

# POTENTIAL PLANTS IN THE COAST AND MANGROVE FOREST AREA OF SERIBU ARCHIPELAGO

RA Wigati, Nunik Siti Aminah

Pusat Penelitian Pengembangan Ekologi dan Status Kesehatan, Jakarta

**Abstrak.** Kondisi lingkungan yang bervariasi menyebabkan terbentuknya zonasi vegetasi mangrove yang berlapis-lapis, mulai bagian terluar yang sering terkena ombak laut dan gelombang laut serta bagian yang relatif kering di pedalaman. Penelitian tumbuhan berpotensi dilakukan pada tahun 2005, di pulau Kotok dan pulau Rambut yang mewakili vegetasi hutan bakau di Kepulauan Seribu. Pengambilan data menggunakan meta de plot atau petak cuplikan, sedangkan pengukuran keanekaragaman tumbuhan dengan metode sampling. Setiap jenis tumbuh-tumbuhan yang ditemukan dicatat nama daerahnya dan diidentifikasi di Herbarium Bogoriense, Bogar. Jenis tumbuhan bakau putih (*Rhizophora api culata*) sering ditemukan diatas tanah berlumpur dipulau Rambut dan Pulau Kotok. Sedangkan Bakau Kecil (*R. stylosa*) banyak ditemukan di tanah pasir berlumpur, di bagian laut yang lebih tenang hidup tumbuhan api-api (*Avicenia marina*) merupakan tanaman pionir. Di daerah yang masih mempunyai air pasang cukup tinggi ditemukan tanaman jeruk kingkit (*Triphasia trifolia*). Di pedalaman hutan P. Rambut ditemukan bola-bola (*Xylocarpus malucencis*) dan kayu buta-buta (*Excoecaria agalloca*). Jenis mangrove sejati yang hidup terbatas merupakan penyusun utama di P. Rambut dan P. Kotok adalah tumbuhan api-api (*Avicenia alba*) dan bakung (*Crinum asiaticum L.*). Sedangkan penyusun minomya adalah kayu buta-buta (*Excoecaria agalloca*) dan bolabola (*Xylocarpus malucencis*). Ditemukan 43 jenis tumbuhan liar di P. Kotok dan P. Rambut, nilai guna dan manfaat tumbuhan yang berpotensi sebagai penangkap ikan dan tanaman hias masing-masing 5%, peneduh 8%, perkakas rumah tangga 12%, perabot rumah tangga 20%, kayu bakar 30%, bahan baku insektisida 40% dan tumbuhan obat sekitar 78%. Diantara tumbuhan tersebut ada yang bermanfaat ganda, satu jenis tumbuhan bermanfaat sebagai tanaman obat, insektisida dan sebagai sayuran.

**Kata Kunci :** Tumbuhan berpotensi, Hutan Pantai, Hutan Bakau, Kepulauan Seribu

## FOREWORD

Mangroves refer to a formation of plants that grow in brackish marshes, usually located along the coastline and affected by sea tide. In these areas, the accumulation of mud and organic matters are usually very high. Due to the high salinity, and thick silt resulting in poor soil aeration, the types of plants that could live in mangrove are very specific. Only a few species could survive in mangroves. We could found a lot of plant species in

mangrove area, but only 16 families could be considered as true mangrove species, those are the species found only living in mangrove areas and rarely anywhere else. From all those species, 39% of them lives in Indonesia (1). The aim of the research was to know the potential plants in coastal and mangrove forest area in Seribu Archipelago.

Rambut island of the Seribu Archipelago' is famous for its nature reserve forest, managed to protect the diversity and

the beauty of its nature. The Kotok and Rambut island are also a conservation forest, meaning that they are the type of forest reserved for other usage but then conserved for non forestry usage. Rambut island is a beautiful conservation area where every evening we could see birds fly across the island. If the coastal and mangrove forest areas are to be disturbed, it may result in the extinction of its wild plants and animals. Indonesia's biodiversity is the third highest after Brazil and Colombia.

## TIME AND LOCATION

The research was conducted in two island, Kotok and Rambut in 2005. The administration of the two areas included in the Seribu Archipelago district, North Jakarta.

## RESEARCH METHOD

Data collection was performed using plot method, biodiversity measurement through quantitative sampling method (2). In each location (island), a plot is made with rectangle shape and 10m x 100m or 20m x 50m (0.01 ha) size. Each plot is divided into a Sub-Plot, sized 10m x 10m for tree, 5m x 5m for bush, and 1m x 1m for herbs. Individual sum is counted for every species (except for herbs, researchers only estimate coverage area). Every species of plants found was noted its local name, and traditional usage, also fresh collection and herbarium is made.

## RESULT AND DISCUSSION 1.

### Kotok Island

The research was in conservation area has three types of vegetation: coastal forest, mangrove, and secondary

forest. Coastal forest vegetation is dominated by pandan duri (*Pandanus tectorius*) that could reach 3m in height, kangkung pantai (*Ipomoea longiflora*), and Oyot-oyotan (*Ipomoea prescaprae*). In mangrove area, bakau putih (*Rhizophora apiculata*) is dominant. In secondary forest, biduri (*Calotropis gigantea*), nyamplung (*Calophyllum inophyllum*), cemara (*Casuaria equisetifolia*), kayu hitam (*Diosphyros maritima*), buta-butua (*Excoecaria agallocha*), and waru laut (*Thespesia populnea*) is abundant.

### 2. Rambut Island

Rambut Island is a conservation area with 18 hectare width, and has three types of forest vegetation which is; coastal forest, mangroves, and secondary lowland forest. Coastal forest area dominated by grass (*Lepturus repens*) and bushes, ubi dara (*Clerodendrum inerme*) and duri kretek (*Carsalpinia crista*). Mangrove areas are dominated by bakau putih (*Rhizophora apiculata*), bakau kecil (*Rhizophora stylosa*) and bola-bola (*Xylocarpus moluc-censis*). Secondary lowland forest is dominated by jeruk kingkit (*Triphasia trifolia*), mengkudu (*Morinda citrifolia*).

Population and utilization of wild plants in Rambut island and Kotok island can be seen in Table 1 and 2.

In Table 1 and 2, could be identified several wild plants that grow in Rambut island and Kotok island, Seribu Archipelago district according to the bibliographic investigation is potential as material for traditional medicine manufacture. From 43 species of wild plants, 8% of them are utilized as shelter, 8% as fish net, 15% still unknown, 20% as household, 30% as fire log, 40% as

insecticide raw material and 75% as medical ingredients. Valuable points and benefit of plants on Kotok island and Rambut island that have potentials about 5% as fish net material, 5% as shelter, 12%

as household, 40% as insecticide raw material and 78% as medicine plant. Some plants have many functions, one plant can be used as medicine, insecticide, and as vegetable

**Table 1. List of Plants that were Collected in Various Types of Vegetation in Kotok and Rambut Island**

Family/Species	Habitus	Local name	Location		Sum of individual in 0,01 ha	
			K	R	K	R
<i>Acanthaceae</i>						
1. <i>Avicenia marina</i> (Forsk.) Vierh.	P	Api-api	+	+	5	8
<i>Amaryllidaceae</i>						
2. <i>Crinum asiaticum</i> L.	S	Bakung	+		4	
<i>Anacardiaceae</i>						
3. <i>Lannea coromandelica</i> (Houtt.) Merr.	P	Kedondong + Laki			5	
<i>Apocynaceae</i>						
4. <i>Catharanthus roseus</i> (L.) G. Don	S	TapakDara +			50	
5. <i>Ochrosia oppositifolia</i> (Lamk) K. Schum	P	Songgolangrt		+		3
<i>Asclepiadaceae</i>						
6. <i>Calotropis gigantea</i> (Wild.) Dryand ex Ait	Pd	Biduri		+		
7. <i>Wedelia biflora</i> (L.) DC	S			+		6
<i>Caricaceae</i>						
8. <i>Carica papaya</i> L.	P	Pepaya		+		21
<i>Casuarinaceae</i>						
9. <i>Casuarina equisetifolia</i> J.R.G. Forst	P	Cemara	+		6	
<i>Clusiaceae</i>						
10. <i>Calophyllum inophyllum</i> L.	P	Nyamplung	+		12	
<i>Combretaceae</i>						
11. <i>Terminalia catapa</i> L.	P	Ketapang	+		30	
<i>Convolvulaceae</i>						
12. <i>I. pescaprae</i> (L.) R.Br.	H	Oyot-oyotan	+			
<i>Ebenaceae</i>						
13. <i>Diospyros maritime</i> Blume	P	KayuHitam		+		2
<i>Euphorbiaceae</i>						
14. <i>Excoecaria agallocha</i> L.	P	Buta-but		+		3
<i>Fabaceae</i>						
15. <i>Caesalpinia crista</i> L.	L	Duri Kletek		+		24
16. <i>Pongamia pinnata</i> (L.) Pierre	P	Bangkang	+		1	9

<i>Goodeniaceae</i>							
17. <i>Scaevola taccada</i> (Gaertn.) Roxb.	Pd	Jejambu	+	+	7	8	
<i>Gnetaceae</i>							
18. <i>Gnetum gnemon</i> L.	P	Mlinjo		+		2	
<i>Lauraceae</i>							
19. <i>Cuscuta australis</i> R.Br.	Pr	Jala-jala	+				
<i>Malvaceae</i>							
20. <i>Thespesia populnea</i> (L.) Soland ex Corres	P	WaruLaut	+	+	14	2	
<i>Meliaceae</i>							
21. <i>Dysoxylum amooroides</i> Miq	P	Kedoya		+		4	
22. <i>Melia azedarach</i> L.	P	Mindi	+	+	2	2	
23. <i>Xylocarpus moluccensis</i> Roem	P	Bola-bola		+		9	
<i>Moraceae</i>							
24. <i>Ficus superba</i> Mig.	P	Krasak	+	+	6	6	
<i>Pandanaceae</i>							
25. <i>Pandanus tectorius</i> Soland. Ex Park	P	Pandan duri	+		28		
<i>Piperaceae</i>							
26. <i>Piper caninum</i> Blume	L	Cabe Jawa	+	+		9	
<i>Poaceae</i>							
27. <i>Lepturus repens</i> (Forst.) R.Br.			+				
<i>Rhizophoraceae</i>							
28. <i>Ceriops tagal</i>	P	Kunyitan		+		4	
29. <i>Rhizophora apiculata</i> Blume	P	Bakau Putih	+	+	9	48	
30. <i>R. stylosa</i> Griff	P	Bakau Kecil	+	+	4	6	
<i>Rubiaceae</i>							
31. <i>Guettarda speciosa</i> L.	P	Bisoro		+		5	
32. <i>Morinda citrifolia</i> L.	Pd	Mengkudu	+	+	9	10	
<i>Rutaceae</i>							
33. <i>Triphasia trifolia</i> (Burm.f.) Wils.	Pd	J eruk Kingkit		+		86	
<i>Sapindaceae</i>							
34. <i>Allophyllus cobe</i> (L.) Raeusch.	P	Koreak		+		17	
<i>Sterculiaceae</i>							
35. <i>Heritiera littoralis</i> Dryand & Aiton	P	Bayur	+	+	3	3	
36. <i>Sterculia foetida</i> L.	P	Kepuh	+	+	5	2	
<i>Tumeraceae</i>							
37. <i>Tumera ulmifolia</i> L.	S		+		52		
<i>Verbenaceae</i>							
38. <i>Clerodendrum inerme</i> (L.) Gaertn	S	Ubi dara/ Melati Rutan	+	+	14	12	

39. <i>Vitex trifolia</i> L.	Pd	Legundi	+	2 0
K = Kotok Island R = Rambut Island		P = Tree S = Bush Pd = Clump H =Herb		
= Not Found		Pr = Paracites L =Liana		
+ =Found				

**Table 2. Utilization and Value of use from Plants that were Collected in Seribu Archipelago**

Family/Species	Local Name	Value of use	
<i>Acanthaceae</i>			
1. <i>Avicenia marina</i> (Forsk.) raw material	Api-api	Medicinal plant and insecticida	Vierh
<i>Amaryllidaceae</i>			
2. <i>Crinum asiaticum</i> L.	Bakung	Medicinal plant, vegetables and insecticida raw material	
<i>Anacardiaceae</i>			
3. <i>Lannea coromandelica</i> (Routt) fire wood	Kedondong Laki	Medicinal plant, vegetables and	Merr.
<i>Apocynaceae</i>			
4. <i>Catharanthus roseus</i> (L.) G. raw material	Tapak Dara	Medicinal plant and insecticida	Don
5. <i>Ochrosia oppositifolia</i> (Lamk) shrimp poisoning	Songgo Langit and	Medicinal plant, stomach pain	K. Scgum
<i>Asclepiadaceae</i>			
6. <i>Calotropis gigantea</i> (Wild.) raw material	Biduri	Medicinal plant and insecticida	Dryand ex Ait
<i>Caricaceae</i>			
7. <i>Carica papaya</i> L.	Pepaya	Medicinal plant	
<i>Casuarinaceae</i>			
8. <i>Casuarina equisetifolia</i> J.R. G. Forst	Cemara	Medicinal plant, insecticida raw material and fire wood	
<i>Clusiaceae</i>			
9. <i>Calophyllum inophyllum</i> L.	Nyamplung	Medicinal plant, insecticida raw material and fire wood	

<i>Combretaceae</i>		
10. <i>Terminalia catapa</i> L.	Ketepeng	Shading plant, Medicinal plant and insecticida raw material
<i>Convolvulaceae</i>		
11. 1. <i>pes-caprae</i> (L.) R.Br.	Oyot-oyotan	Medicinal plant
<i>Ebenaceae</i>		
12. <i>Diospyros maritima</i> Blume	KayuHitam	Medicinal plant, for making music instrument and statue
<i>Euphorbiaceae</i>		
13. <i>Excoecaria agallocha</i> L.	Buta-buta	Medicinal plant, neutralize poisoning and fire wood
<i>Fabaceae</i>		
14. <i>Caesalpinia crista</i> L.	Duri Kletek	Medicinal plant
15. <i>Pongamia pinnata</i> (L.) Pierre	Bangkong	Fire wood
<i>Goodeniaceae</i>		
16. <i>Scaevola taccada</i> (Gaertn.) Roxb.	Jejambu	
<i>Gnetaceae</i>		
17. <i>Gnetum gnemon</i> L.	Mlinjo	Vegetable and fire wood
<i>Lauraceae</i>		
18. <i>Cuscuta australis</i> R.Br.	Jala-jala	Medicinal plant
<i>Malvaceae</i>		
19. <i>Thespesia populnea</i> (L.) Soland	Waru Laut Ex Corres	Medicinal plant, for making canoe raw material and fire wood
<i>Meliaceae</i>		
20. <i>Dysoxylum amooroides</i> Miq	Kedoya	Shading plant and fire wood
21. <i>Melia azedarach</i> L.	Mindi	plant, insecticida raw material
22. <i>Xylocarpus moluccensis</i> Roem.	Bola-bola	For making canoe raw material and Fire wood
<i>Moraceae</i>		
23. <i>Ficus superba</i> Miq	Krasak	Insecticida plant and fire wood
<i>Pandanaceae</i>		
24. <i>Pandanus tectorius</i> Soland.	ex Pandan duri	raw material Medicinal plant and insecticida Park.
<i>Piperaceae</i>		

25. <i>Piper caninum</i> Blume <i>Rhizophoraceae</i>	Cabe Jawa	Medicinal plant and insecticida raw material
26. <i>Ceriops tagal</i>	Kunyitan	The wood for underpinning and medicinal plant
27. <i>Rhizophora apiculata</i> Blume	Bakau Putih	The wood for anchor, medicinal plant, fish trap and fire wood
28. <i>R. stylosa</i> Griff. <i>Rubiaceae</i>	Bakau Kecil	Fish trap and fire wood
29. <i>Guettarda speciosa</i> L.	Bisoro	Fire wood
30. <i>Morinda citrifolia</i> L. <i>Rutaceae</i>	Mengkudu	Medicinal plant
31. <i>Triphasia trifolia</i> (Burm.f.) Wils. <i>Sapindaceae</i>	Jeruk Kingkit	Ornamental and medicinal plant
32. <i>Allophyllus cobe</i> (L.) Raeusch <i>Sterculiaceae</i>	Korea k	Shading plant and fire wood
33. <i>Heritiera littoralis</i> Dryand and Aiton	Bayur	Fire Wood
34. <i>Sterculia foetida</i> L. <i>Verbenaceae</i>	Kepuh	Shading plant and fire wood
35. <i>Lantana camara</i> L.	Pletokan	Medicinal plant and insecticida raw material
36. <i>Clerodendrum inerme</i>	Melati hutan	Insecticida raw material
37. <i>Vitex trifolia</i> L.	<u>Legundi</u>	<u>Medicinal plant and insecticida raw material</u>

This plant can be cultivated as a plant that has an economic value in Seribu Archipelago. Those plants are; *Cataranthus roseus* (L.) G. Don. used to cure malaria, diarrhoea, diabetic, cancer, and skin diseases. It contains vindoline (up to 0,5%), serpentine, catharanthine, ajmalicine, akuammine, lochnerine, tetrahydroalstonine (2); *Clerodendrum inerme* (L.) Gaerin (Forest Jasmine), its seed can be used to cure stomach ache that caused by poison from eating sea fish. Its root can be used to cure rheumatic (8); *Crinum asiaticum* L. (Beach Lily), its leaf can be used for inflammation treatment and as diuretic (8); *Morinda citrifolia* L. its fruit

to cure diabetic, beri -beri, asthma, cough, and respiration problem (3); *Piper aduncum* L. (Sea Betel Vine), its leaf contains saponin, flavonoid, polifenol, and volatile oil that can be used for high blood pressure, asphyxia, and pektai, sap and stalk can be used as abscess medicine; *Eugenia polyanta* Wight (Salam) leaf and bark contains saponin and flavonoid, leaf contains alkaloids, and polifenol; stalk contains tannin that can be used as diarrhoea, digestive disease, and gastric ulcers disease, *Cassia tora* L. (Ketepeng), leaf contains saponin, flavonoid, and polifenol, leaf as dermal disease medicine, scabies, and malaria.

Different types of plant preparations such as powders, solvent extracts, essential oils and whole plants are being investigated for their insecticidal activity including their action as fumigants, repellents, antifeedants, anti-ovipositions and insect growth regulators (3). Considerable efforts have been focused on plant derived materials, potentially useful as commercial insecticides. Toxic effects of plant products on some pests have been studied by many researchers (4). Wild plants as insecticides that are found in Kotok island and Rambut island among others; *Clerodendrum inerme* (Forest Jasmine), leaf extract with water is poisonous for beetle and used to Insect Growth Rate for rice pest; *Lantana Camara* (Tembelekan), leaf and flower as antifeedan, leaf extract with water is poisonous for *Aphis*, whereas leaf extracted with ether as larvacide for agricultural pest, dried leaf powder for potato pest, and leaf extract as larvacide for pest. Leaf extract with alcohol can be used to repellent for *Aedes aegypti*; *Vitex trifolia* (Legundi), leaf extract can be used as insecticide, repellent and IGR for *Aedes aegypti*. Leaf powder can be used as insecticide for warehouse pest; *Ipomoea prescaprae* (Oyot-oyotan), seed and leaf powder as insecticide for pest; *1. longiflora* (Kangkung Laut) extract from bud, root and leaf with ether can be used as attractant for insect; *Piper caninum*, extract and powder from leaf with water can be utilized as insecticide for beetle, seed extract with acetone can kill *Achanthascelidus* sg Piperine is deathful for warehouse pest (5).

*Melia azedarah* (Mindi), leaf fruit and seed containing saponin, flavonoid, polifenol. Flavonoid from *M azedarah* can be used as biological insecticide. *Pandanus tectorius* (Pandanus), leaf contains saponin, alkaloid, flavonoid, tannin and polifenol. Leaf extract with alcohol 90% potential as

larvacide for *Aedes aegypti* which is LD50 found in concentration 0.300 mg and LD100 in concentration 0.900 mg. *Ficus superba* (Krasak) containing flavonoid and polifenol, leaf extract with water can be used as antifeedan from *Spodoptera* sp.

Root and leaf from *Catharantus roseus* (Tapak Dara) containing saponin, alkaloids and flavonoids, beside that, roots also contain tannin. Root extract useful for antifeedan in warehouse and leaf pest, while leaf extract as larvacide. Leaf extract with water causes growth obstacle, leaf extract can be used as insecticide for *Sarcophaga* sp, leaf and root extract as antifeedan for rice pest (5).

*Terminalia catapa* (Ketepeng), leaf extract used for repellent for Japanese beetle, *Callophyllum inophyllum* (Nyamplung), leaf extract and oil from leaf can be used for insecticides agricultural pest. *Casuarina* sp (Cemara), leaf extract and stalk containing terpenoid, potential for repellent for pest.

We can know that several coastal plants have an economic value in Kotok and Rambut island is api-api or also known as api-api merah, is one of mangroves species from *Achantaceae* (previously *Verbenaceae* or *Avicenniaceae*). Its botanical name is *Avicennia marina* (Forsk.) Vierh. This tree is in estuary. This species can be used as alternative control for heavy metal contamination in coastal area. Research conducted by Daru Setyo Rini (1) said that api-api tree have a high ability to accumulate heavy metal. This mangrove species that dominate east coast of Surabaya have a prevention system from toxic material by diluting heavy metal concentration. Of saving much water to dilute heavy metal concentration in its tissue, it can minimize toxicity from heavy metal. This species can be developed as



controller heavy metal contamination in coastal area.

Heavy metal contamination in East coast of Surabaya mainly caused by industrial waste that use heavy metal in its production process, such as: metal manufacturing, paint and coloring, paper, printing, electrical instrumentation etc (4).

Solvation of a metal in water controlled by pH (6). Toxicity of heavy metal to living organism depends on kind of metals, Plumbum (Pb), Cadmium (Cd), and Mercury (Hg) which are the most poisonous metal in living organism (7).

Bakau tree (*Rhizophora apiculata*) can accumulate copper (Cu), Mn, and Zinc (Zn) (8) also reported that hipocotyl of *Rhizophora* can be used as alternative protection for coastal estuary.

Mangroves that grow in river delta is accumulation spot for wastes in the river, if the waste coming to the estuary exceeds the purification ability of a delta. Copper (Cu) in high or low concentration is very toxic for plants if there is no other substance in solution. As fungicide, Copper is used as powder and spray. Copper is also needed by several plants as micro elements in respiratory process (9).

The research of heavy metal concentration of Cadmium (Cd) and Copper (Cu) was done by Daru Set yo Rini, showed that api-api tree from Wonokromo river delta, Surabaya (East Java) have the highest copper degree in root 11,5319 mg/gr and cadmium in root 8,6387, in trunk 3,7752 mg/gr, and leaf 1,2138 mg/gr. Average degree of copper in silt from Wonokromo river delta is 13/7513 mg/gr and cadmium is 11,7495mg/gr.

Another plants that dominate coastal area is *Cemara muricata* (Cemara Laut) used as fire log, fence post in mining, gun barrel, and ship making. Its bark can be

used to cure shiver, leaf for stomach stiff, and seed for hypotense.

## CONCLUSIONS

Potential plants in coastal forest and mangroves area are:

1. Beach Forest  
Beach with dry land and stones dominated by *Callophyllum inopyllum* (nyamplung)
2. Mangrove  
Beach with river edge and influenced by sea tide, dominated by *Avicennia marina* (api-api)
3. Some plants dominate either coastal or mangrove forests have potential for traditional medicine, insecticide, supplying food and drink, and also decrease contamination of heavy metal matter

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