+
	Shorea curtisii Dyer ex King	B, L, Wd	1+	+	+
	Shorea glauca King	L, S	1+	+	–
	Shorea leprosula Miq.	S, L	–	–	–
	Shorea resina-negra Foxw.	B, L, Wd	1+	–	+
Ebenaceae	*Diospyros lanceifolia* (cf. Corner)	S, L	–	+	+
Elaeocarpaceae	*Elaeocarpus petiolatus* (Jack.) Wall.	S, L	1+	+	–
	Elaeocarpus robustus Roxb.	S, L	1+	+	–
Epacridaceae	*Styphelia malayana* (Jack.) Spr.	S, L	–	+	+
Euphorbiaceae	*Bridelia tomentosa* Bl.	F, S, L	1+	–	–
	Croton argyratum Bl.	L, S	1+	–	–
	Euphorbia atoto Forst. f.	S	2+	–	–
		L	–	–	–
	Euphorbia hirta L.	W	–	–	–
	Euphorbia synadenium Ridl.	L, S	–	–	–
	Excoecaria agallocha L.	L, S	–	–	–
	Flueggea virosa Baill.	S, L	4+	–	+
	Glochidion obscurum (Willd.) Bl.	F, L, S	–	–	–
	Glochidion wallichianum Mull.	B, L, Wd	–	–	–
		F	1+	–	+
	Jatropha gossypiifolia L.	S	2+	+	+
		L, Pc, Sd	–	–	–
	Macaranga gigantea M. A.	S	–	3+	–
		F, L	–	–	–
	Macaranga hosei King	F, L, S	–	–	–
	Macaranga hullettii King (male)	S, L	1+	–	–
	Macaranga hullettii King (female)	F, L, S	–	–	–
	Macaranga hypoleuca M. A.	L, S	–	–	–
	Macaranga javanica (Bl.) M. A. (male)	L, S	–	–	–
	Macaranga javanica (Bl.) M. A. (female)	L, S	–	–	–
	Macaranga tanarius (L.) M. A.	L, S	–	–	–
	Macaranga triloba M. A.	F, L, S	–	–	–
	Mallotus macrostachyus M. A. (female)	F, L, S	–	–	–
	Mallotus macrostachyus M. A. (male)	L, S	–	–	–
	Mallotus paniculatus (Lmk.) M. A.	L, S	–	–	–
	Omalanthus populnea (Geisel.) Pax.	L, S	1+	–	–

	Phyllanthus niruri L.	W	–	–	–
Fagaceae	*Quercus kunstleri* King	L, S	–	+	+
		F	–	3+	–
Flacourtiaceae	*Casearia lobbiana* Turcz.	L, S	–	–	–
Flagellariaceae	*Flagellaria indica* L.	W	1+	+	–
Gnetaceae	*Gnetum gnemon* L. var brunonianum (Griff.) Mgf.	L, S	–	+	–
Goodeniaceae	*Scaevola taccada* (Gaertn.) Roxb.	L, S	3+	–	+
Gramineae	*Oplismenus compositus* Beauv.	W	–	–	–
	Themeda arguens Hack.	W	–	–	–
Hernandiaceae	*Hernandia ovigera* L.	L, S	1+	–	–
Hypericaceae	*Cratoxylon arborescens* Bl.	L, S	–	–	+
	Cratoxylon formosum (Jack.) Dyer	L, S	–	–	–
Iridaceae	*Trimeza martinicensis* (Jacq.) Herb.	W	1+	–	–
Juglandaceae	*Engelhardtia roxburghiana* Wall.	L, S	–	–	–
	Engelhardtia spicata Lechen. ex Bl.	L, S	–	–	+
Labiatae	*Hyptis capitata* Jacq.	F, L, S	–	–	–
	Hyptis suaveolens (L.) Poit.	W	–	–	+
	Ocimum basilicum L.	L, S	1+	–	+
Lauraceae	*Cassytha filiformis* L.	W	2+	–	–
	Cinnamomum paraneuron Miq.	L, S	1+	–	–
	Lindera lucida (Bl.) Boerl.	L, S, F	1+	–	–
	Lindera oxyphylla Hk. f.	R	2+	+	–
		B, Wd	1+	+	–
		L	–	–	–
	Litsea umbellata Merr.	L, S	–	–	–
	Neolitsea zeylanica Merr.	S	3+	+	+
		L	1+	–	–
	Notaphoebe panduriformis Gamble	L	–	2+	–
		S	3+	–	–
Liliaceae	*Dianella ensifolia* Red.	W	–	–	–
	Sansevieria zeylanicum Willd.	Rh, L	–	+	–
Linaceae	*Roucheria griffithiana* Planch.	S	4+	3+	–
		L	1+	+	–
Loganiaceae	*Fagraea crenulata* Maing. ex Clarke	L, S, F	2+	–	–
		Ped	2+	–	+
	Fagraea fragrans Roxb.	S	2+	–	–
		F, L	1+	–	+
	Fagraea racemosa Jack. ex Wall.	L, S	–	–	–
		F	3+	–	–
	Fagraea fragrans Jack. ex. Wall.	L, S	–	–	+
Malvaceae	*Hibiscus tiliaceus* L.	L, S	–	–	–
	Sida retusa L. (dwarf)	W	–	+	–
	Sida retusa L. (normal)	W	–	–	–
	Sida rhombifolia L.	W	2+	–	–
Marantaceae	*Donax grandis* Ridl.	L, S	–	–	–
Melastomataceae	*Allomorphia malaccensis* Ridl.	L, S	1+	–	+
	Anplectrum divaricatum Triana.	L, S	–	+	–
		F	2+	–	+
	Clidemia hirta D. Don.	L, S	–	+	–
	Dissochaeta annulata Hk. f.	L, S	–	–	+
	Dissochaeta aff. bracteata (Jack.) Bl.	F, L, S	–	–	+
	Macrolenes muscosa (Bl.) Bakh. f.	L, S	–	–	–
	Melastoma muticum Ridl.	L, S	–	–	+
	Melastoma sanguinium Sims.	F, L, S	–	–	+
	Melastoma schizocarpa Ridl.	S	1+	–	+
		L	–	+	+
	Memecylon garcinioides Bl.	L, S	–	–	–
	Phyllagathis rotundifolia Bl.	W	–	–	–
	Pternandra echinata Jack.	L, S	1+	–	–
	Sonerila heterostemon Naud.	W	–	–	–
	Sonerila rudis Stapf.	W	–	–	–
Meliaceae	*Carapa guianensis* Aubl.	S, Sd	1+	–	–
		L, Pc	–	+	–
	Melia azedarach L.	F, S	1+	–	+
		L	–	–	–
Menispermaceae	*Tinospora crispa* (L.) Miers. ex Hk. f. & Thoms.	S	2+	–	–
Mimosaceae	*Adenanthera pavonina* L.	S	1+	2+	–
		L, Sd	–	–	–
	Mimosa invisa Mart.	W	–	–	–
	Parkia speciosa Hassk.	L, S	–	+	+
	Pithecellobium ellipticum (Bl.) Hassk.	L, S	–	2+	–
		F	–	+	–
Moraceae	*Ficus alba* Reinw.	F, L, S	–	–	–
	Ficus annulata Bl.	F, L, S	1+	–	–
	Ficus deltoidea Jack.	S	1+	–	–
		L, F	1+	–	+
	Ficus fulva Reinw. ex Bl.	S	1+	–	–
		L	–	–	–
	Ficus hirta L. f.	S	–	–	–
		L	2+	–	–
Myristicaceae	*Knema hookeriana* Warb.	L, S	–	–	–
Myrsinaceae	*Ardisia crispa* (*cf.* Corner)	L, S	–	–	+
		F	–	–	–
	Maesa ramentacea Wall.	S, B	2+	3+	–
		L	–	2+	+
Myrtaceae	*Eugenia grandis* Wight	L, S	–	–	+
	Eugenia longiflora (Presl.) F. Vill.	L, S	1+	+	+
	Eugenia palembanica Merr.	F, L, S	–	–	+
	Melaleuca leucadendron L.	L, S	–	+	+
	Rhodamnia cinerea Jack.	L, S	–	+	+
	Rhodomyrtus tomentosa (W. Ait.) Hassk.	S	–	–	+
		L	–	2+	–
Olacaceae	*Ochanostachys amentacea* Mast.	L, S	1+	+	–
Onagraceae	*Jussiaea linifolia* Vahl.	W	–	–	+
Orchidaceae	*Arundina graminifolia* Schlechter	W	–	–	–
	Spathoglottis plicata Bl.	W	–	–	–
Oxalidaceae	*Averrhoa bilimbi* L.	L, S	–	+	+
		F	–	–	–
Pandanaceae	*Pandanus recurvatus* St. John	S	2+	–	–
		L	–	–	–

Papilionaceae	*Aeschynomene americana* L.	W	–	–	–
	Dalbergia junghuhnii Benth.	L, S	1+	–	–
	Derris heterphylla (Willd.) Back.	L, S	–	–	–
	Desmodium heterocarpum (L.) DC.	L, S	–	–	–
	Desmodium umbellatum (L.) DC.	L, S	1+	–	–
	Millettis decipiens Prain.	S	1+	3+	–
		L	1+	–	–
	Moghania macrophylla (Willd.) O. K.	L, S	–	–	–
		F	1+	–	–
Pedaliaceae	*Sesamum indicum* L.	W	–	–	–
Piperaceae	*Peperomia pellucida* H. B. K.	W	–	–	–
	Piper aduncum L.	L, S	1+	–	–
Polygalaceae	*Polygala paniculata* L.	W	2+	2+	–
Restionaceae	*Leptocarpus disjunctus* Mast.	Rh, S	–	–	–
Rhizopheraceae	*Bruguiera cylindrica* (L.) Bl.	S	1+	+	–
		L	–	–	–
	Pellacalyx saccardianus Scort.	S	2+	–	–
		L	–	–	–
Rubiaceae	*Argostemma involucratum* Hemsl.	W	1+	–	–
	Borreria laevicaulis Ridl.	W	–	–	–
	Borreria alata (Aubl.) DC.	W	–	–	–
	Chonemorpha penangensis Ridl.	L, S	4+	–	+
	Guettarda speciosa L.	F, L, S	–	+	+
	Lasianthus stipularis Bl.	W	–	–	–
	Morinda citrifolia L.	S	2+	–	–
		L	1+	–	+
	Morinda umbellata L.	W	–	–	+
	Ophiorrhiza discolor R. Br.	W	1+	–	–
	Randia cochinchinensis (Lour.) Merr.	S	–	5+	–
		L, F	–	+	+
	Uncaria cirdata (Lour.) Merr.	S	2+	2+	–
		L	–	+	–
	Uncaria gambir (Hunt.) Roxb.	L, S	4+	–	–
	Uncaria ovalifolia Roxb.	S	2+	+	+
		L	–	–	+
	Uncaria pteropoda Miq.	S, L, B	4+	–	–
	Uncaria sclerophylla Roxb.	S	–	+	–
		L	2+	–	+
Rutaceae	*Evodia latifolia* DC.	S	2+	–	–
		L	–	–	–
Sapindaceae	*Guioa pleuropteris* Radlk.	L, S	–	–	–
	Pometia pinnata J. R. & C. Forst.	S, F	–	3+	+
		L	–	–	–
Sapotaceae	*Medhuca utilis* H. J. L.	B, L, Wd	–	–	+
	Palaquium ridleyi King	S	1+	2+	+
		L	–	+	+
Saurauiaceae	*Saurauia tristyla* DC.	L, S	–	2+	+
	Saurauia cf. tristyla DC.	L, S	–	–	+
Scrophulariaceae	*Scoparia dulcis* L.	W	–	–	–
Solanaceae	*Cestrum nocturnum* L.	L, S	–	2+	–
	Solanum torvum Sw.	F, L, S	–	–	–
Sterculiaceae	*Commersonia bartramia* (L.) Merr.	S	–	–	+
		L	1+	–	–
	Sterculia rubiginosa Vent.	Fl, S, L	–	–	+
Taccaceae	*Tacca pinnatifida* Forst.	T	–	+	–
		L, S	–	–	–
		F	1+	–	–
Taxaceae	*Podocarpus teysmanni* Miq.	F, S	–	–	–
		L	2+	–	–
Theaceae	*Eurya acminata* DC.	L, S	–	+	+
	Ploiarium alternifolium (Becc.) Melch.	L, S	–	–	–
Tiliaceae	*Grewia umbellata* Roxb.	L, S	–	–	+
	Muntingia calabura L.	L, S	–	–	–
	Triumfetta rhomboidea Jacq.	L, S	1+	–	–
Ulmaceae	*Trema cannabina* Lour.	L, S	1+	–	–
	Trema orientalis (L.) Bl.	B, Wd	–	–	+
		L	–	–	–
Urticaceae	*Pipturus mollissimus* Wedd.	L, S	–	–	–
	Poikilospermum suaveolens (Bl.) Merr.	L, S	–	–	+
	Villebrunea rubescens (Bl.) Bl.	S	–	–	+
		L	–	–	–
Verbenaceae	*Callicarpa tomentosa* Willd.	L, S	–	–	+
	Clerodendron inerme (cf. Corner)	L, S	–	–	–
	Clerodendron japonicum (Thunb.) Sweet.	L, S	1+	–	–
	Clerodendron serratum (L.) Moon.	S	1+	2+	–
		L	4+	–	–
	Clerodendron villosum Bl.	L, S	–	–	–
	Gmelina arborea L.	L, Wd	–	–	–
		B, F	1+	–	–
	Premna tomentosa Willd.	L, S	1+	–	+
	Sphenodesma barbata Schauer.	W	–	+	–
	Stachytarpheta indica (L.) Vahl.	L, S	2+	–	+
	Stachytarpheta jamaicensis (L.) Vahl.	L, S	3+	–	+
	Stachytarpheta mutabilis (Jacq.) Vahl.	S	–	3+	–
		L	2+	+	–
	Vitex japonica Thunb.	W	–	–	–
	Vitex ovata Thunb.	S	–	–	+
		L, F	1+	–	–
	Vitex pubescens Vahl.	L, S	–	–	–
Xyridaceae	*Xyris complanata* R. Br.	F, R, S	–	–	–
Zingiberaceae	*Alpinia rafflesiana* Wall.	W	–	–	–
	Costus speciosus Smith	W	–	–	–
	Globba aurantiaca Miq.	W	–	–	–
	Zingiber spectabile Griff.	I, L, S	–	–	–

Abbreviations——Plants parts: B=bark; F=fruit; Fl=flower; I=inflorescene; L=leaf; P=petiole; Ped=pedicel; Pe=pericarp; Pod=pod; Pp=pulp; R=root; Rh=rhizome; S=stem; Sd=seed; T=timber; W=whole plant; Wd=wood. Visual assessment of the result is denoted as follows: (a) alkaloids, (average of results using Bouchardat, Dragendroff and Meyer reagents) 4+=heavy precipitate, 3+=strong precipitate, 2+=weak precipitate, 1+=negligible precipitate, and –=no precipitate; (b) saponins, each plus (+) means 1 cm permanent froth; and (c) steroids and triterpenes, + denotes a positive Liebermann-Burchard reaction(see experimental).

was tested with the Liebermann–Burchard reagent.[9] The basis of visual quantitative estimation of the presence of alkaloids and saponins was the same as outlined by Douglas, *et al.*[5] and Arthur.[10] In the Liebermann–Burchard reaction, a transient reddish purple colour turning to green is considered as positive.

Conclusion

In this work 226 species of plants belonging to 82 families and 169 genera have been tested and the results are shown in Table II. 46 species have positive tests for alkaloids, 60 for saponins, and 71 for steroids and triterpenes (Liebermann–Burchard reaction); these species represent respectively 20%, 27% and 31% of those tested.

Very strong tests for alkaloids were given by the following plants which are known sources of alkaloids: *Lochnera* (*Vinca*) *rosea*[11] (Apocynaceae), *Flueggea* (*Securinega*) *virosa*[12] (Euphorbiaceae) and *Chonemorpha pennangensis*[13] (Rubiaceae). Species which reacted very strongly to alkaloid reagents but have not been reported to yield alkaloids are *Roucheria griffithiana* (Linaceae), *Clerodendron serratum*, and *Stachytarpheta jamaicensis* (Verbenaceae). All three are used medicinally by the Malays[3]; furthermore, *Roucheria* is used as a dart-poision,

Table I. Constituents isolated from Malayan Plants Surveyed

Plant	Part	Compounds	Structure	Reference
Dipterocarpaceae				
Dryobalanops aromatica Gaertn. f.	resin	dipterocarpol	I	14)
		dammarendiol-II	II	14)
		dryobalanone	III	14)
		ocotillol-II	IV	14)
		erythrodiol	V	14)
		oleanonic acid[a]	VI	15)
		oleanolic acid[a]	VII	15)
		hederagenin[b]	VIII	15)
		maslinic acid[a]	IX	15)
		arjunolic acid[b]	X	15)
		asiatic acid[a]	XI	15)
		alphitolic acid[a]	XII	15)
Shorea acuminata Dyer	resin	asiatic acid[a]	XI	16)
		2α-hydroxyursolic acid[a]	XIII	16)
Rubiaceae				
Uncaria gambir (Hunt) Roxb.	stem	mitraphylline	XIV	17)
		gambirdine	XIV	17)
		isogambirdine	XIV	17)
Uncaria pteropoda Miq.	stem	pteropodine	XIV	18)
		isopteropodine	XIV	18)
Theaceae				
Eurya acuminata DC.	bark	betulinic acid	XV	15)

a) Isolated as methyl esters. *b*) Isolated as artifact derivatives.[16]

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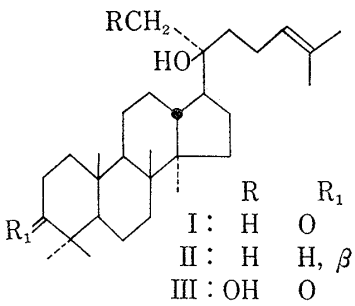
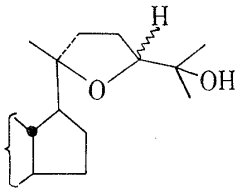
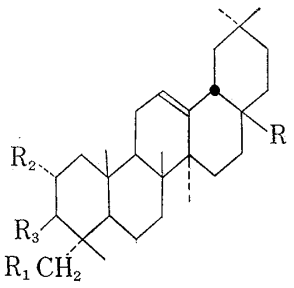


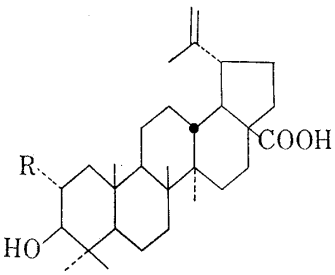
	R	R_1
I:	H	O
II:	H	H, β−OH
III:	OH	O



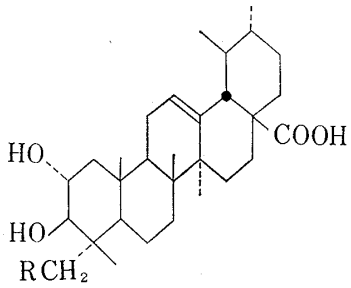
IV : R_1=H, β−OH



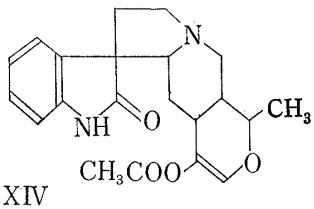
	R_1	R_2	R_3	R
V:	H	H	OH	CH_2OH
VI:	H	H	(=O)	COOH
VII:	H	H	OH	COOH
VIII:	OH	H	OH	COOH
IX:	H	OH	OH	COOH
X:	OH	OH	OH	COOH



XII : R=OH
XV : R=H



XI : R=OH
XIII : R=H



XIV

Clerodendron in magic practices, and *Stachytarpheta* by the local Chinese as well.[3] Two *Uncaria* species (Rubiaceae), *U. gambir* and *U. pteropoda*, also gave very strong tests, and the presence of alkaloids has been confirmed by us (see below).

Exceptionally strong tests for saponins were afforded by *Maesa ramentacea* (Mysinaceae), a local medicinal plant, and *Randia cochinchinensis* (Rubiaceae). The genus *Randia* is a known source of saponins.[19]

Arising from the screening tests, detailed chemical studies have been made of certain plants which gave positive screening tests. The results of isolation, identification, and structural elucidation of alkaloid and triterpene constituents are summarized in Table I, and are a confirmation of the usefulness of the preliminary tests.

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