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A CONTRIBUTION TO THE THAI PHYTOCHEMICAL SURVEY

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Summary

As part of the Thai Phytochemical Survey, 185 species representing 161 genera and 74 families have been located in the Peninsular Floristic Region of Southern Thailand and tested for alkaloids in the field. Twenty seven species representing 27 genera and 16 families gave positive tests for alkaloids.

The present work is a contribution to the Thai Phytochemical Survey which is being undertaken by workers in several Thai Universities and Government Departments. We hope that this will develop along the lines of the successful Australian Phytochemical Survey and that it will stimulate both chemical and biological research in Thailand. In addition, we hope that it will help scientists from Thailand to participate to an increasing extent in the activities of the UNESCO Regional Network for the Chemistry of Natural Products in Southeast Asia which has been formed recently.

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The flora of Thailand comprises about 13,000 species[1] of which 271 species have already been described precisely in the Flora of Thailand, which has just begun to appear[2]. There is an extensive literature in Thai on the uses of particular plants for medicinal purposes[3-5]. Many of these plants are sold as crude drugs in local markets and such material has been used in some of the pioneering phytochemical studies carried out in Thailand by the late Dr. Stang Mongkolsuk[6-10], Dr. Dep Shienthong[11-14], Dr. Vichai Reutrakul[15-16], and their colleagues.

TABLE 1. SPECIES GIVING A POSITIVE TEST FOR ALKALOIDS

Family	Herbarium No.	Species
Acanthaceae	PS 191	*Barleria lupulina* Lindl.
Annonaceae	PS 241	*Uvaria ridleyi* King
Apocynaceae	PS 42	*Ervatamia coronaria* Stapf.
	PS 74	*Holarrhena curtisii* King and Gamble
Dioscoreaceae	PS 1	*Dioscorea hispida* Dennst.
Euphorbiaceae	PS 179	*Acalypha siamensis* Gage.
	PS 176	*Cleistanthus polyphyllus* Will.
Lauraceae	JRC 276	*Cassytha filiformis* L.
	JRC 295	*Cinnamomum parthenoxylon* Meissn.
Leguminosae	PS 52	*Canavalia maritima* (Aubl.) Piper
	JRC 268	*Cassia siamea* Lam.
	PS 213	*Clitoria ternata* L.
	PS 234	*Desmodium pulchellum* (L.) Benth.
Llliaceae	JRC 274	*Gloriosa superba* L.
Magnoliaceae	PS 144	*Talauma candollii* Bl.
Menispermaceae	PS 101	*Anamirta cocculus* (L,) W. and A.
	JRC 305	*Coscinium blumeanum* Miers
	PS 216	*Stephania japonica* (Thunb. *ex* Murr.) Miers
Oleaceae	PS 232	*Jasminum arenarium* Ridl.
Rhamnaceae	PS 198	*Zizyphus oenoplia* Mill.
Rubiaceae	JRC 214	*Adina cordifolia* Benth. and Hook. f.
	VL 48	*Ixora dichophylla* K. Schum.
	PS 135	*Mussaenda variolosa* Wall. *ex* G. Don.
	PS 149	*Ophiorrhiza membranacea* Craib.
Rutaceae	PS 170	*Glycosmis macrophylla* Lindl.
Stemonaceae	PS 59	*Stemona tuberosa* Lour.
Verbenaceae	PS 140	*Callicarpa angustifolia* King and Gamble

In the present work it was decided to complement this approach by venturing into the field and selecting plants for chemical study on the basis of simple spot tests.* The technique of alkaloid screening developed by Culvenor and Fitzgerald[17] was used during the investigation of plants which are found in the Peninsular Florisitic Region of Southern Thailand. The results of these tests are set out in Tables 1 and 2.

*We thank a referee for drawing our attention to the work of Sommai Prarakkamo (M.Sc. Thesis, Chulalongkorn University, 1971) who screened 161 Thai plants for the presence of alkaloids some years ago.

TABLE 2: SPECIES GIVING A NEGATIVE TEST FOR ALKALOIDS

Family	Herbarium No.	Species
Acanthaceae	PS 171	*Andrographis paniculata* Nees.
	PS 138	*Justicia quadrifaria* Wall
	PS 38	*Thunbergia laurifolia* Lindl.
Anacardiaceae	PS 20	*Buchanania lucida* Bl.
	PS 14	*Semecarpus curtisii* King
Annonaceae	VL 57	*Annona muricata* L.
	VL 37	*Cananga odorata* Hook. f. and Thoms.
	JRC 296	*Desmos chinensis* Lour.
Apocynaceae	PS 87	*Holarrhena pauciflora* Ridl.
	PS 25	*Thevetia peruviana* (Pers.) K. Schum.
Araceae	JRC 279	*Pistia stratiotes* L.
Asclepiadaceae	JRC 216	*Hoya parasitica* Wall.
Bischofiaceae	PS 148	*Bischofia javanica* Bl.
Bixaceae	PS 46	*Bixa orellana* L.
Capparidaceae	JRC 287	*Capparis micrantha* DC.
	VL 16	*Cleome viscosa* L.
Celestraceae	PS 55	*Salacia prinoides* DC.
Chloranthaceae	PS 81	*Chloranthus officinalis* Bl.
Combretaceae	VL 19	*Quisqualis indica* L.
Commelinaceae	PS 243	*Forrestia griffithii* Clarke
	PS 146	*Pollia sorzogonensis* Endl.
Compositae	JRC 212	*Eupatorium odoratum* L.f.
	PS 183	*Vernonia cinerea* Less
	PS 224	*Vernonia wallichii* Ridl.
	PS 181	*Wedelia biflora* DC.
Connaraceae	PS 51	*Connarus cochinchinensis* (Baill.) Pierre
Convolvulaceae	PS 13	*Ipomoea obscura* Ker.
	PS 236	*Merremia hastata* Hallier
Costaceae	JRC 255	*Costus speciosus* Sm.
Crypteroniaceae	PS 68	*Crypteronia paniculata* Bl.
Cucurbitaceae	PS 36	*Momordica charantia* L.
Davalliaceae	PS 117	*Davallia solida* (Forst) Sw.
Dioscoreaceae	PS 2	*Discorea pentaphylla* L.
Dipterocarpaceae	VL 15	*Dipterocarpus chartaceus* Sym.
Droseraceae	PS 89	*Drosera burmanni* Vahl.
Eriocaulaceae	PS 19	*Eriocaulon sexangulare* L.
Euphorbiaceae	VL 53	*Acalypha indica* L.
	PS 50	*Antidesma diandrum* (Roxb.) Roth
	VL 70	*Antidesma ghoesembilla* Gaert.
	PS 39	*Baliospermum axillare* Bl.
	JRC 283	*Excoecaria agallocha* L.
	PS 53	*Hymenocardia wallichii* Tul.
	VL 21	*Jatropha multifida* L.

TABLE 2: SPECIES GIVING A NEGATIVE TEST FOR ALKALOIDS *(Cont.)*

Family	Herbarium No.	Species
	PS 212	*Jatropha gossypifolia* L.
	VL 65	*Macaranga perakensis* Hook. f.
	PS 33	*Mallotus oblongifolius* Müll.
	PS 238	*Mallotus porterianus* Müll.
	JRC 284	*Sapium indicum* Willd.
	VL 1	*Sauropus albican* Bl.
Fagaceae	VL 5	*Quercus helferiana* A. DC.
Gnetaceae	PS 94	*Gnetum macrostachyum* Hook.
Gramineae	PS 107	*Leptaspis urceolata* (Roxb). R. Br.
Guttiferae	JRC 291	*Calophyllum pulcherrimum* Wall.
	PS 189	*Garcinia dulcis* Kurtz.
	VL 30	*Ochrocarpus siamensis* Anders.
Hydrocharitaceae	JRC 261	*Ottelia alismoides* Pers.
Hypericaceae	VL 9	*Cratoxylon prunifolium* Dyer
Labiatae	PS 137	*Hyptis capitata* Jacq.
	PS 203	*Hyptis suaveolans* Poit.
	PS 69	*Leucas lavandulaefolia* Sm.
	PS 167	*Leucas zeylanica* R. Br.
Lauraceae	PS 47	*Cinnamomum parthenoxylon* (Jack.) Meissn.
Leguminosae	PS 35	*Abrus precatorius* L.
	VL 34	*Acacia concinna* DC.
	PS 27	*Acacia farnesiana* (L.) Willd.
	VL 38	*Adenanthera pavonina* L.
	JRC 311	*Bauhinia flammifera* Ridl.
	JRC 289	*Caesalpinia crista* L.
	VL 25	*Cajanus indicus* Spreng.
	JRC 210	*Centrosema pubescens* Benth.
	PS 185	*Crotolaria laburnifolia* L.
	PS 32	*Cynometra cauliflora* L.
	PS 61	*Derris elliptica* Benth.
	JRC 285	*Derris scandens* Benth.
	PS 188	*Indigofera hirsuta* L.
	PS 228	*Millettia atropurpurea* Wall.
	PS 22	*Mimosa invisa* Mart. *ex* Colla.
	JCR 211	*Mimosa pudica* L.
	PS 141	*Moghania macrophylla* (Willd.) O.K.
	JRC 228	*Parkia speciosa* Hassk.
	JRC 294	*Peltophorum inerme* (Roxb.) Llanos.
	JRC 230	*Pithecellobium jinnga* (Jack.) Prain *ex* King
	PS 84	*Saraca bijuga* Prain
Liliaceae	JRC 313	*Dianella ensiflora* Redoute
Loganiaceae	PS 56	*Fagraea fragrans* Roxb.
Lycopodiaceae	JRC 262	*Lycopodium cernum* L.

TABLE 2: SPECIES GIVING A NEGATIVE TEST FOR ALKALOIDS *(Cont.)*

Family	Herbarium No.	Species
Lythraceae	PS 30	*Lawsonia inermis* Roxb.
Magnoliaceae	PS 131	*Talauma betongensis* Craib.
Malvaceae	PS 3	*Malvaviscus pendicliflorus* DC.
	PS 180	*Sida carpinifolia* L.
	PS 186	*Sida cordifolia* L.
	JRC 302	*Urena lobata* L.
Marantaceae	PS 31	*Maranta arundinaceae* L.
Melastomataceae	PS 240	*Allomorphia alata* Scort.
	PS 136	*Allomorphia exigera* Bl.
	JRC 221	*Melastoma malabathricum* L.
	VL 39	*Memecylon coeruleum* Jack.
Meliaceae	PS 45	*Aglaia odorata* Lour.
	JRC 269	*Azadirachta indica* A. Juss.
Moraceae	JRC 252	*Artocarpus champenden* Spreng.
	JRC 224	*Artocarpus heterophyllus* Link.
	PS 64	*Phyllochlamys wallichii* Hook. f.
	VL 52	*Streblus asper* Lour.
	VL 51	*Taxotrophis ilicifolia* Vidal.
Myrsinaceae	PS 54	*Ardisia colorata* Roxb.
	VL 6	*Ardisia crenulata* Lodd.
	JRC 293	*Maesa ramentacea* Wall.
Myrtaceae	PS 96	*Melaleuca leucadendron* L.
	PS 62	*Rhodomyrtus tomentosa* Wight.
	VL 49	*Syzygium cumini* (L.) Skeels.
Nepenthaceae	PS 72	*Nepenthes rafflesiana* Jack.
Oxalidaceae	VL 14	*Biophytum sensitivum* DC.
Palmae	JRC 226	*Caryota mitis* Lour.
Piperaceae	VL 36	*Piper longum* L.
Plumbaginaceae	VL 28	*Plumbago indica* L.
Rhizophoraceae	JRC 288	*Rhizophora apiculata* Bl.
Rubiaceae	PS 29	*Gardenia carinata* Wall.
	PS 76	*Geophila repens* (L.) I.M. Johnston
	PS 112	*Greenea jackii* W. and A.
	JRC 222	*Ixora javanica* (Bl.) DC.
	JRC 218	*Morinda citrifolia* L.
	PS 217	*Paederia foetida* L.
	JRC 242	*Prismatomeris malayana* Ridl.
	JRC 277	*Randia siamensis* Craib.
Rutaceae	PS 70	*Atalantia monophylla* Corr.
	JRC 213	*Clausena excavata* Burm.
	JRC 270	*Feroniella lucida* (Scheff.) Swingle
	PS 44	*Murraya paniculata* (L.) Jack.
Sapindaceae	VL 46	*Allophyllus cobbe* (L.) Raeusch.

TABLE 2: SPECIES GIVING A NEGATIVE TEST FOR ALKALOIDS *(Cont.)*

Family	Herbarium No.	Species
	PS 194	*Cardiospermum halicacabum* L.
Scrophulariaceae	VL 13	*Scoparia dulcis* L.
	PS 139	*Torenia atropurpurea* Ridl.
Simaroubaceae	JRC 247	*Eurycoma longifolia* Jack.
Smilacaceae	JRC 237	*Smilax blumei* A. DC.
	VL 10	*Smilax polyacantha* Willd.
Solanaceae	PS 201	*Solanum torvum* Sw.
	JRC 290	*Solanum trilobatum* L.
Sonneratiaceae	JRC 286	*Sonneratia caseolaris* Engler
Sterculiaceae	VL 2	*Commersonia bartramia* (L.) Merr.
	PS 63	*Helicteres hirsuta* Lour.
	JRC 264	*Melochia corchorifolia* L.
	PS 71	*Pterospermum pierii* Hance.
Taccaceae	PS 78	*Tacca laevis* Roxb.
Theaceae	JRC 244	*Schima noronhae* Reinwdt.
Ulmaceae	PS 220	*Trema orientalis* Bl.
Umbelliferae	VL 20	*Centella asiatica* Urb.
Urticaceae	PS 147	*Elatostema sessile* Forst.
	PS 98	*Poikilospermum sauveolens* (Bl.) Merr.
Verbenaceae	PS 168	*Clerodendrum paniculatum* L.
	PS 143	*Clerodendrum serratum* (L.) Spreng.
	PS 195	*Clerodendrum siphonatus* Br.
	VL 68	*Congea velutina* Wight.
	JRC 312	*Gmelina asiatica* L.
	JRC 219	*Vitex pubescens* Vahl.
	JRC 273	*Vitex trifolia* L.
Violaceae	PS 145	*Rinorea horneri* (Korth) O.K.
Vitaceae	JRC 272	*Cissus repandra* Vahl.
Zygophyllaceae	JRC 282	*Tribulus terrestris L.*

In general, fresh leaves and soft stems (2–4 g) were ground in an unglazed mortar with sufficient clean sand and chloroform to yield a thick slurry. 0.05 N ammoniacal chloroform (10 ml) was then added, and the mixture was stirred for 1 min. before being filtered through paper into a test tube. The chloroform layer was then shaken vigorously with 2N aq. H_2SO_4 (0.5 ml) and the mixture was allowed to stand until two layers had separated. The upper acid layer was then removed with a dropper containing a plug of cotton wool in the tip to act as a filter. The clear acid layer was then treated with a drop of Mayer's reagent which had been prepared by dissolving mercuric chloride (1.36g), and potassium iodide (5.0 g) in water (100 ml). If a heavy precipitate was obtained on the addition of Mayer's reagent the test was judged to be positive.

Table 1 lists (in alphabetical order of family and genus) those species which gave positive tests for alkaloids and Table 2 similarly lists those species which gave negative tests. Altogether 185 species were identified and tested and in all cases voucher specimens have been lodged in the Herbarium of the Biology Department at the Prince of Songkla University. Most species were identified by reference to the Floras of the Malay Peninsula[18], Java[19] and India[20].

Of the species listed in Table 1 we considered that *Holarrhena curtisii* King and Gamble and *Adina cordifolia* Benth. and Hook.f. warranted further examination immediately. This has led to the isolation of the aminoglycosteroid holacurtine and a new alkaloid, N-demethylholacurtine, from the leaves of the former species and the bark of *A. cordifolia* has afforded the known alkaloid cadambine[21,22].

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บทคัดย่อ

จากการสำรวจพืชในภาคใต้ของประเทศไทย ได้พบพันธุ์ไม้ 185 ชนิด จัดอยู่ใน 161 สกุลและ 74 ตระกูล ในจำนวนที่มีพันธุ์ที่มีแอลคาลอยด์ประกอบอยู่ 27 ชนิด ซึ่งจัดอยู่ใน 27 สกุล และ 16 ตระกูล