AGENCY FOR THE ASSESSMENT AND APPLICATION OF TECHNOLOGY

REPORT

ON

BIOPROSPECTING OF INDONESIAN MEDICINAL PLANTS

ALAS PURWO NATIONAL PARK

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TABLE OF CONTENT

I.	Background	1
II.	Aim	2
III.	Activities Outline	2
IV.	Methodology	3
V.	Results	6
VI.	Conclusion	9
VII.	Plant Specimens Collected from Alas Purwo National Park	10

I. BACKGROUND

Compounds isolated from plants have been shown to play an important role in drug discovery for the treatment of various diseases. Countries with rich biodiversity are usually also rich in medicinal plants that have been used for many generations. The use of these plants, especially if supported by ethno-pharmaceutical data, would be very useful in the discovery of new drug candidates. Medicinal plants could also be developed into herbal medicine that is relatively safer and less toxic compared to chemically synthesized drugs. The development of global herbal industries is increasing due to a tendency of increase number of self-medication using natural products. In the last two decades the Government of Indonesia is supporting the research and production of Indonesian herbal medicine. However, besides the documented medicinal plants, Indonesia still has large potential bio resources for the health and welfare of mankind that is still unknown and can be explored.

Indonesia is recognized as a major world center for biodiversity with its wide range of natural habitats, rich plant and animal resources and high numbers of island endemics. Indonesia is in the top five on plant diversity with an estimated 38,000 higher plant species; heads the world list in palm diversity with 477 species, 225 of them endemic; and has over half of the 350 species of dipterocarp trees, with 155 being endemic in Kalimantan. Indonesia also ranks behind only Brazil and possibly Columbia in freshwater fish diversity, about 1,400 species. Some species were discovered only in the 20th century.

Many of Indonesia's biological resources are economically important. Several plant species of global and national importance originated in Indonesia and more than 6000 species of plants and animals are utilized on a daily basis by Indonesian citizens, either harvested from the wild or cultivated. Seven thousand species of marina freshwater fish are the major sources of protein for the Indonesian people. Agriculture and fisheries is the mainstay of the nation's subsistence economy. Numerous wild plants and animals are harvested for domestic or commercial consumption including for medicinal uses.

Indonesia with its rich biodiversity also has a large and diverse amount of medicinal plants. However, it is difficult for Indonesian traditional medicine to be accepted into the formal medical system due to lack of information and scientific report to support in the evidence based medicine. It is estimated that more than 1.000 species of the more than 28.000 plants species found in Indonesia can be used for medicinal purposes but currently only around 300 medicinal plants is used in Indonesian traditional medicine and even those medicinal plants has not been intensively studied especially for its chemical components, activities and safety.

Therefore Indonesia biodiversity has a large potential as a source of active compound for medicinal purpose. History has shown that a significant number of modern drug are extracted from natural products or derivatives of compound extracted from the nature. These compounds have shown important pharmacological activities such as antibiotics, anti-diabetes and anti-cholesterol.

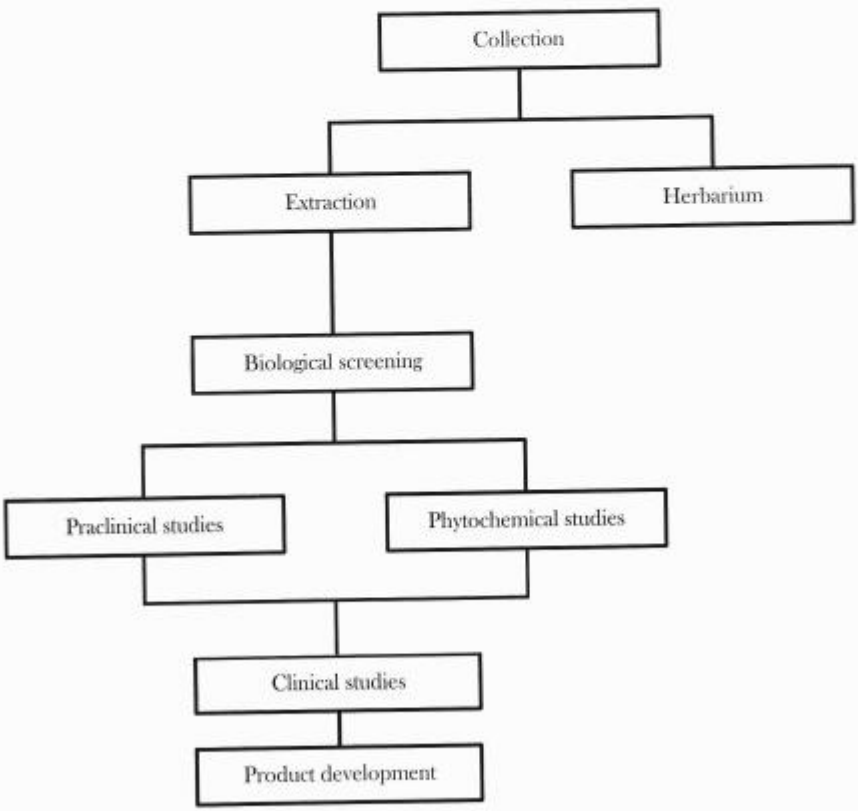
II. AIM

The aims of the Bioprospectingof Indonesia Medicinal Plants activities are:

- To collect, identify and characterize the unexplored medicinal plants of Indonesia.
- To explore the potential of Indonesia medicinal plants especially as herbal medicine.
- To develop herbal medicine from Indonesia unexplored medicinal plants.

III. ACTIVITIES OUTLINE

The outline for the activities in Bioprospecting of Indonesia Medicinal Plants is as follows:



IV. METHODOLOGY

The methodology used in Bioprospecting of Indonesia Medicinal Plants is as follows:

A. Collection of Plant Specimens

The collection of plant specimens was conducted in Alas Purwo National Park -East Java. The expeditions were conducted between 12 July - 19 July 2011. During the expedition 150 plant specimens was collected from Alas Purwo National Park.

Alas Purwo National Park is representative of a typical lowland tropical rain forest ecosystem in Java. Peculiar and endemic species of plant that grow in this Park include sawo kecik (*Manilkara kauki*) and manggong bamboo (*Gigantochloa manggong*). Among the other plants that can be found here are ketapang (*Terminalia cattapa*), nyamplung (*Calophyllum inophyllum*), kepuh (*Sterculia foetida*), and keben (*Barringtonia asiatica*).

A local guide accompanied the expedition team and provided with ethnopharmacological information. A minimum of 400 grams of plant specimens were collected along with herbarium specimen, digital images, location using Global Positioning System (GPS) and all related data were noted to support specimen identification and database purposes.

B. Identification and Preparation of Herbarium Specimens

Vernacular name (local name) and general/specific characterization were noted for each specimen on the spot (location where the specimen is collected) before further identification. The specimens were labeled properly using pencil on paper labels and then wrapped using used newspaper. A group of specimens was tighten by plastic rope, put in the big plastic bag and wet thoroughly with ethanol 75-95% before proper and further processing in the Laboratory.

1. Repacking and drying of specimens

After the specimens arrive in the Laboratory, the specimens were treated as follows:

a. Repacking by changing the newspaper and cleaning the specimens from any visible contamination such as fungi.

b. The specimens were then dried in an oven at 80°C for 2-3 days.

2. Mounting of specimen on duplex paper

The dried specimens were treated as follows:

a. The dried specimens were mounted on to duplex paper using cellophane tape and any important loose part of the specimen is put into an envelope and stuck to the specimen.

b. Mounted specimens were collected and wrapped together in a large plastic bag and stored in a -20°C freezer to avoid any contamination.

3. Identification and labeling

Identification was based on

a. Taxonomy identification book

b. Herbarium collection of Herbarium Bogoriensis

c. Online herbarium identification sites

After the specimens have been identified the identification data were written on the herbarium label and stuck to the herbarium specimens.

4. Storage of herbarium specimens

Herbarium specimens have been identified and labeled; they were grouped according to the Family and stored in cardboard boxes with camphor. These cardboard boxes were then stored in special aluminum cupboards in a 16°C room with constant humidity.

C. Extraction of Plant Specimens

The wet samples were weight and directly dried using *solar dryer* for 2-3 days. The samples were then dried further using *bed dryer* until the water content is less than 10% (ten percent). For samples that are very wet, the drying process was conducted directly in the bed dryer to minimize the destruction of the samples. The temperature of both dryer was a maximal of 40°C. The dried samples were grind using grinder. The grinded dry samples were weight and stored in sealed plastic bags away from direct sunlight.

The grinded dry samples were extracted using maceration method. The extraction was conducted at 25°C (room temperature) using 2 L beaker glass with mixing for certain period. The solvent used was distillated methanol with proportion of the raw material:solvent = 1:10 w/v. The extraction process was conducted two times. The first extraction was conducted for 24 hours. After the first extraction, the extracts were filtered using Whatman paper to separate the filtrate and the waste/raw materials. The second extraction was conducted like the first one. The filtrated yielded from both extraction processes were then mixed and saturated by evaporation using rotary vapor. The evaporation process was conducted at 40°C, 175 mmHg, and 75 rpm with chilled water at 7-8°C. The evaporation process was stopped when there was no distillate dropped from the condenser. The obtained saturated extracts were then weighted, put into capped dark/grey bottle and stored at 4°C.

D. Biological Activity Assay

The extracts were then screened using three different biological activity assay :

1. Cytotoxicity Assay (MTT Assay)

The MTT assayis a colorimetric assaysthat is used to assess the viability (cell counting) and the proliferation of cells. It can also be used to determine cytotoxicity of potential medicinal agents and toxic materials, since those agents would stimulate or inhibit cell viability and growth

MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) is reduced to purpleformazan in living cells. These reductions take place only when reductase enzymes are active, and therefore conversion is often used as a measure of viable (living) cells.A solubilization solution is added to dissolve the insoluble purple formazan product into a colored solution. The absorbance of this colored solution can be quantified by measuring at 570 nm by a spectrophotometer.

Briefly, 1×10^4 Raw264.7 cells/well was adhered to 96 well plate for 4 hours at 37°C, 5% CO_2. Samples were then added and incubate for a further 24 hours. After 24 hours, MTT was added, incubated for 4 hours then DMSO was added and allowed to react for 10 minutes before measuring the absorbance at 570nm.

2. Anti-Inflammation (NO Inhibition)Assay

Nitric oxide (NO) is one of the inflammatory mediators causing inflammation in many organs. NO is produced from L- arginine by a chemical reaction catalyzed by the enzyme inducible nitric oxide synthase (iNOS) in living systems. After stimulation with bacterial lipopolysaccharide (LPS), many cells including macrophages express the iNOS which is responsible for the production of large amount of NO. The anti inflammatory potential medicinal agents are measured for their inhibitory activities against lipopolysaccharide (LPS) induced nitric oxide (NO) production in RAW 264.7 cell lines.

Briefly, 5×10^4 Raw264.7 cells/well was adhered to 96 well plate for 4 hours at 37°C, 5% CO_2. Samples were then added and incubate for a further1 hour. After 1 hour, LPS (lipopolysaccharide) was added and incubated for a further 24 hours. After 24 hours, the supernatant was removed and placed into a new multi well plate. Then Griess Reagent Solutionwas added and allowed to react for 10 minutes at RT, protected from lightbefore measuring the absorbance at 540 nm.

3. Insecticidal Activity Assay

The larvicidal activity of the plant extracts was evaluated as per the method recommended by WHO. Batches of 10 third instar larvae were transferred to a 6 well cell culture plate, each containing 10 ml of water. Three replicate were set up for 500 ppm and an equal number of control were set up using tap water. The percent mortality of larvae for each treatment was recorded at 24 hours.

V. RESULTS

A. Preparation of Herbarium

For each plant specimen at least one copy of herbarium, each herbarium was labeled with information regarding plant specimen. The information includesspecimen ID, date of collection, collector, location, island, habitat, determinator, family, genus, species and vernacular name.

Example of the herbarium

B. Identification of Plant Specimens

The plant specimens collected from Alas Purwo National Park was identified (Attachment 1). The identification of the 150 (one hundred and fifty) plant specimens is listed in Table 1 below.

Table 1 Recapitulation of Specimen Identification fromAlas Purwo National Park

NO	IDENTIFICATION OF PLANT SPECIMENS	NUMBER OF PLANT SPECIMEN
1	Complete identification (Family, Genus and Species)	149
2	Partial identification (Family and Genus)	1
3	Partial identification (Family)	0
4	Unidentified	0
	TOTAL	**150**

The family of all the 150 plant specimens collected has been identified. They belong to 52 different families as listed in Table 2 below.

Table 2 Family of Plant Specimens Collected from Alas Purwo National Park

NO	IDENTIFICATION OF PLANT SPECIMENS	NUMBER OF PLANT SPECIMEN
1.	Acanthaceae	6
2.	Amarillydaceae	1
3.	Anacardiaceae	3
4.	Apocynaceae	7
5.	Arecaceae	5
6.	Asparagaceae	3
7.	Asteraceae	7
8.	Athyriaceae	1
9.	Bignoniaceae	1
10.	Burseraceae	2
11.	Calophyllaceae	1
12.	Clusiaceae	1
13.	Colchicaceae	1
14.	Combretaceae	1
15.	Convolvulaceae	3
16.	Cordiaceae	1
17.	Cyperaceae	2
18.	Dioscoreaceae	1
19.	Dryopteridaceae	1
20.	Ebenaceae	3
21.	Euphorbiaceae	8
22.	Fabaceae	14
23.	Gnetaceae	1
24.	Goodeniaceae	1
25.	Hernandiaceae	1
26.	Lamiaceae	3
27.	Lecythidaceae	3
28.	Lythraceae	1
29.	Malvaceae	8
30.	Marantaceae	1
31.	Meliaceae	4
32.	Moraceae	11
33.	Muntingiaceae	1
34.	Myrtaceae	3
35.	Oxalidaceae	1

NO	IDENTIFICATION OF PLANT SPECIMENS	NUMBER OF PLANT SPECIMEN
36.	Phyllanthaceae	4
37.	Piperaceae	2
38.	Poaceae	2
39.	Primulaceae	1
40.	Pteridaceae	1
41.	Pteridophyta	1
42.	Putranjivaceae	1
43.	Rubiaceae	4
44.	Rutaceae	1
45.	Sapindaceae	4
46.	Sapotaceae	4
47.	Simaurubaceae	1
48.	Solanaceae	1
49.	Ulmaceae	1
50.	Verbenaceae	3
51.	Vitaceae	4
52.	Zingiberaceae	3
	TOTAL	**150**

C. Biological Activity Assay

The plant specimen collected from Alas Purwo National Park have been extracted and are currently being screened for their biological activity including cytotoxicity, anti inflammatory and insecticidal activity.

VI. CONCLUSION

After the plant specimens were collected, they were identified and extracted. The three different bioassays, namely cytotoxicity assay, anti-inflammation assay and insecticidal activity assay, were used to screen the extracts for potential medicinal plants that can be used as anti-asthma, anti inflammation, anti-cancer and for insecticidal activity.

Intensive literature and patent review will be conducted on these plant to analyse whether these plants have been used in patented for these indication or used in commercially available products. Reconfirmation on the identification of plants specimens is also crucial using both morphological and molecular method.

If the results from these preliminary studies show that these plants have potential to be developed into products then further preclinical and phytochemical studies will be conducted.

The plant have been identified and extracted and are currently being screened for their biological activity.

VII. PLANT SPECIMENS COLLECTED FROM ALAS PURWO NATIONAL PARK

No	Specimen ID	Vernacular Name	Scientific Name		
			Family	Genus	Species
1.	PMT 1262	Kedawung	Fabaceae	*Parkia*	*Parkia roxburghii* G.Don
2.	PMT 1263	Kemiri	Euphorbiaceae	*Aleurites*	*Aleurites moluccana* (L.) Willd.
3.	PMT 1264	Sirih Tanah/Rambat	Piperaceae	*Piper*	*Piper sarmentosum* Roxb.
4.	PMT 1265	Sirih cabe	Piperaceae	*Piper*	*Piper retrofractum* Vahl.
5.	PMT 1266	Salam	Myrtaceae	*Syzygium*	*Syzygium polyanthum* (Wight) Walp.
6.	PMT 1267		Moraceae	*Ficus*	*Ficus variegata* Blume
7.	PMT 1268		Moraceae	*Ficus*	*Ficus septica* Burm. f.
8.	PMT 1269	Sawo kecik	Sapotaceae	*Manilkara*	*Manilkara kauki* (L.) Dubard
9.	PMT 1270	Belimbing wuluh	Oxalidaceae	*Averrhoa*	*Averrhoa bilimbii* L.
10.	PMT 1271	Ketangi	Lythraceae	*Lagerstroemia*	*Lagerstroemia speciosa* (L.) Pers.
11.	PMT 1272		Malvaceae	*Pterospermum*	*Pterospermum javanicum* Jungh.
12.	PMT 1273	Suren	Meliaceae	*Toona*	*Toona sureni* (Blume) Merr.
13.	PMT 1274	Cembirit	Apocynaceae	*Voacanga*	*Voacanga grandifolia* (Miq.) Rolfe
14.	PMT 1275	Kanggolasri	Goodeniaceae	*Scaevola*	*Scaevola taccada* (Gaertn.) Roxb.
15.	PMT 1276	Bogem	Lechytidaceae	*Barringtonia*	*Barringtonia asiatica* (L.) Kurz
16.	PMT 1277		Calophyllaceae	*Calophyllum*	*Calophyllum inophyllum* L.
17.	PMT 1278	Borogondolo	Hernandiaceae	*Hernandia*	*Hernandia sonora* L.
18.	PMT 1279	Lampeni	Primulaceae	*Ardisia*	*Ardisia humilis* Vahl.
19.	PMT 1280	Ketapang	Combretaceae	*Terminalia*	*Terminalia catappa* L.
20.	PMT 1281		Vitaceae	*Leea*	*Leea simplicifolia* Zoll. & Moritzi
21.	PMT 1282		Fabaceae	*Pongamia*	*Pongamia pinnata* (L.) Pierre
22.	PMT 1283		Sapindaceae	*Schleichera*	*Schleichera oleosa* Willd.
23.	PMT 1284	Beringin	Moraceae	*Ficus*	*Ficus benjamina* L.
24.	PMT 1285	Dadap Cangkring	Fabaceae	*Erythrina*	*Erythrina fusca* Lour.
25.	PMT 1286	Laban	Lamiaceae	*Vitex*	*Vitex glabrata* R.Br.
26.	PMT 1287	Muni	Phyllanthaceae	*Antidesma*	*Antidesma montanum* Bl.
27.	PMT 1288	Kendal	Cordiaceae	*Cordia*	*Cordia obliqua* Willd.

No	Specimen ID	Vernacular Name	Scientific Name		
			Family	Genus	Species
28.	PMT 1289		Acanthaceae	*Hemigraphis*	*Hemigraphis javanica* Bremek
29.	PMT 1290		Moraceae	*Ficus*	*Ficus virens* Aiton
30.	PMT 1291		Moraceae	*Ficus*	*Ficus tinctoria* G. Forst. subspecies *gibbosa* (Blume) Corner
31.	PMT 1292	Johar	Fabaceae	*Senna*	*Senna siamea* (Lam.) Irwin & Barneby
32.	PMT 1293		Asteraceae	*Chromolaena*	*Chromolaena odorata* (L.) R.M. King & H. Rob
33.	PMT 1294	Ketepeng	Fabaceae	*Senna*	*Senna alata* (L.) Roxb.
34.	PMT 1295	Soka hutan	Rubiaceae	*Ixora*	*Ixora paludosa* (Bl.) Kurz
35.	PMT 1296	Paku laut	Pteridophyta	*Acrostichum*	*Acrostichum aureum* L.
36.	PMT 1297		Moraceae	*Ficus*	*Ficus subulata* Blume
37.	PMT 1298	Pakis	Athyriaceae	*Diplazium*	*Diplazium esculentum* (Retz.) Sw
38.	PMT 1299	Jarong	Verbenaceae	*Stachytarpheta*	*Stachytarpheta jamaicensis* (L.) Vahl
39.	PMT 1300		Malvaceae	*Urena*	*Urena lobata* L.
40.	PMT 1301	Kenitu	Sapotaceae	*Chrysophyllum*	*Chrysophyllum cainito* L.
41.	PMT 1302	Cangcang kuda	Malvaceae	*Sida*	*Sida acuta* Burm. f.
42.	PMT 1303	Kelayu	Sapindaceae	*Erioglossum*	*Erioglossum rubiginosum* (Roxb.) Blume
43.	PMT 1304		Vitaceae	*Leea*	*Leea aculeata* Blume ex Spreng
44.	PMT 1305	Kedoya	Meliaceae	*Dysoxylum*	*Dysoxylum gaudichaudianum* (A.Juss.) Miq.
45.	PMT 1306		Apocynaceae	*Alstonia*	*Alstonia spectabilis* R.Br.
46.	PMT 1307		Anacardiaceae	*Buchanania*	*Buchanania arborescens*(Blume) Blume
47.	PMT 1308		Putranjivaceae	*Drypetes*	*Drypetes serrata* (Maycock) Krug & Urb.
48.	PMT 1309		Malvaceae	*Hibiscus*	*Hibiscus tiliaceus* L.
49.	PMT 1310		Vitaceae	*Tetrastigma*	*Tetrastigma laevigatum* (Blume) Gagnep
50.	PMT 1311		Sapotaceae	*Palaquium*	*Palaquium amboinense* Burck
51.	PMT 1312	Gadung	Dioscoreaceae	*Dioscorea*	*Dioscorea hispida* Dennst.
52.	PMT 1313		Marantaceae	*Donax*	*Donax canniformis* (G. Forst) K. Schum.
53.	PMT 1314	Hangasa/Resah	Zingiberaceae	*Amomum*	*Amomum maximum* Roxb.
54.	PMT 1315		Anacardiaceae	*Dracontomelon*	*Dracontomelon dao* (Blanco) Merr. & Rolfe

No	Specimen ID	Vernacular Name	Scientific Name		
			Family	Genus	Species
55.	PMT 1316		Lamiaceae	*Leucas*	*Leucas zeylanica* (L.) W.T.Aiton
56.	PMT 1317		Arecaceae	*Corypha*	*Corypha utan* Lam.
57.	PMT 1318		Euphorbiaceae	*Cleistanthus*	*Cleistanthus sumatranus* (Miq.) Muell. Arg.
58.	PMT 1319		Ebenaceae	*Diospyros*	*Diospyros buxifolia* (Blume) Hiern
59.	PMT 1320		Verbenaceae	*Lantana*	*Lantana camara* L.
60.	PMT 1321		Convolvulaceae	*Merremia*	*Merremia mammosa* (Lour.) Hallier f.
61.	PMT 1322	Cembirit	Apocynaceae	*Tabernaemontana*	*Tabernaemontana sphaerocarpa* Blume
62.	PMT 1323		Apocynaceae	*Voacanga*	*Voacanga globosa* (Blanco) Merr.
63.	PMT 1324	Angkrung	Muntingiaceae	*Muntingia*	*Muntingia calabura* L.
64.	PMT 1325	Jambu air	Myrtaceae	*Syzygium*	*Syzygium aqueum* (Burm. f.) Alston
65.	PMT 1326		Apocynaceae	*Hoya*	*Hoya diversifolia* Blume
66.	PMT 1327		Vitaceae	*Cissus*	*Cissus diffusa* (Miq.) Amshoff
67.	PMT 1328	jambu batu	Myrtaceae	*Psidium*	*Psidium guajava* L.
68.	PMT 1329	Mata buta	Euphorbiacea	*Excoecaria*	*Excoecaria agallocha* L.
69.	PMT 1330	Laban	Euphorbiaceae	Vitex	*Vitex paniculata* Lam.
70.	PMT 1331	Kayu kambing/wiyu	Burseraceae	*Garuga*	*Garuga floribunda* Decne.
71.	PMT 1332	Serut	Moraceae	*Streblus*	*Streblus asper* Lour.
72.	PMT 1333	Bendo	Moraceae	*Artocarpus*	*Artocarpus elasticus* Reinw. ex Blume
73.	PMT 1334	Serut berduri	Moraceae	*Streblus*	*Streblus spinosus* (Blume) Corner
74.	PMT 1335	Pangkal buaya	Rutaceae	*Zanthoxylum*	*Zanthoxylum rhetsa* DC.
75.	PMT 1336		Euphorbiaceae	*Mallotus*	*Mallotus philippensis* (Lam.) Müll.Arg.
76.	PMT 1337	Pule	Apocynaceae	*Alstonia*	*Alstonia scholaris* (L.) R.Br
77.	PMT 1338	Putat	Lechytidaceae	*Barringtonia*	*Barringtonia acutangula* subsp. *spicata* (Blume) Payens
78.	PMT 1339		Phyllanthaceae	*Bridelia*	*Bridelia tomentosa* Blume
79.	PMT 1340	Semutan	Sapindaceae	*Tristiopsis*	*Tristiopsis acutangula* Radlk.
80.	PMT 1341	Wareng	Verbenaceae	*Gmelina*	*Gmelina elliptica* Sm.
81.	PMT 1342		Phyllanthaceae	*Phyllanthus*	*Phyllanthus reticulatus* Poir.
82.	PMT 1343		Meliaceae	*Azadirachta*	*Azadiractha indica* A. Juss.
83.	PMT 1344	Jambe	Arecaceae	*Areca*	*Areca catechu* L.
84.	PMT 1345	Talok	Euphorbiaceae	*Mallotus*	*Mallotus paniculatus* (Lmk) M.A. var. *paniculatus*

No	Specimen ID	Vernacular Name	Scientific Name		
			Family	Genus	Species
85.	PMT 1346	jabon	Rubiaceae	*Nauclea*	*Nauclea obtusa* Blume
86.	PMT 1347		Clusiaceae	*Garcinia*	*Garcinia dulcis* (Roxb.) Kurz
87.	PMT 1348		Moraceae	*Ficus*	*Ficus racemosa* L.
88.	PMT 1349	Glintungan	Bignoniaceae	*Bischofia*	*Bischofia javanica* Blume
89.	PMT 1350	Timoho	Malvaceae	*Kleinhovia*	*Kleinhovia hospita* L.
90.	PMT 1351		Ebenaceae	*Diospyros*	*Diospyros cauliflora* Blume
91.	PMT 1352		Asteraceae	*Elephantopus*	*Elephantopus scaber* L.
92.	PMT 1353	Besole	Lecythidaceae	*Chydenanthus*	*Chydenanthus excelsus* (Blume) Miers.
93.	PMT 1354	Asem Jawa	Fabaceae	*Tamarindus*	*Tamarindus indica* L.
94.	PMT 1355		Burseraceae	*Protium*	*Protium javanicum* Burm. f.
95.	PMT 1356	Ribandil (Duri Bandil)	Simaurubaceae	*Harrisonia*	*Harrisonia perforata* (Blanco) Merr.
96.	PMT 1357		Poaceae	*Dinochloa*	*Dinochloa scandens* (Blume ex Nees) Kuntze
97.	PMT 1358	Wuwu	Colchicaceae	*Gloriosa*	*Gloriosa superba* L.
98.	PMT 1359		Arecaceae	*Caryota*	*Caryota mitis* Lour.
99.	PMT 1360		Asteraceae	*Blumea*	*Blumea lacera* (Burm. f.) DC
100.	PMT 1361	Paku Jajalokan	Dryopteridaceae	*Tectaria*	*Tectaria zeylanica* (Houtt.) Sledge
101.	PMT 1362	Patian	Euphorbiaceae	*Euphorbia*	*Euphorbia hirta* L.
102.	PMT 1363	Gempur batu	Rubiaceae	*Spermacoce*	*Spermacoce alata* Aubl.
103.	PMT 1364	Gandarusa	Achanthaceae	*Justicia*	*Justicia gendarussa* Burm. f.
104.	PMT 1365		Fabaceae	*Entada*	*Entada phaseoloides* (L.) Merr.
105.	PMT 1366		Fabaceae	*Cassia*	*Cassia fistula* L.
106.	PMT 1367	Gondang hijau	Moraceae	*Ficus*	*Ficus racemosa L.*
107.	PMT 1368	Huni	Phyllanthaceae	*Antidesma*	*Antidesma ghaesembila* Gaertn.
108.	PMT 1369	Kacangan	Fabaceae	*Uraria*	*Uraria lagopodoides* (L.) DC.
109.	PMT 1370		Solanaceae	*Solanum*	*Solanum donianum* Walp.
110.	PMT 1371		Asteraceae	*Struchium*	*Struchium sparganophorum* (L.) Kuntze
111.	PMT 1372		Asteraceae	*Sphagneticola*	*Sphagneticola trilobata* (L.) Pruski
112.	PMT 1373		Acanthaceae	*Ruellia*	*Ruellia tuberosa* L.
113.	PMT 1374	Lempuyang	Zingiberaceae	*Etlingera*	*Etlingera coccinea* (Blume) S.Sakai & Nagam.
114.	PMT 1375		Arecaceae	*Licuala*	*Licuala spinosa* Wurmb
115.	PMT 1376		Arecaceae	*Livistona*	*Livistona rotundifolia* (Lam.) Mart

No	Specimen ID	Vernacular Name	Scientific Name		
			Family	Genus	Species
116.	PMT 1377		Asparagaceae	*Dracaena*	*Dracaena elliptica* Thunb. & Dalm.
117.	PMT 1378	Honje	Zingiberaceae	*Hornstedtia*	*Hornstedtia* sp.
118.	PMT 1379		Asparagaceae	*Dracaena*	*Dracaena reflexa* var. *salicifolia* (Regel) Baker
119.	PMT 1380		Acanthaceae	*Acanthus*	*Acanthus ilicifolius* L.
120.	PMT 1381		Cyperaceae	*Schoenoplectiell a*	*Schoenoplectiella lateriflora* (J.F.Gmel.) Lye.
121.	PMT 1382		Sapindaceae	*Harpullia*	*Harpullia arborea* (Blanco) Radlk.
122.	PMT 1383		Euphorbiacea	*Aleurites*	*Aleurites moluccana* (L.) Willd.
123.	PMT 1384		Poaceae	*Schizostachyum*	*Schizostachyum iraten* Steud.
124.	PMT 1385		Anacardiaceae	*Mangifera*	*Mangifera indica* L.
125.	PMT 1386	Beluntas	Asteraceae	*Pluchea*	*Pluchea indica* (L.) Less.
126.	PMT 1387		Asteraceae	*Sphaeranthus*	*Sphaeranthus africanus* L.
127.	PMT 1388		Pteridaceae	*Acrostichum*	*Acrostichum speciosum* (Fee) C. Presl.
128.	PMT 1389		Acanthaceae	*Hygrophila*	*Hygrophila erecta* (Burm.f.) Hochr.
129.	PMT 1390	Jati Pasir	Rubiaceae	*Guettarda*	*Guettarda speciosa* L.
130.	PMT 1391		Ebenaceae	*Diospyros*	*Diospyros maritima* Blume
131.	PMT 1392	Carang Purut	Sapotaceae	*Palaquium*	*Palaquium amboinense* Burck.
132.	PMT 1393	Walangan	Malvaceae	*Pterospermum*	*Pterospermum diversifolium* Blume
133.	PMT 1394	Melinjo	Gnetaceae	*Gnetum*	*Gnetum gnemon* L.
134.	PMT 1395	Waru Laut	Malvaceae	*Thespesia*	*Thespesia populnea* (L.) Sol. ex Correa
135.	PMT 1396		Fabaceae	*Cynometra*	*Cynometra cauliflora* L.
136.	PMT 1397		Meliaceae	*Xylocarpus*	*Xylocarpus granatum* Koen.
137.	PMT 1398		Fabaceae	*Caesalpinia*	*Caesalpinia bonduc* (L.) Roxb.
138.	PMT 1399	Widuri	Apocynaceae	*Calotropis*	*Calotropis gigantea* (L.) Dryand.
139.	PMT 1400		Acanthaceae	*Avicennia*	*Avicennia marina* (Forssk.) Vierh.
140.	PMT 1401		Cyperaceae	*Scleria*	*Scleria lithosperma* (L.) Sw.
141.	PMT 1402	Suji	Asparagaceae	*Dracaena*	*Dracaena angustifolia* (Medik.) Roxb.
142.	PMT 1403	Bakung	Amarillydaceae	*Crinum*	*Crinum asiaticum* L.
143.	PMT 1404	Dedep serep	Fabaceae	*Erythrina*	*Erythrina hypaphorus* Boerl. ex Koord.
144.	PMT 1405		Malvaceae	*Triumfetta*	*Triumfetta semitriloba* Jacq.

No	Specimen ID	Vernacular Name	Scientific Name		
			Family	Genus	Species
145.	PMT 1406		Convolvulaceae	*Merremia*	*Merremia tridentata* (L.) Hallier f.
146.	PMT 1407		Fabaceae	*Desmodium*	*Desmodium umbellatum* (L.) DC.
147.	PMT 1408		Ulmaceae	*Celtis*	*Celtis wightii* Planch.
148.	PMT 1409		Fabaceae	*Abrus*	*Abrus precatorius* L.
149.	PMT 1410		Lamiaceae	*Ocimum*	*Ocimum basilicum* L.
150.	PMT 1411		Convolvulaceae	*Ipomoea*	*Ipomoea pes-caprae* Roth.