Medicinal Plant Diversity and Vegetation Analysis of Logged over Hill Forest of Tekai Tembeling Forest Reserve, Jerantut, Pahang

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The research is financed by Research University Grant Scheme, Universiti Putra Malaysia (03/01/07/0039RU)

Abstract

The study was carried out to analyze the species diversity and study of quantitative analysis of medicinal plants in logged over forest in Tekai Tembeling Forest Reserve (TTFR). Four plots of 1-hectare size each were established within the forest area. A total of 6788 individual medicinal trees and non trees representing 231 species, 179 genera and 87 families were recorded. The species area curve did not approach an asymptote condition. The regression equation to estimate species richness was $Ln S = -0.47833 + (0.577954 * Ln(A))$ with r^2=0.95%. The most diverse species for trees was *Cinnamomum porrectum* and *Lygodium circinnatum* for non trees. The most diverse plot was plot 2 with 7335 individuals and 188 species. Since the forest area was diverse in medicinal species, it is necessary to begin conservation assessment that will improve medicinal plants biodiversity.

Keywords: Species diversity, Importance value index (IVI), Medicinal plant

1. Introduction

Malaysia has been classified as one of the 12 megadiversity countries of the world. Altogether, these twelve megadiversity countries comprise at least 60% of the world's known species (Latiff, 2005). Plant has been used for ages for food, shelter, treat human disorders and disease. Malaysia has about 15,000 species of flowering plants of which about 10% are said to be medicinal (Faridah Hanum et. al. 2001a, Faridah Hanum et. al. 2001b). Medicinal plant could be defined as plants which may have medicinal properties and many of them were collected from forest. Medicinal plants is one of the valuable non-timber in the forest. Traditional medicine is an important part in Malaysian culture and were practiced by ancestors long before the inroduction of modern medicine. The complete reports on the Malay traditional medicinal plants was reported by Burkill (1935) in a book entitled "A Dictionary of the Economic Products of the Malay Peninsula". Burkill (1935) provided the first comprehensive knowledge about the medicinal plants of Peninsular Malaysia, and that became the starting point for the phytochemists and ethnobotanist to do some studies and research relating to the medicinal plants. All of these works add a comprehensive knowledge to the account of the Malaysian medicinal plants. 'In conjunction with phytochemical screenings and chemical studies by the chemists, the above compilation attempted to introduce the diversity of medicinal plants to the Malaysian public was made. This is the key for future bioprospecting in Malaysia. It covers 135 families and more than 1000 species of medicinal plants. Those that are commonly used in traditional practices only cover about 103 families and 768 dicotyledonous species documented, and hence would definitely impeded the country's efforts to better and judiciously utilize them for the benefits of the populations' (A. Latiff, 2007). According to Tuan Marina et. al. (2007), there was high species richness, abundance and economic value of medicinal plants at Tranum Forest Reserved, Raub, Pahang. This forest categorized as hill forest. The most popular and high demanding of medicinal plants within this area are *Phyllagathis rotundifolia, Labisia pumila, Mapania cuspidata, Homalomena sagittifolia, Peliosanthes teta and Tacca integrifolia*. It proved that, hill forest also have abundance of medicinal plants to look at. This paper provides species diversity and quantitative analysis of medicinal plants in four hectare plots of hill forest of Tekai Tembeling Forest Reserve (TTFR), Jerantut, Pahang. The findings of this study indicate that TTFR is most

diverse for medicinal plant such as *Cinnamomum porrectum, Lygodium circinnatum, Globba sp., Labisia pumila* and many else.

2. Methodology

2.1 Study site

This study were conducted at Tekai Tembeling Forest Reserve, Jerantut, Pahang. This is logged over hill dipterocarp forest and majority of the stocks are dipterocarp species. The fieldwork was carried out during May-December 2008. This forest area were logged over 2-5 years ago.

2.2 Data collection

Four plots each size 1 hectare were established at different elevation within the hill forest. Each of the 1 hectare plot were divided into 100 of 10x10m quadrates. The elevation range from 340a.s.l - 520a.s.l. Data were gathered from each quadrates. Data collected were divided into two groups, tree and non-tree. Plants with diameter at breast height (dbh) more or equal to 5.0 cm were classified as tree while plants with dbh less than 5.0 cm were classified as non-tree. Parameters recorded for tree were species name, dbh and height. For non-tree species name and number of individuals were recorded. Dbh for trees were measured at 1.37m above the ground level by using diameter tape. The height of trees were measured using laser hypsometer. All the specimens collected were brought to UPM herbarium for drying process and proceed to Forest Research Institute Malaysia (FRIM) for identification and verification by expert. Then, all the specimens were identified again according to Burkill (1935) to separate plant which possess medicinal value. Data on medicinal plants were recorded in database for statistical analysis.

2.3 Data analysis

Data collected were used to calculate frequency, density and basal area. Density, frequency and basal area of each species in each plot were calculated to seek importance value index (IVI). Vegetation analysis is the best way to study species composition and vegetation structure in one ecosystem and IVI were calculated in vegetation analysis (Bambang & Ati, 2006). Importance Value Index (IVI) is the sum of relative density, relative dominance and relative frequency for a species and is calculated as follows (Curtis and Mclntosh, 1950). This formula were used to calculate IVI for trees only.

IVI of sp. i = relative density of sp. i + relative frequency of sp. i + relative dominance of sp. i

where:

$$relative\ density = \frac{(no.individuals\ of\ species)}{total\ individuals\ of\ all\ species} * 100$$

$$\text{relative frequency} = \frac{\text{frequency of species i}}{\text{total frequency values for all species}} * 100$$

$$\text{relative dominance} = \frac{\text{basal area of species i}}{\text{total basal area of all species}} * 100$$

However, data on relative dominance which is derived from basal area is not possible for non-trees. According to Bambang and Ati (2006), IVI for undergrowth (non trees) calculated using formula modified as below:

IVI of sp. i = relative density of sp. i + relative frequency of sp. i

The Family Value Index (FVI) is the sum of relative density, relative frequency and relative dominance (tree only) for a family and was calculated using same formula as IVI, where species is replaced by family.

The data for computing species richness, evenness and diversity indices were analyzed using Ecological Methodology Software (Krebbs, 1998) formula.

2.3.1 Species richness

Jackknife estimate

$$\hat{s} = s + (n - 1/n)k$$

where; $\hat{s}$ = jack knife estimate of species richness

s = observed total number of species present in quadrates

n = total quadrates

k = unique species

2.3.2 Species diversity

Simpson's Index

$$\hat{D} = 1 - \sum Pi^2$$

where; $\hat{D}$ = Simpson's index

Pi = proportion of species i in the community

Shannon-Weiner measure

$$H' = \sum_{i=1}^{s} (Pi)(\log Pi)$$

where; H' = information content of sample (bits/individual) and index of diversity

s = number of species

Pi = proportion of total sample belonging to i species

2.3.3 Species evenness

Simpson's measure of evenness

$$E_{1/D} = (1/\hat{D})/s$$

where; $E_{1/D}$ = Simpson measure of evenness

s = number of species in the sample

$\hat{D}$ = Simpson index

Smith and Wilson's index of evenness

$$E_{var} = 1 - [2/(\pi \arctan\{\sum_{i=1}^{s} (\log_e(n_i) - \sum_{j=1}^{s} \left(\frac{\log_e(n_j)}{s}\right)^2 /s\})]$$

where E_{var} = Smith and Wilson's index of evenness

n_i = Number of individuals in species i in sample ($i = 1, 2, ..., s$)

n_j = Number of individuals in species j in sample ($j = 1, 2, ..., s$)

s = Number of species in entire sample

3. Results and discussion

(Note 1)

Figure 1 showed the species accumulation curve constructed from the four 1-hectare plots. The number of medicinal plant species increase as the sample area increase but did not approach an asymptote condition. The actual number of species almost reach an asymptote condition. But the estimated number of species showed the number of species increase rapidly as the sample area increase and shows no signs to approach asymptotic condition. The estimated species richness plotted in Figure 1 followed the estimate regression equation $Ln\hat{S} = -0.47833 + (0.377954 * Ln(A))$ with r^2=0.95%.

(Note 2)

Table 1 showed most of the medicinal plant are from the group of tree, woody, climber and shrubs. 27 species from herbaceous, 14 from fern, 4 from palm and 3 from epiphyte. The largest group of tree, woody, climber and shrub represent 79.2% from all species occured.

(Note 3)

A total of 6,788 stems of medicinal plants comprising 231 species included in 179 genera and 87 families were identified from all four 1-ha plots. Most of the stems conquered by non-trees because the plots were logged over within 2-5 years ago, so it has lack number of large trees. The three most diverse families collected across all categories were Euphorbiaceae, Annonaceae and Rubiaceae. Most of these species families were represented by one genus and many species. These three families represent about 19.2% of the total species recorded in the study area. In terms of individuals composition, the study area was dominated by three most abundance medicinal tree species, namely *Cinnamomum porrectum* (Lauraceae), *Garcinia scortechinii* (Guttiferae) and *Croton argyratus* (Euphorbiaceae). For non trees the three most abundance medicinal species were *Lygodium circinnatum*

(Schizaeaceae), *Globba sp.* (Zingiberaceae) and *Croton argyratus* (Euphorbiaceae). Appendix 1 showed the uses of each medicinal plants found in TTFR. The plants may be used internally or externally. The parts of plants used for medical purpose were leaves, roots, bark, stems and shoot. The use of medicinal plants for treatments such as skin disease, fever, coughs, post-natal mother, tonic and so many else. It were practised by our ancestors for many centuries ago and has been passed for every generations. These herbal medicine is an alternative remedy besides modern drugs. Nowadays, there were increasing of interest on value of medicinal plants. Possibly, the demand of these plants will increase as well for future health care needs (Shaharuddin, 2005).

(Note 4)

The distribution of dbh classes shown in Figure 2 conformed to a reverse 'J' shape curve with 359 individuals having dbh between 5.0-9.9 cm, 154 individuals of 10-14.9 cm dbh and 84 individuals of 15.0-19.9 cm dbh. The number of individuals with a diameter greater than 50cm was 7. In dbh range 5-9.9cm showed plot 4 has the highest number of species compared to others. The number of medicinal plants which have dbh less than 5cm was 6108 individuals. The reverse 'J' shape size class distribution curve was obtained which is typical of all types of forests particularly in the logged-over forest where small trees emerges due to canopy openings in the forest area (Kunwar & Sharma, 2004). Low pioneer vegetation dominated the area after logging. For trees the total number of medicinal plants is 674 while 6059 for non trees. The large proportion of medicinal plants with dbh less than 5cm indicates that majority of the medicinal plants are undergrowth.

(Note 5)

Appendix 2 showed the quantitative analysis for medicinal trees with dbh ≥5cm. A total of 99 medicinal tree species were observed from this study and the total of individual of trees is 674. Three most diverse species were *Cinnamomum porrectum*, *Garcinia scortechinii* and *Croton argyratus*. However, when the study site were evaluated in terms of importance value index (IVI), the three most important species are *Cinnamomum porrectum*, *Shorea leprosula* and *Ochanostachys amentaceae*. The dominant and co-dominant species were *Cinnamomum porrectum* and *Shorea leprosula*, showing their values of IVI of 20.84 and 18.43 respectively and the highest (35 plants / 4ha) value of density was also recorded for *Cinnamomum porrectum* with their contributions to the study site were 5.17% of the total density, 4.87% of frequency, 10.81% of basal area and 6.95% of IVI. Co-dominant species contribute 3.10% 0f total density, 3.02% of frequency, 12.31% of basal area and 6.14% of IVI.

(Note 6)

The non trees composition from Appendix 3, shows a total of 228 medicinal species were recorded. The study area were dominated by five most abundance species namely, *Lygodium circinnatum* (183), *Globba sp*. (147), *Labisia pumila* (147), *Tectaria singaporeana* (142) and *Croton argyratus* (126). These five medicinal species represent about 12.3% of the total medicinal plants species from non trees which found in the four hectare plots. The IVI also indicates that the area was dominated by these five species.

(Note 7)

Referring to Appendix 4, the most five dominant family for tree were Lauraceae, Euphorbiaceae, Guttiferae, Dipterocarpaceae and Annonaceae. While, the less dominant family were Styracacea with FVI 0.39 and Menispermaceae with FVI 0.34. Appendix 5 indicates the highest value for FVI from non trees were dominated by five family such Euphorbiaceae, Annonaceae, Rubiaceae, Melastomataceae and Zingiberaceae. Family from Violaceae and Orchidaceae possess the same lowest value of FVI 0.03.

(Note 8)

Figure 3 showed the dominance-diversity curve plotted between importance value index and species sequence for trees and non trees which indicates a relationship between different species showing importance value in study site. Species dominance related to the availability of suitable niche and resource apportionment in a community has often been interpreted from the dominance diversity curve (Kunwar & Sharma, 2004). For trees, at the beginning, the curve quite steep because there were several species possess high IVI value than others, but then the curve moving consistent with gentle slope. The gentle slope of dominance diversity curve indicates steady growth of trees, while sharp depression of the curve representing the small size classes of trees is the results of human disturbance (logging). For non trees the curve is not very clear. The different between the IVI value also not obvious. Thus, indicates all the medicinal non trees contribute the same significant to the composition of medicinal plants within this study site.

3.1 Species Diversity

(Note 9)

Referring to Table 2, the species diversity in four hectare plots of TTFR was calculated using Ecological Methodology Software (Krebbs, 1998). Comparison of the four plots in the study area showed the highest species diversity index H'=6.189, plot 2 and plot 1 showed the lowest species diversity index H' of 4.632. Shannon-Weiner index (H') was one of the most common indices used to evaluate forest diversity and the higher value of Shannon-Weiner's index indicates high species richness (Tuan Marina, et. al., 2007). Shannon-Weiner measure assumes that a random sample is taken from an infinitely large population and that all the species in the community population are represented in the sample (Robert, 1974). The average of diversity index for Shannon-Weiner measure was 5.708 (above 5.0) indicates high diversity. The Brillouin's index of diversity range from 4.56 to 6.108 and the Simpsons index (S) range from 0.869 to 0.976. Smith and Wilson's measure maximum evenness value were recorded in plot 3 (0.38) while the minimum was registered at plot 2 (0.243).

4. Conclusion

This study showed that TTFR has a diverse population of medicinal plants. A total of 6788 medicinal trees and non trees represented by 231 species, 179 genera and 87 family found within the study site. The most dominant medicinal tree was *Cinnamomum porrectum* (Lauraceae) while *Lygodium circinnatum* (Schizaeaceae) for non tree species. The most dense and diverse plot represent by plot 2 which comprise the greatest number of individuals and species. This paper concludes that a proper management from human disturbance and scientific management of medicinal plants of the forest area may lead a rich biodiversity site in Malaysia.

Acknowledgements

This study was conducted in collaboration with the Pahang State Forestry Department, Malaysia and was supported by Research University Grant Scheme (03/01/07/0039RU).

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Notes

Note 1. Figure 1 is placed here

Note 2. Table 1 is placed here

Note 3. Appendix 1 is placed here

Note 4. Figure 2 is placed here

Note 5. Appendix 2 is placed here

Note 6. Appendix 3 is placed here

Note 7. Appendix 4 and Appendix 5 is placed here

Note 8. Figure 3 is placed here

Note 9. Table 2 is placed here

Table 1. Number of species by class

Category of plant	no. of species
tree/ woody/ climber/ shrub	183
herbaceous	27
fern	14
palm	4
epiphyte	3
TOTAL	231

Table 2. Diversity indices of Tekai Tembeling Forest Reserve

Diversity indices	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
N	4850	7335	2513	3119
S_{obs}	116	188	121	133
R	129.9	223.6	136.8	151.8
H	4.560	6.108	5.876	5.866
H’	4.632	6.189	6.019	5.993
S	0.869	0.976	0.976	0.975
E	0.267	0.243	0.380	0.322

 ISSN 1916-9752 E-ISSN 1916-9760

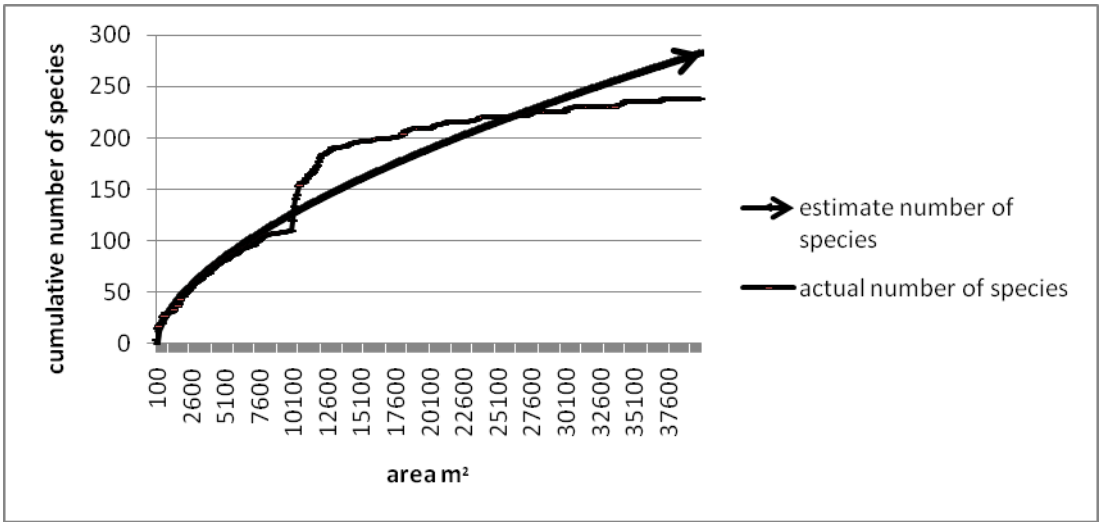

Figure 1. Species area curve

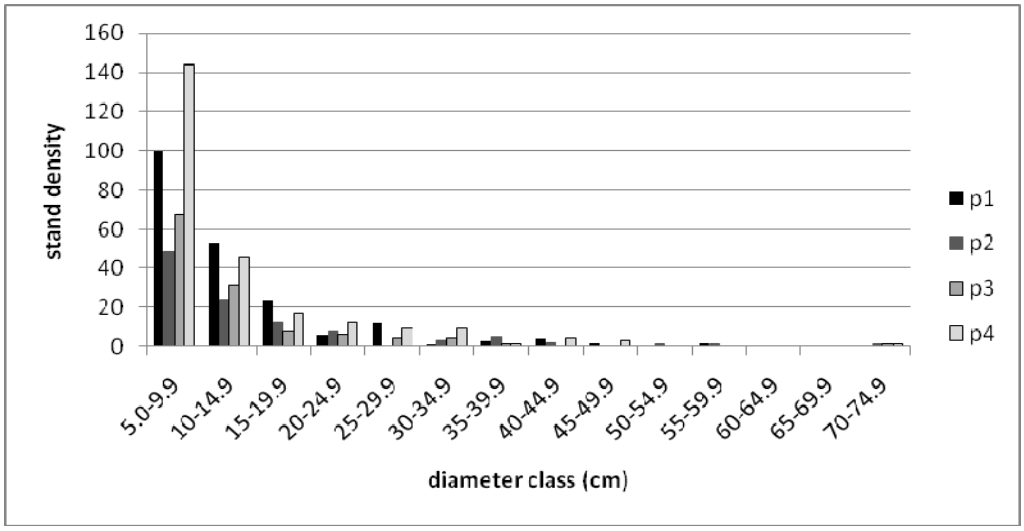

Figure 2. Distribution of medicinal plants in different size classes

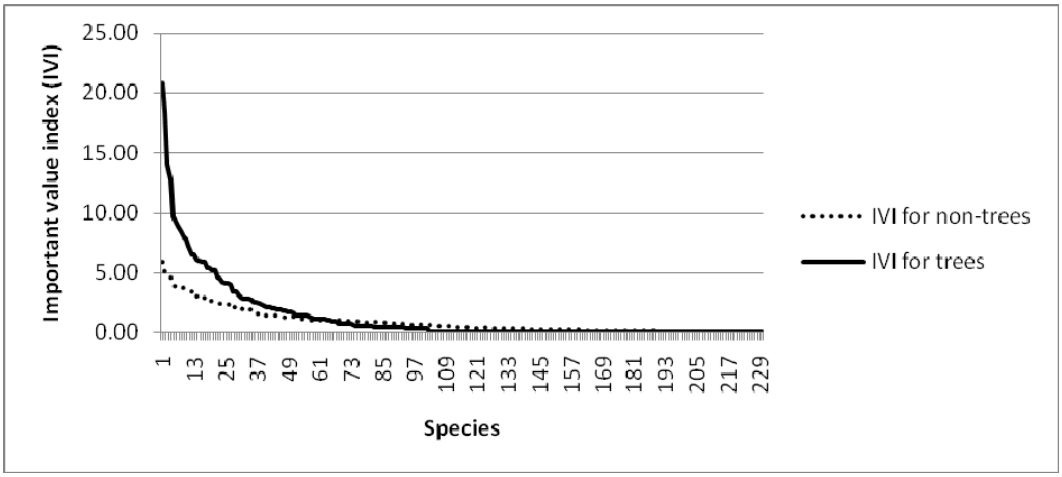

Figure 3. Dominance diversity curve for the medicinal plants (trees and non trees)

Appendix 1. Uses of medicinal plants in TTFR based on Burkil (1935) and Kamarudin & Latiff (2002)

NO.	SPECIES NAME	USES
1	*Acrotrema costatum*	protective medicine for women after childbirth.
2	*Agelaea macrophylla*	rheumatism and in an aphrodisiac with *smilax*
3	*Agrostistachys longifolia var*	for tooth-ache
4	*Albizzia splendens*	diarrhoea
5	*Alpinia malaccensis*	sores
6	*Alstonia augustiloba*	for remittent fever
7	*Amischotolype griffithii*	fever
8	*Amischotolype molissima*	to treat malarial fever
9	*Ancistrocladus tectorius*	dysentery and malaria
10	*Antidesma montanum*	for headache in children, for measles, chicken-pox and malaria
11	*Aralidium pinnatifitidum*	fever, rheumatism
12	*Ardisia crenata*	applied to the skin for scurf, ear-ache and orchitis
13	*Ardisia villosa*	for dropsyand jungle fevers.
14	*Arenga pinnata*	for stone in the bladder, phthisis, dysentery and lactagogue.
15	*Artabotrys grandifolius*	treatment after childbirth
16	*Artocarpus elasticus*	dysentery, for poulticing ulcers and prevents conception.
17	*Asplenium nidus*	for washing hair and to facilitate giving birth
18	*Baccaurea brevipes*	to regulate menstruation
19	*Baccaurea parviflora*	to ease urinating
20	*Barringtonia scortechinii*	the fruit are edible and the seed used as a spice to flavour food.
21	*Bauhinia bidentata*	given internally to women for nervous complaints and treatment of toothache
22	*Blechnum orientale*	urinary complaints and for dropsy.
23	*Bouea macrophylla*	poultice for headache and for thrush
24	*Breynia discigera*	poulticing over the kidneys.
25	*Bridelia tomentosa*	for colic, stomacache and for fever
26	*Callicarpa candicans*	for abdominal troubles, for bringing on the menses and for poulticing wounds
27	*Calophyllum rubiginosum*	for itch and other skin complaints
28	*Calophyllum wallichianum*	for itch and other skin complaints
29	*Campylospermum serratum*	for dysentery and for fever
30	*Carallia brachiata*	the leaves for treatment in sapraemia. The bark is employed in the treatment of
31	*Carallia suffruticosa*	for worms, coughs, after childbirth as protective medicine and for bathing in
32	*Cayratia molissima*	pouticing swellings
33	*Chassalia chartacea*	malaria, coughs, childbirth, cuts, wounds and ulcers.
34	*Chrysophyllum roxburgii*	the fruit can be eaten
35	*Cinnamomum porrectum*	tonic
36	*Cinnamomum javanicum*	after childbirth
37	*Cinnamomum sintoc*	diarrhoea and other intestinal complaints. As vermifuge. Also used for
38	*Clerodendron deflexum*	for fever and bowel complaints
39	*Clerodendron laevifolium*	contains saponin which beneficial to human body.
40	*Clidemia hirta*	used as antidote
41	*Cnestis palala*	for stomacache,after childbirth,malaria and gonorrhoea.
42	*Colocasia esculenta*	for wounds, including snake bites.
43	*Combretum sundaicum*	for head ache
44	*Connarus ferrugineus*	as antiseptic for skin complaints
45	*Coptosapelta griffithii*	for colic and fevers
46	*Coptosapelta parviflora*	for colic and fevers
47	*Coscinium fenestratum*	poultice cuts and sores with it.
48	*Costus speciocus*	colds, rheumatism, pneumonia, tonic, depurative, small pox, coughs,
49	*Cratoxylum cochinchinensis*	for colic, itch, skin complaints and stomach-ache.
50	*Cratoxylum formosum*	used for antioxidants.

 ISSN 1916-9752 E-ISSN 1916-9760

51	*Croton argyratus*	to cure purging, diarrhoea and after childbirth.
52	*Croton laevifolium*	after childbirth
53	*Ctenolophon parvifolius*	cooling lotion for elephants
54	*Cyathea mollucana*	for sores on the legs.
55	*Cyrtandra capulata*	after childbirth and cure fever
56	*Cyrtandromoea grandis*	fever
57	*Dalbergia pinnata*	for varicose veins, nervous disorders, itch and an embrocation for coughs
58	*Desmos chinensis*	dysentery or after childbirth and for vertigo
59	*Didisandra wrayii*	a genus of herbs.
60	*Diospyros argenteum*	applying in herpes
61	*Diospyros buxifolia*	treat venereal disease, diabetes and whiteness
62	*Diospyros lanceifolia*	cure ill waist.
63	*Diospyros latisepala*	venereal disease
64	*Diospyros sumatrana*	used as a protective medicine after childbirth
65	*Dipteris conjugata*	in lower Siam its roots are eagerly collected as being of medicinal value
66	*Dissochaeta celebica*	affords an 'ubat meroyan'.
67	*Dissochaeta intermedia*	after childbirth as protective medicine.
68	*Donax grandis*	snake bites, to sore eyes and for blood poisoning
69	*Donax parviflorus*	snake bites, to sore eyes and for blood poisoning
70	*Dryobalanops aromatica*	treat wound, tooth-ache, stomach-ache, head-ache, eye complaints and urinary
71	*Dysoxylum cauliflorum*	for rheumatism and for abdominal pains
72	*Elaeocarpus floribundus*	used as a mouth-wash for inflamed gums
73	*Elaeocarpus nitidus*	the fruit eaten by local in Sabah
74	*Embelia ribes*	as an anthelmintic, alterative, tonic, coughs and diarrhoea
75	*Entada rheedei*	for itch, abdominal complaints, colic and severe internal complaints.
76	*Epipremnum giganteum*	treat ulcerated nose.
77	*Epiprinus malayanus*	for healthy and ageless.
78	*Erycibe albida*	used chiefly in childbirth
79	*Eurycoma longifolia*	used as a febrifuge, for internittent fever, for childbirth, head-ache,wounds,
80	*Euthemis leucocarpa*	the roots used medicinally
81	*Fagerlindia fasciculata*	for poulticing sores
82	*Fagraea acuminatissima*	as a poultice in fever and head-ache
83	*Fagraea fragrans*	for passing blood in stools and for malaria
84	*Fagraea racemosa*	a tonic after fever, for pains in the loins, for curing fever in children. Boiled
85	*Fibraurea tinctoria*	after childbirth, dysentery, diabetes and for treating ulcerated noses.
86	*Ficus hispida*	for fever, after childbirth, stomach-ache in children, fever, diarrhoea and
87	*Fissistigma lanuginosum*	after childbirth and for stomach-ache
88	*Flacourtia rukam*	for diarrhoea, dysentery, dysmenorrhoea, to inflamed eye-lids and for small
89	*Forrestia griffithii*	for fever
90	*Friesodielsia affinis*	for ringwormh
91	*Galearia fulva*	for gonorrhoea
92	*Garcinia atroviridis*	after confinement and for ear-ache
93	*Garcinia griffithii*	for abortion.
94	*Garcinia nigrolineata*	used in making a lotion for running eyes
95	*Garcinia scortechinii*	curing cuts
96	*Gironniera hirta*	after childbirth as a protective medicine
97	*Globba patens*	used as a protective medicine (meroyan) after childbirth.
98	*Globba sp.*	Cure a fever and ability to give invulnerability
99	*Gnetum gnemon*	the fruit use to prevent constipation
100	*Gnetum tenuifolium*	after childbirth
101	*Goniothalamus macrophylla*	for colds, fever, administering after childbirth, applied to swelling and
102	*Goniothalamus malayanus*	used to treat small-pox and arthritic illness

103	*Gynotroches axillaris*	for poulticing the head in fever
104	*Hanguana malayana*	pain in the bones.
105	*Henckelia platypus*	coughs
106	*Homalomena sp.*	after childbirth and another is for the poulticing of yaws-sores
107	*Hoya sp.*	tonic
108	*Hulettia dumosa*	for all disease of the abdomen and to the gums for tooth-ache
109	*Hydnocarpus castanea*	for internal disorders and skin disease
110	*Intsia palembanica*	given to men who have become demented by reason of elephant spirits
111	*Ixonanthes icosandra*	head-ache, cough
112	*Ixonanthes reticulata*	used as potion (ubat pengasih)
113	*Labisia Pumila*	after childbirth as a protective medicine, to expedite labour, for flatulence,
114	*Lansium domesticum*	to cuts, ulcers, swellings,for rheumatism
115	*Lasianthus oblongus*	after childbirth
116	*Leea indica*	skin complaints, including caterpillar itch, poulticing for body pains and for
117	*Lepidagathis sp.*	coughs, to procure abortion during the first three month of pregnancy.
118	*Lepisanthes tetraphylla*	coughs and for bathing for fever
119	*Leptonychia caudata*	during childbirth, for fever, ulcerated noses and cooling lotion in fever.
120	*Litsea elliptica*	it supplies the 'perawas' bark of native medicines and very aromatic
121	*Litsea grandis*	applied to wounds.
122	*Litsea lancifolia var lancifolia*	the leaves are used for poulticing boils.
123	*Luvunga scandens*	to reduce malaria fever.
124	*Lycopodiella cernua*	lotion in beri-beri, coughs and uneasiness of the chest
125	*Lygodium circinnatum*	protective medicines after childbirth and for wounds.
126	*Macaranga conifera*	for malaria and dopsy.
127	*Macaranga gigantea*	for diarrhoea and dysentery
128	*Macaranga hypoleuca*	used as a febrifuge, expectorant and anti-spasmodic
129	*Macaranga triloba*	for stomach-ache and poultice boils on the head.
130	*Maclurodendron porteri*	to treat high blood pressure.
131	*Maesa ramentacea*	for itch, other skin disease and for pain at the heart.
132	*Mallotus macrostachys*	for cleansing wounds, fever
133	*Mapania palustris*	has cooling properties. Good for kidney.
134	*Medusanthera gracilis*	for rheumatism and used to blacken teeth
135	*Melastoma malabathricum*	for diarrhoea, dysentery, women after childbirth, used for leucorrhoea,
136	*Memecylon dichotomum var*	lotion for rheumatism, for vertigo and is given internally after childbirth
137	*Memecylon minutiflorum*	one of the 'rempah ratus' or hundred ingredients given after childbirth
138	*Merremia peltata*	for stomach-ache, for coughs, diarrhoea, worms, sore eyes, for washing hair
139	*Mesua ferrae*	poulticing wounds, draught taken after childbirth
140	*Mezettia leptopoda*	used for strengthen energy and maintain health
141	*Microcos fibrocarpa*	the pulped use in cooking.
142	*Microcos latifolia*	the fruit use in cooking.
143	*Mitrella kentii*	for fever
144	*Molineria capitulata*	one of the several drugs to be sprinkled over the body of an elephant to cure
145	*Molineria latifolia*	for menorrhagia or used as lotion in ophthalmia, fever, used as a stomachic
146	*Murraya paniculata*	for blistered in stomach, tooth-ache, tonic and for tapeworm problem.
147	*Mussaenda sp.*	asthma, recurrent fevers and dropsy.
148	*Nephrolepis auriculata*	itch and used for treat hypertension.
149	*Ochanostachys amentacea*	for fever, after childbirth and rheumatic fever
150	*Oncosperma horridum*	fever
151	*Paramignya lobata*	to facilitate labour.
152	*Parkia speciosa*	prevent diabetes, kidney relating problem, hypertension, stomach-ache and to
153	*Payena lucida*	after childbirth
154	*Peliosanthes teta*	treating diarrhoea

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155	*Pentaspadon motleyi*	for itch and similar skin disease. kill the parasites but set up great irritation in
156	*Peperomia sp.*	anti-rheumatic and head-ache.
157	*Phyllanthus emblica*	fever, dysentery, head-ache, vertigo, dyspepsia, as a diuretic, conjunctivitis,
158	*Pimelodendron griffithianum*	fruit edible.
159	*Pinanga disticha*	an antidote to poison ingested
160	*Piper sarmentosum*	to cure weakness and pains in the bones, head-ache, for 'panau' or
161	*Pittosporum ferrugineum*	malaria
162	*Pleocnemia irregularis*	cure diarrhoea and skin complaints.
163	*Plocoglottis javanica*	for ear-ache.
164	*Podocarpus polystachyus*	as a alternative in rheumatism and for painful joints.
165	*Poikilospermum sp.*	prescribes leaves for application to an abscess or carbuncle before and roots
166	*Polyalthia glauca*	give to women after chilbirth to shrink the uterus.
167	*Polyalthia hypoleuca*	after childbirth as a protective medicine (ubat meroyan)
168	*Polyalthia sumatrana*	the plants used for head-ache
169	*Pometia pinnata*	fever and to festering sores
170	*Popowia tomentosa*	ingredient for poison.
171	*Porterandia anisophyllea*	for itch and abortion.
172	*Prunus arborea var arborea*	the bitter bark tasting like laurel is medicinal. There is glucoside in it like
173	*Psydrax nitidum*	f diarrhoea. Hydrocyanic acid occurs in the leaves.
174	*Pteris ensiformis*	for cleansing unhealthy tongues of children and for glandular swelling of the
175	*Pternandra coerulescens*	for poulticing in orchitis or hydrocele, for vomiting and administered after
176	*Pternandra echinata*	for coughs and asthma.
177	*Pyramidanthe prismatica*	for diarrhoea and snake-bite
178	*Pyrenaria acuminata*	for sores on the legs.
179	*Rhodamnia cinerea*	after chilbirth, protective medicine, for stomach-ache and used as a poultice
180	*Rinorea anguifera*	as a protective draught after childbirth.
181	*Rourea acutipetala var acutipetala*	for lumbago.
182	*Rourea mimosoides*	colic, leprosy, as an 'ubat meroyan' after childbirth and to children for colds.
183	*Rourea rugosa*	for constipation and apparently it is resorted to freely.
184	*Salacca glabrescens*	fruit edible.
185	*Salacia grandiflora*	after childbirth.
186	*Sandoricum koetjape*	one of the rempah ratusas a protective medicine after childbirth, for remittent
187	*Santiria griffithii*	prescribed for rheumatism.
188	*Sapium baccatum*	to treat 'bisul'.
189	*Saraca cauliflora*	the fruit is used medicinally.
190	*Sauropus androgynus*	for fever and for stricture of the bladder.
191	*Scaphium linearicarpum*	as a febrifuge.
192	*Scaphium macropodum*	for fever and dysentery.
193	*Schima wallichii*	one of the 'rempah ratus' infused to make a draught for a mother after
194	*Selaginella intermedia*	for stomach-ache, rheumatism and asthma.
195	*Selaginella plana*	to stop bleeding.
196	*Selaginella wallichii*	as a protective medicine after childbirth
197	*selaginella wildenowii*	for high fever, for pains in the back, tonic medicine and poultices for skin
198	*Shorea leprosula*	a tonic for adolescent.
199	*Sindora coriacea*	wood-oil is used for medicinal purposes.
200	*Sindora wallichii*	Use after childbirth.
201	*Smilax megacarpa*	the juice is given to a child at birth.
202	*Smilex sp.*	after childbirth.
203	*Spatholobus ferrugineus*	for colic and after childbirth, for irregular menstruation, uterine haemorrhage,
204	*Sticherus truncatus*	useful in healing high fever.
205	*Styrax benzoin*	used for asthma in children.
206	*Symplocos crassipes var penangiana*	for stomach-ache.

207	*Symplocos rubiginosa*	for swollen spleen.
208	*Syngramma alismifolia*	Used as a substitute for *Helminthostachys* (as a tonic, for fever, medicine for
209	*Syzygium polyanthum*	for diarrhoea and for itch.
210	*Tacca integrifolia*	as a poultice for a rash due to irritant hairy caterpillars.
211	*Taenitis blechnoides*	use as protective medicine (ubat meroyan) after childbirth.
212	*Tectaria singaporeana*	cure for fever and a post-natal tonic.
213	*Tetracera indica*	for itch.
214	*Tetracera scandens*	after childbirth also given in dysentery, diarrhoea, for burns and for coughs.
215	*Thottea corymbosa*	for tooth-ache and as a diuretic during confinement.
216	*Thottea tomentosa*	for poulticing skin complanits, Snake bites and for coughs.
217	*Tinomiscium petiolare*	for rheumatism.
218	*Toona sp.*	for dysentery, poultices to wounds.
219	*Trema orientalis*	for sore tongue, for diarrhoea and the passing of blood in the urine.
220	*Uncaria cordata*	used for sores and callus.
221	*Urophyllum glabrum*	for fever.
222	*Uvaria grandiflora*	to warm children body, after childbirth, stomach-ache, tooth-ache, scabies and
223	*Ventilago sp.*	tonic
224	*Xanthophyllum amoenum*	the fruit used for head skin itch and remove danddruff.
225	*Ximenia americana*	for colic.
226	*Xylopia ferruginea*	to stop vomiting.
227	*Xylopia malayana var obscura*	one of the hundred ingredients (rempah ratus) given to a women after
228	*Zingiber griffithii*	used for poulticing, for giddiness, fever and cure asthma.
229	*Zingiber officinale*	ginger taken into stomach is a warm, stimulating carminative and when
230	*Zingiber spectabile*	for poulticing swelling and for bathing eyes with inflamed lids.
231	*Ziziphus kunstleri*	administered after childbirth.

Appendix 2. Quantitative analysis of vegetation of medicinal plants (trees) in TTFR

No.	Species name	Family	D	F	BA	RD (%)	RF (%)	RBA (%)	IVI
1	*Cinnamomum porrectum*	Lauraceae	35	29	1.542	5.19	4.89	10.85	20.93
2	*Shorea leprosula*	Dipterocarpaceae	21	18	1.756	3.12	3.04	12.36	18.51
3	*Ochanostachys amentacea*	Olacaceae	15	14	1.356	2.23	2.36	9.54	14.13
4	*Garcinia scortechinii*	Guttiferae	30	27	0.538	4.45	4.55	3.79	12.79
5	*Elaeocarpus floribundus*	Elaeocarpaceae	23	22	0.367	3.41	3.71	2.58	9.70
6	*Xanthophyllum amoenum*	Polygalaceae	21	20	0.398	3.12	3.37	2.80	9.29
7	*Croton argyratus*	Euphorbiaceae	29	20	0.182	4.30	3.37	1.28	8.96
8	*Cinnamomum javanicum*	Lauraceae	20	16	0.396	2.97	2.70	2.79	8.45
9	*Mallotus macrostachys*	Euphorbiaceae	22	15	0.314	3.26	2.53	2.21	8.01
10	*Memecylon minutiflorum*	Melastomataceae	21	18	0.231	3.12	3.04	1.63	7.78
11	*Scaphium linearicarpum*	Sterculiaceae	14	13	0.423	2.08	2.19	2.98	7.25
12	*Mesua ferrae*	Guttiferae	13	13	0.340	1.93	2.19	2.39	6.51
13	*Rhodamnia cinerea*	Myrtaceae	18	13	0.233	2.67	2.19	1.64	6.50
14	*Artocarpus elasticus*	Moraceae	5	5	0.642	0.74	0.84	4.52	6.11
15	*Flacourtia rukam*	Flacourtiaceae	16	16	0.131	2.37	2.70	0.92	5.99
16	*Baccaurea parviflora*	Euphorbiaceae	17	16	0.097	2.52	2.70	0.68	5.90
17	*Hydnocarpus castanea*	Flacourtiaceae	8	7	0.499	1.19	1.18	3.51	5.88
18	*Xylopia ferruginea*	Annonaceae	12	12	0.226	1.78	2.02	1.59	5.39
19	*Polyalthia hypoleuca*	Annonaceae	15	15	0.087	2.23	2.53	0.61	5.37
20	*Polyalthia sumatrana*	Annonaceae	15	13	0.118	2.23	2.19	0.83	5.25

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21	*Psydrax nitidum*	Rubiaceae	14	13	0.136	2.08	2.19	0.96	5.23
22	*Medusanthera gracilis*	Icacinaceae	11	8	0.233	1.63	1.35	1.64	4.62
23	*Memecylon dichotomum var*	Melastomataceae	15	7	0.155	2.23	1.18	1.09	4.50
24	*Maclurodendron porteri*	Rutaceae	8	8	0.235	1.19	1.35	1.65	4.19
25	*Diospyros lanceifolia*	Ebenaceae	13	10	0.073	1.93	1.69	0.51	4.13
26	*Cinnamomum sintoc*	Lauraceae	9	8	0.202	1.34	1.35	1.42	4.11
27	*Trema orientalis*	Ulmaceae	15	9	0.040	2.23	1.52	0.28	4.02
28	*Sindora coriacea*	Leguminosae	5	5	0.257	0.74	0.84	1.81	3.39
29	*Scaphium macropodum*	Sterculiaceae	9	9	0.076	1.34	1.52	0.53	3.39
30	*Urophyllum glabrum*	Rubiaceae	10	8	0.043	1.48	1.35	0.30	3.14
31	*Ptenandra echinata*	Melastomataceae	6	6	0.138	0.89	1.01	0.97	2.87
32	*Diospyros buxifolia*	Ebenaceae	7	6	0.112	1.04	1.01	0.79	2.84
33	*Agrostistachys longifolia var*	Euphorbiaceae	8	8	0.040	1.19	1.35	0.28	2.82
34	*Macaranga gigantea*	Euphorbiaceae	7	6	0.105	1.04	1.01	0.74	2.79
35	*Baccaurea brevipes*	Euphorbiaceae	7	6	0.097	1.04	1.01	0.69	2.74
36	*Pittosporum ferrugineum*	Pittosporaceae	7	5	0.095	1.04	0.84	0.67	2.55
37	*Ardisia crenata*	Myrsinaceae	7	7	0.046	1.04	1.18	0.32	2.54
38	*Litsea elliptica*	Lauraceae	5	5	0.122	0.74	0.84	0.86	2.44
39	*Sandoricum koetjape*	Meliaceae	5	5	0.096	0.74	0.84	0.68	2.26
40	*Eurycoma longifolia*	Simaroubaceae	7	6	0.026	1.04	1.01	0.18	2.23
41	*Fagraea fragrans*	Loganiaceae	5	4	0.099	0.74	0.67	0.70	2.11
42	*Pentaspadon motleyi*	Anacardiaceae	5	5	0.074	0.74	0.84	0.52	2.11
43	*Ixonanthes icosandra*	Ixonanthaceae	4	4	0.110	0.59	0.67	0.77	2.04
44	*Agelaea macrophylla*	Connaraceae	3	3	0.149	0.45	0.51	1.05	2.00
45	*Carallia brachiata*	Rhizophoraceae	5	5	0.046	0.74	0.84	0.32	1.91
46	*Barringtonia scortechinii*	Lcythidaceae	6	5	0.022	0.89	0.84	0.15	1.89
47	*Bouea macrophylla*	Anacardiaceae	3	3	0.126	0.45	0.51	0.89	1.84
48	*Macaranga triloba*	Euphorbiaceae	4	4	0.072	0.59	0.67	0.51	1.77
49	*Syzygium polyanthum*	Myrtaceae	4	4	0.065	0.59	0.67	0.46	1.73
50	*Lepisanthes tetraphylla*	Sapindaceae	5	5	0.016	0.74	0.84	0.11	1.70
51	*Parkia speciosa*	Leguminosae	1	1	0.186	0.15	0.17	1.31	1.63
52	*Breynia discigera*	Euphorbiaceae	4	4	0.025	0.59	0.67	0.18	1.45
53	*Ctenolophon parvifolius*	Ctenolophonaceae	1	4	0.088	0.15	0.67	0.62	1.44
54	*Intsia palembanica*	Leguminosae	2	2	0.113	0.30	0.34	0.79	1.43
55	*Pternandra coerulescens*	Melastomataceae	3	3	0.060	0.45	0.51	0.43	1.38
56	*Calophyllum wallichianum*	Guttiferae	3	3	0.060	0.45	0.51	0.42	1.37
57	*Rourea rugosa*	Connaraceae	4	4	0.012	0.59	0.67	0.08	1.35
58	*Macaranga hypoleuca*	Euphorbiaceae	3	3	0.036	0.45	0.51	0.26	1.21
59	*Garcinia nigrolineata*	Guttiferae	3	3	0.027	0.45	0.51	0.19	1.14
60	*Elaeocarpus nitidus*	Elaeocarpaceae	3	3	0.022	0.45	0.51	0.16	1.11
61	*Prunus arborea var arborea*	Rosaceae	3	3	0.020	0.45	0.51	0.14	1.09
62	*Dryobalanops aromatica*	Dipterocarpaceae	1	1	0.106	0.15	0.17	0.74	1.06
63	*Diospyros sumatrana*	Ebenaceae	3	3	0.015	0.45	0.51	0.11	1.06
64	*Litsea grandis*	Lauraceae	2	2	0.057	0.30	0.34	0.40	1.03
65	*Dissochaeta celebica*	Melastomataceae	3	3	0.010	0.45	0.51	0.07	1.02
66	*Rourea mimosoides*	Connaraceae	3	2	0.023	0.45	0.34	0.16	0.95
67	*Payena lucida*	Sapotaceae	2	2	0.033	0.30	0.34	0.23	0.87

68	*Pyrenaria acuminata*	Theaceae	2	2	0.016	0.30	0.34	0.12	0.75
69	*Cratoxylum formosum*	Guttiferae	2	2	0.012	0.30	0.34	0.08	0.72
70	*Microcos latifolia*	Tiliaceae	2	2	0.010	0.30	0.34	0.07	0.70
71	*Santiria griffithii*	Burseraceae	2	2	0.009	0.30	0.34	0.06	0.69
72	*Pimelodendron griffithianum*	Euphorbiaceae	2	2	0.008	0.30	0.34	0.06	0.69
73	*Diospyros latisepala*	Ebenaceae	2	2	0.006	0.30	0.34	0.04	0.68
74	*Peliosanthes teta*	Convallariaceae	1	1	0.045	0.15	0.17	0.32	0.63
75	*Dysoxylum cauliflorum*	Meliaceae	1	1	0.033	0.15	0.17	0.23	0.55
76	*Clerodendrum laevifolium*	Verbenaceae	2	1	0.010	0.30	0.17	0.07	0.54
77	*Friesodielsia affinis*	Annonaceae	2	1	0.009	0.30	0.17	0.07	0.53
78	*Pometia pinnata*	Sapindaceae	2	1	0.008	0.30	0.17	0.06	0.52
79	*Symplocos rubiginosa*	Symplocaceae	1	1	0.028	0.15	0.17	0.20	0.51
80	*Garcinia atroviridis*	Guttiferae	1	1	0.019	0.15	0.17	0.13	0.45
81	*Murraya paniculata*	Rutaceae	1	1	0.015	0.15	0.17	0.11	0.42
82	*Schima wallichii*	Theaceae	1	1	0.014	0.15	0.17	0.10	0.41
83	*Uvaria grandiflora*	Annonaceae	1	1	0.012	0.15	0.17	0.08	0.40
84	*Campylospermum serratum*	Ochnaceae	1	1	0.012	0.15	0.17	0.08	0.40
85	*Styrax benzoin*	Styracaceae	1	1	0.010	0.15	0.17	0.07	0.39
86	*Albizzia splendens*	Leguminosae	1	1	0.008	0.15	0.17	0.05	0.37
87	*Entada rheedei*	Leguminosae	1	1	0.007	0.15	0.17	0.05	0.36
88	*Leptonychia caudata*	Sterculiaceae	1	1	0.007	0.15	0.17	0.05	0.36
89	*Porterandia scortechchinii*	Rubiaceae	1	1	0.006	0.15	0.17	0.04	0.36
90	*Maesa ramentacea*	Myrsinaceae	1	1	0.006	0.15	0.17	0.04	0.36
91	*Microcos fibrocarpa*	Tiliaceae	1	1	0.005	0.15	0.17	0.04	0.35
92	*Paramignya lobata*	Rutaceae	1	1	0.003	0.15	0.17	0.02	0.34
93	*Calophyllum rubiginosum*	Guttiferae	1	1	0.003	0.15	0.17	0.02	0.34
94	*Fibraurea tinctoria*	Menispermaceae	1	1	0.003	0.15	0.17	0.02	0.34
95	*Lansium domesticum*	Meliaceae	1	1	0.003	0.15	0.17	0.02	0.34
96	*Mezettia parvilora*	Annonaceae	1	1	0.003	0.15	0.17	0.02	0.34
97	*Xylopia malayana var*	Annonaceae	1	1	0.002	0.15	0.17	0.02	0.33
98	*Polyalthia glauca*	Annonaceae	1	1	0.002	0.15	0.17	0.01	0.33
99	*Antidesma montanum*	Euphorbiaceae	1	1	0.002	0.15	0.17	0.01	0.33
	TOTAL		674	593	14.211	100	100	100	300

D = density, F = frequency, BA = basal area, RD = relative density, RF = relative frequency, RBA = relative basal area, IVI = importance value index

Appendix 3. Quantitative analysis of vegetation of medicinal plants (non trees) in TTFR

No.	Species	Family	D	F	RD (%)	RF (%)	IVI
1	*Lygodium circinnatum*	Schizaeaceae	183	159	3.02	2.92	5.94
2	*Globba sp.*	Zingiberaceae	147	140	2.43	2.57	4.99
3	*Labisia Pumila*	Myrsinaceae	147	136	2.43	2.50	4.92
4	*Tectaria singaporeana*	Dryopteridaceae	142	126	2.34	2.31	4.66
5	*Croton argyratus*	Euphorbiaceae	126	105	2.08	1.93	4.01
6	*Fibraurea tinctoria*	Menispermaceae	116	106	1.91	1.94	3.86
7	*Melastoma malabathricum*	Melastomataceae	122	100	2.01	1.83	3.85

8	*Pinanga disticha*	Palmae	117	100	1.93	1.83	3.77
9	*Rourea rugosa*	Connaraceae	115	100	1.90	1.83	3.73
10	*Ziziphus kunstleri*	Rhamnaceae	115	94	1.90	1.72	3.62
11	*Shorea leprosula*	Dipterocarpaceae	110	92	1.82	1.69	3.50
12	*Garcinia scortechinii*	Guttiferae	106	93	1.75	1.71	3.46
13	*Trema orientalis*	Ulmaceae	95	84	1.57	1.54	3.11
14	*Henckelia platypus*	Gesneriaceae	96	77	1.58	1.41	3.00
15	*Tetracera scandens*	Dilleniaceae	97	75	1.60	1.38	2.98
16	*Scaphium macropodum*	Sterculiaceae	87	81	1.44	1.49	2.92
17	*Uncaria cordata*	Rubiaceae	88	74	1.45	1.36	2.81
18	*Macaranga triloba*	Euphorbiaceae	83	77	1.37	1.41	2.78
19	*Baccaurea parviflora*	Euphorbiaceae	80	74	1.32	1.36	2.68
20	*Breynia discigera*	Euphorbiaceae	83	68	1.37	1.25	2.62
21	*Lasianthus oblongus*	Rubiaceae	79	65	1.30	1.19	2.50
22	*Mapania palustris*	Cyperaceae	74	68	1.22	1.25	2.47
23	*Homalomena sp.*	Araceae	75	66	1.24	1.21	2.45
24	*Urophyllum glabrum*	Rubiaceae	72	67	1.19	1.23	2.42
25	*Dissochaeta celebica*	Melastomataceae	77	62	1.27	1.14	2.41
26	*Rhodamnia cineria*	Myrtaceae	72	65	1.19	1.19	2.38
27	*Smilax megacarpa*	Smilacaceae	75	59	1.24	1.08	2.32
28	*Macaranga gigantea*	Euphorbiaceae	65	62	1.07	1.14	2.21
29	*Mesua ferrae*	Guttiferae	64	60	1.06	1.10	2.16
30	*Spatholobus ferrugineus*	Leguminosae	61	55	1.01	1.01	2.02
31	*Macaranga hypoleuca*	Euphorbiaceae	67	49	1.11	0.90	2.00
32	*Peperomia sp.*	Piperaceae	64	50	1.06	0.92	1.97
33	*Polyalthia hypoleuca*	Annonaceae	55	54	0.91	0.99	1.90
34	*Combretum sundaicum*	Combretaceae	56	53	0.92	0.97	1.90
35	*Cinnamomum porrectum*	Lauraceae	56	50	0.92	0.92	1.84
36	*Eurycoma longifolia*	Simaroubaceae	52	50	0.86	0.92	1.78
37	*Scaphium linearicarpum*	Sterculiaceae	49	47	0.81	0.86	1.67
38	*Diospyros buxifolia*	Ebenaceae	49	41	0.81	0.75	1.56
39	*Embelia ribes*	Myrsinaceae	46	38	0.76	0.70	1.46
40	*Goniothalamus macrophyllus*	Annonaceae	43	40	0.71	0.73	1.44
41	*Taenitis blechnoides*	Adiantaceae	42	40	0.69	0.73	1.43
42	*Dalbergia pinnata*	Leguminosae	42	40	0.69	0.73	1.43
43	*Arenga pinnata*	Palmae	42	40	0.69	0.73	1.43
44	*Lepisanthes tetraphylla*	Sapindaceae	45	37	0.74	0.68	1.42
45	*Gnetum tenuifolium*	Gnetaceae	40	39	0.66	0.72	1.38
46	*Ventilago sp.*	Rhamnaceae	41	38	0.68	0.70	1.37
47	*Cyrtandromoea grandis*	Scrophulariaceae	40	38	0.66	0.70	1.36
48	*Pternandra echinata*	Melastomataceae	41	36	0.68	0.66	1.34
49	*Piper sarmentosum*	Piperaceae	38	36	0.63	0.66	1.29
50	*Ochanostachys amentacea*	Olacaceae	37	36	0.61	0.66	1.27
51	*Alpinia malaccensis*	Zingiberaceae	40	33	0.66	0.61	1.27
52	*Agrostistachys longifolia var leptostachys*	Euphorbiaceae	37	32	0.61	0.59	1.20
53	*Memecylon minutiflorum*	Melastomataceae	34	31	0.56	0.57	1.13
54	*Flacourtia rukam*	Flacourtiaceae	32	31	0.53	0.57	1.10

55	*Uvaria grandiflora*	Annonaceae	33	30	0.54	0.55	1.10
56	*Sapium baccatum*	Euphorbiaceae	31	31	0.51	0.57	1.08
57	*Porterandia anisophyllea*	Rubiaceae	31	30	0.51	0.55	1.06
58	*Mussaenda sp.*	Rubiaceae	32	29	0.53	0.53	1.06
59	*Blechnum orientale*	Blechnaceae	31	29	0.51	0.53	1.04
60	*Hydnocarpus castanea*	Flacourtiaceae	31	29	0.51	0.53	1.04
61	*Zingiber officinale*	Zingiberaceae	31	29	0.51	0.53	1.04
62	*Cyathea mollucana*	Cyatheaceae	31	28	0.51	0.51	1.03
63	*Goniothalamus malayanus*	Annonaceae	29	29	0.48	0.53	1.01
64	*Donax grandis*	Marantaceae	30	28	0.50	0.51	1.01
65	*Leptonychia caudata*	Sterculiaceae	31	27	0.51	0.50	1.01
66	*Zingiber griffithii*	Zingiberaceae	31	27	0.51	0.50	1.01
67	*Macaranga conifera*	Euphorbiaceae	32	26	0.53	0.48	1.01
68	*Rourea acutipetala ssp. acutipetala*	Connaraceae	30	27	0.50	0.50	0.99
69	*Xanthophyllum amoenum*	Polygalaceae	30	27	0.50	0.50	0.99
70	*Barringtonia scortechinii*	Lecythidaceae	28	28	0.46	0.51	0.98
71	*Antidesma montanum*	Euphorbiaceae	31	25	0.51	0.46	0.97
72	*Lycopodiella cernua*	Lycopodiaceae	28	27	0.46	0.50	0.96
73	*Dissochaeta intermedia*	Melastomataceae	28	27	0.46	0.50	0.96
74	*Baccaurea brevipes*	Euphorbiaceae	27	26	0.45	0.48	0.92
75	*Molineria latifolia*	Hypoxidaceae	28	25	0.46	0.46	0.92
76	*Clerodendron laevifolium*	Verbenaceae	26	26	0.43	0.48	0.91
77	*Rourea mimosoides*	Connaraceae	27	25	0.45	0.46	0.90
78	*Ardisia crenata*	Myrsinaceae	26	25	0.43	0.46	0.89
79	*Donax parviflorus*	Marantaceae	27	24	0.45	0.44	0.89
80	*Xylopia ferruginea*	Annonaceae	25	25	0.41	0.46	0.87
81	*Nephrolepis auriculata*	Oleandraceae	26	24	0.43	0.44	0.87
82	*Selaginella wildenowii*	Selaginellaceae	27	23	0.45	0.42	0.87
83	*Cinnamomum sintoc*	Lauraceae	25	24	0.41	0.44	0.85
84	*Maclurodendron porteri*	Rutaceae	25	24	0.41	0.44	0.85
85	*Campylospermum serratum*	Ochnaceae	24	24	0.40	0.44	0.84
86	*Amischotolype griffithii*	Commelinaceae	26	22	0.43	0.40	0.83
87	*Friesodielsia affinis*	Annonaceae	25	22	0.41	0.40	0.82
88	*Prunus arborea var arborea*	Rosaceae	23	23	0.38	0.42	0.80
89	*Smilex sp.*	Smilacaceae	23	22	0.38	0.40	0.78
90	*Fissistigma lanuginosum*	Annonaceae	22	22	0.36	0.40	0.77
91	*Elaeocarpus floribundus*	Elaeocarpaceae	23	20	0.38	0.37	0.75
92	*Polyalthia sumatrana*	Annonaceae	21	21	0.35	0.39	0.73
93	*Spatholobus bornensis*	Leguminosae	21	21	0.35	0.39	0.73
94	*Zingiber spectabile*	Zingiberaceae	21	21	0.35	0.39	0.73
95	*Tetracera indica*	Dilleniaceae	20	20	0.33	0.37	0.70
96	*Polyalthia glauca*	Annonaceae	20	19	0.33	0.35	0.68
97	*Costus speciocus*	Costaceae	20	18	0.33	0.33	0.66
98	*Garcinia nigrolineata*	Guttiferae	19	17	0.31	0.31	0.63
99	*Epipremnum giganteum*	Araceae	20	16	0.33	0.29	0.62
100	*Sindora coriacea*	Leguminosae	18	17	0.30	0.31	0.61
101	*Mitrella kentii*	Annonaceae	19	16	0.31	0.29	0.61

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102	*Calophyllum wallichianum*	Guttiferae	18	16	0.30	0.29	0.59
103	*Cratoxylum formosum*	Guttiferae	18	16	0.30	0.29	0.59
104	*Galearia fulva*	Pandaceae	16	16	0.26	0.29	0.56
105	*Gironniera hirta*	Ulmaceae	16	15	0.26	0.28	0.54
106	*Cinnamomum javanicum*	Lauraceae	15	15	0.25	0.28	0.52
107	*Diospyros sumatrana*	Ebenaceae	15	14	0.25	0.26	0.50
108	*Agelaea macrophylla*	Connaraceae	14	14	0.23	0.26	0.49
109	*Maesa ramentacea*	Myrsinaceae	14	14	0.23	0.26	0.49
110	*Coscinium fenestratum*	Menispermaceae	15	13	0.25	0.24	0.49
111	*Thottea corymbosa*	Aristolochiaceae	14	13	0.23	0.24	0.47
112	*Medusanthera gracilis*	Icacinaceae	14	13	0.23	0.24	0.47
113	*Epiprinus malayanus*	Euphorbiaceae	13	13	0.21	0.24	0.45
114	*Mallotus macrostachys*	Euphorbiaceae	13	13	0.21	0.24	0.45
115	*Hanguana malayana*	Hanguanaceae	13	13	0.21	0.24	0.45
116	*Litsea elliptica*	Lauraceae	13	13	0.21	0.24	0.45
117	*Ixonanthes icosandra*	Ixonanthaceae	13	12	0.21	0.22	0.43
118	*Diospyros argenteum*	Ebenaceae	12	12	0.20	0.22	0.42
119	*Gnetum gnemon*	Gnetaceae	12	12	0.20	0.22	0.42
120	*Ximenia americana*	Olacaceae	12	11	0.20	0.20	0.40
121	*Selaginella plana*	Selaginellaceae	12	11	0.20	0.20	0.40
122	*Microcos latifolia*	Tiliaceae	12	11	0.20	0.20	0.40
123	*Crytandra capulata var capulata*	Gesneriaceae	11	11	0.18	0.20	0.38
124	*Bauhinia bidentata*	Leguminosae	11	11	0.18	0.20	0.38
125	*Memecylon dichotomum var dichotomum*	Melastomataceae	11	11	0.18	0.20	0.38
126	*Hullettia dumosa*	Moraceae	11	11	0.18	0.20	0.38
127	*Leea indica*	Leeaceae	12	10	0.20	0.18	0.38
128	*Pimelodendron griffithianum*	Euphorbiaceae	11	10	0.18	0.18	0.37
129	*Luvunga scandens*	Rutaceae	11	10	0.18	0.18	0.37
130	*Artabotrys grandifolius*	Annonaceae	10	10	0.17	0.18	0.35
131	*Sticherus truncatus*	Gleicheniaceae	10	10	0.17	0.18	0.35
132	*Pentaspadon motleyi*	Anacardiaceae	9	9	0.15	0.17	0.31
133	*Ctenolophon parvifolius*	Ctenolophonaceae	9	9	0.15	0.17	0.31
134	*Sandoricum koetjape*	Meliaceae	9	9	0.15	0.17	0.31
135	*Coptosapelta griffithii*	Rubiaceae	9	9	0.15	0.17	0.31
136	*Poikilospermum sp.*	Cecropiaceae	10	8	0.17	0.15	0.31
137	*Chrysophyllum roxburghii*	Sapotaceae	10	8	0.17	0.15	0.31
138	*Diospyros lanceifolia*	Ebenaceae	9	8	0.15	0.15	0.30
139	*Salacia grandiflora*	Celastraceae	8	8	0.13	0.15	0.28
140	*Tacca integrifolia*	Taccaceae	8	8	0.13	0.15	0.28
141	*Callicarpa candicans*	Verbenaceae	8	8	0.13	0.15	0.28
142	*Dysoxylum cauliflorum*	Meliaceae	8	7	0.13	0.13	0.26
143	*Santiria griffithii*	Burseraceae	7	7	0.12	0.13	0.24
144	*Litsea grandis*	Lauraceae	7	7	0.12	0.13	0.24
145	*Psydrax nitidum*	Rubiaceae	7	7	0.12	0.13	0.24
146	*Cayratia molissima*	Vitaceae	7	7	0.12	0.13	0.24
147	*Lepidagathis sp.*	Acanthaceae	7	6	0.12	0.11	0.23
148	*Acrotrema costatum*	Dilleniaceae	7	6	0.12	0.11	0.23

149	*Molineria capitulata*	Hypoxidaceae	7	6	0.12	0.11	0.23
150	*Bouea macrophylla*	Anacardiaceae	6	6	0.10	0.11	0.21
151	*Desmos chinensis*	Annonaceae	6	6	0.10	0.11	0.21
152	*Erycibe albida*	Convolvulaceae	6	6	0.10	0.11	0.21
153	*Intsia palembanica*	Leguminosae	6	6	0.10	0.11	0.21
154	*Clidemia hirta*	Melastomataceae	6	6	0.10	0.11	0.21
155	*Lansium domesticum*	Meliaceae	6	6	0.10	0.11	0.21
156	*Ardisia villosa*	Myrsinaceae	6	6	0.10	0.11	0.21
157	*Pittosporum ferrugineum*	Pittosporaceae	6	6	0.10	0.11	0.21
158	*Peliosanthes teta*	Convallariaceae	6	5	0.10	0.09	0.19
159	*Pyrenaria acuminata*	Theaceae	6	5	0.10	0.09	0.19
160	*Syngramma alismifolia*	Adiantaceae	5	5	0.08	0.09	0.17
161	*Pyramidanthe prismatica*	Annonaceae	5	5	0.08	0.09	0.17
162	*Thottea tomentosa*	Aristolochiaceae	5	5	0.08	0.09	0.17
163	*Phyllanthus emblica*	Euphorbiaceae	5	5	0.08	0.09	0.17
164	*Carallia brachiata*	Rhizophoraceae	5	5	0.08	0.09	0.17
165	*Coptosapelta parviflora*	Rubiaceae	5	5	0.08	0.09	0.17
166	*Selaginella wallichii*	Selaginellaceae	5	5	0.08	0.09	0.17
167	*Parkia speciosa*	Leguminosae	5	4	0.08	0.07	0.16
168	*Hoya sp.*	Asclepiadaceae	4	4	0.07	0.07	0.14
169	*Asplenium nidus*	Aspleniaceae	4	4	0.07	0.07	0.14
170	*Amischotolype molissima*	Commelinaceae	4	4	0.07	0.07	0.14
171	*Cyrtandra capulata var capulata*	Gesneriaceae	4	4	0.07	0.07	0.14
172	*Toona sp.*	Meliaceae	4	4	0.07	0.07	0.14
173	*Chassalia chartacea*	Rubiaceae	4	4	0.07	0.07	0.14
174	*Pometia pinnata*	Sapindaceae	4	4	0.07	0.07	0.14
175	*Clerodendron deflexum*	Verbenaceae	4	4	0.07	0.07	0.14
176	*Ancistrocladus tectorius*	Ancistrocladaceae	3	3	0.05	0.06	0.10
177	*Popowia tomentosa*	Annonaceae	3	3	0.05	0.06	0.10
178	*Colocasia esculenta*	Araceae	3	3	0.05	0.06	0.10
179	*Forrestia griffithii*	Commelinaceae	3	3	0.05	0.06	0.10
180	*Cratoxylum cochinchinense*	Guttiferae	3	3	0.05	0.06	0.10
181	*Litsea lancifolia var lancifolia*	Lauraceae	3	3	0.05	0.06	0.10
182	*Oncosperma horridum*	Palmae	3	3	0.05	0.06	0.10
183	*Salacca glabrescens*	Palmae	3	3	0.05	0.06	0.10
184	*Payena lucida*	Sapotaceae	3	3	0.05	0.06	0.10
185	*Selaginella intermedia*	Selaginellaceae	3	3	0.05	0.06	0.10
186	*Styrax benzoin*	Styracaceae	3	3	0.05	0.06	0.10
187	*Symplocos rubiginosa*	Symplocaceae	3	3	0.05	0.06	0.10
188	*Diospyros latisepala*	Ebenaceae	3	2	0.05	0.04	0.09
189	*Garcinia atroviridis*	Guttiferae	3	2	0.05	0.04	0.09
190	*Paramignya lobata*	Rutaceae	3	2	0.05	0.04	0.09
191	*Mezettia leptopoda*	Annonaceae	2	2	0.03	0.04	0.07
192	*Alstonia augustiloba*	Apocynaceae	2	2	0.03	0.04	0.07
193	*Aralidium pinnatifitidum*	Aralidiaceae	2	2	0.03	0.04	0.07
194	*Connarus ferrugineus*	Connaraceae	2	2	0.03	0.04	0.07
195	*Dipteris conjugata*	Dipteridaceae	2	2	0.03	0.04	0.07

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196	*Garcinia griffithii*	Guttiferae	2	2	0.03	0.04	0.07
197	*Fagraea fragrans*	Loganiaceae	2	2	0.03	0.04	0.07
198	*Fagraea racemosa*	Loganiaceae	2	2	0.03	0.04	0.07
199	*Pternandra coerulescens*	Melastomataceae	2	2	0.03	0.04	0.07
200	*Artocarpus elasticus*	Moraceae	2	2	0.03	0.04	0.07
201	*Pinanga pumila*	Palmae	2	2	0.03	0.04	0.07
202	*Podocarpus polystachyus*	Podocarpaceae	2	2	0.03	0.04	0.07
203	*Pteris ensiformis*	Pteridaceae	2	2	0.03	0.04	0.07
204	*Carallia suffruticosa*	Rhizophoraceae	2	2	0.03	0.04	0.07
205	*Schima wallichii*	Theaceae	2	2	0.03	0.04	0.07
206	*Globba patens*	Zingiberaceae	2	2	0.03	0.04	0.07
207	*Xylopia malayana var obscura*	Annonaceae	1	1	0.02	0.02	0.03
208	*Cnestis palala*	Connaraceae	1	1	0.02	0.02	0.03
209	*Merremia peltata*	Convolvulaceae	1	1	0.02	0.02	0.03
210	*Pleocnemia irregularis*	Dryopteridaceae	1	1	0.02	0.02	0.03
211	*Bridelia tomentosa*	Euphorbiaceae	1	1	0.02	0.02	0.03
212	*Croton laevifolium*	Euphorbiaceae	1	1	0.02	0.02	0.03
213	*Sauropus androgynus*	Euphorbiaceae	1	1	0.02	0.02	0.03
214	*Didissandra wrayi*	Gesneriaceae	1	1	0.02	0.02	0.03
215	*Ixonanthes reticulata*	Ixonanthaceae	1	1	0.02	0.02	0.03
216	*Saraca cauliflora*	Leguminosae	1	1	0.02	0.02	0.03
217	*Sindora wallichii*	Leguminosae	1	1	0.02	0.02	0.03
218	*Fagraea acuminatissima*	Loganiaceae	1	1	0.02	0.02	0.03
219	*Tinomiscium petiolare*	Menispermaceae	1	1	0.02	0.02	0.03
220	*Ficus hispida*	Moraceae	1	1	0.02	0.02	0.03
221	*Syzygium polyanthum*	Myrtaceae	1	1	0.02	0.02	0.03
222	*Euthemis leucocarpa*	Ochnaceae	1	1	0.02	0.02	0.03
223	*Plocoglottis javanica*	Orchidaceae	1	1	0.02	0.02	0.03
224	*Gynotroches axillaris*	Rhizophoraceae	1	1	0.02	0.02	0.03
225	*Fagerlindia fasciculata*	Rubiaceae	1	1	0.02	0.02	0.03
226	*Symplocos crassipes var penangiana*	Symplocaceae	1	1	0.02	0.02	0.03
227	*Microcos fibrocarpa*	Tiliaceae	1	1	0.02	0.02	0.03
228	*Rinorea anguifera*	Violaceae	1	1	0.02	0.02	0.03
			6059	5450	100	100	200

D = density, F = frequency, RD = relative density, RF = relative frequency, IVI = importance value index

Appendix 4. Quantitative analysis for Family Value Index (tree)

	Family	**D**	**F**	**BA**	**RD(%)**	**RF(%)**	**RBA(%)**	**FVI**
1	Lauraceae	71	60	2.319	10.53	10.12	16.32	36.97
2	Euphorbiaceae	104	85	0.979	15.43	14.33	6.89	36.66
3	Guttiferae	53	50	0.999	7.86	8.43	7.03	23.32
4	Dipterocarpaceae	22	19	1.862	3.26	3.20	13.10	19.57
5	Annonaceae	48	45	0.459	7.12	7.59	3.23	17.94
6	Melastomataceae	48	37	0.595	7.12	6.24	4.19	17.55
7	Olacaceae	15	14	1.356	2.23	2.36	9.54	14.13
8	Flacourtiaceae	24	23	0.630	3.56	3.88	4.43	11.87

9	Sterculiaceae	24	23	0.506	3.56	3.88	3.56	11.00
10	Elaeocarpaceae	26	25	0.389	3.86	4.22	2.74	10.81
11	Polygalaceae	21	20	0.398	3.12	3.37	2.80	9.29
12	Rubiaceae	25	22	0.185	3.71	3.71	1.30	8.72
13	Ebenaceae	25	21	0.206	3.71	3.54	1.45	8.70
14	Myrtaceae	22	17	0.298	3.26	2.87	2.10	8.23
15	Leguminosae	10	10	0.570	1.48	1.69	4.01	7.18
16	Moraceae	5	5	0.642	0.74	0.84	4.52	6.11
17	Rutaceae	10	10	0.253	1.48	1.69	1.78	4.95
18	Icacinaceae	11	8	0.233	1.63	1.35	1.64	4.62
19	Connaraceae	10	9	0.184	1.48	1.52	1.30	4.30
20	Ulmaceae	15	9	0.040	2.23	1.52	0.28	4.02
21	Anacardiaceae	8	8	0.201	1.19	1.35	1.41	3.95
22	Meliaceae	7	7	0.131	1.04	1.18	0.92	3.14
23	Myrsinaceae	8	8	0.052	1.19	1.35	0.37	2.90
24	Pittosporaceae	7	5	0.095	1.04	0.84	0.67	2.55
25	Simaroubaceae	7	6	0.026	1.04	1.01	0.18	2.23
26	Sapindaceae	7	6	0.024	1.04	1.01	0.17	2.22
27	Loganiaceae	5	4	0.099	0.74	0.67	0.70	2.11
28	Ixonanthaceae	4	4	0.110	0.59	0.67	0.77	2.04
29	Rhizophoraceae	5	5	0.046	0.74	0.84	0.32	1.91
30	Lecythidaceae	6	5	0.022	0.89	0.84	0.15	1.89
31	Ctenolophonaceae	1	4	0.088	0.15	0.67	0.62	1.44
32	Theaceae	3	3	0.030	0.45	0.51	0.21	1.16
33	Rosaceae	3	3	0.020	0.45	0.51	0.14	1.09
34	Tiliaceae	3	3	0.015	0.45	0.51	0.11	1.06
35	Sapotaceae	2	2	0.033	0.30	0.34	0.23	0.87
36	Burseraceae	2	2	0.009	0.30	0.34	0.06	0.69
37	Convallariaceae	1	1	0.045	0.15	0.17	0.32	0.63
38	Verbenaceae	2	1	0.010	0.30	0.17	0.07	0.54
39	Symplocaceae	1	1	0.028	0.15	0.17	0.20	0.51
40	Ochnaceae	1	1	0.012	0.15	0.17	0.08	0.40
41	Styracaceae	1	1	0.010	0.15	0.17	0.07	0.39
42	Menispermaceae	1	1	0.003	0.15	0.17	0.02	0.34
	TOTAL	674	593	14.211	100	100	100	300

D = density, F = frequency, RD = relative density, RF = relative frequency, FVI = family value index

Appendix 5. Quantitative analysis for Family Value Index (non tree)

	Family	**D**	**F**	**RD(%)**	**RF(%)**	**FVI**
1	Euphorbiaceae	707	619	11.67	11.36	23.03
2	Annonaceae	319	305	5.26	5.60	10.86
3	Rubiaceae	328	291	5.41	5.34	10.75
4	Melastomataceae	321	275	5.30	5.05	10.34
5	Zingiberaceae	272	252	4.49	4.62	9.11
6	Myrsinaceae	239	219	3.94	4.02	7.96
7	Guttiferae	233	209	3.85	3.83	7.68
8	Connaraceae	189	169	3.12	3.10	6.22

9	Schizaeaceae	183	159	3.02	2.92	5.94
10	Leguminosae	166	156	2.74	2.86	5.60
11	Sterculiaceae	167	155	2.76	2.84	5.60
12	Palmae	167	148	2.76	2.72	5.47
13	Rhamnaceae	156	132	2.57	2.42	5.00
14	Dryopteridaceae	143	127	2.36	2.33	4.69
15	Menispermaceae	132	120	2.18	2.20	4.38
16	Lauraceae	119	112	1.96	2.06	4.02
17	Dilleniaceae	124	101	2.05	1.85	3.90
18	Ulmaceae	111	99	1.83	1.82	3.65
19	Gesneriaceae	112	93	1.85	1.71	3.55
20	Dipterocarpaceae	110	92	1.82	1.69	3.50
21	Piperaceae	102	86	1.68	1.58	3.26
22	Araceae	98	85	1.62	1.56	3.18
23	Smilacaceae	98	81	1.62	1.49	3.10
24	Ebenaceae	88	77	1.45	1.41	2.87
25	Cyperaceae	74	68	1.22	1.25	2.47
26	Myrtaceae	73	66	1.20	1.21	2.42
27	Flacourtiaceae	63	60	1.04	1.10	2.14
28	Combretaceae	56	53	0.92	0.97	1.90
29	Marantaceae	57	52	0.94	0.95	1.89
30	Gnetaceae	52	51	0.86	0.94	1.79
31	Simaroubaceae	52	50	0.86	0.92	1.78
32	Olacaceae	49	47	0.81	0.86	1.67
33	Adiantaceae	47	45	0.78	0.83	1.60
34	Sapindaceae	49	41	0.81	0.75	1.56
35	Selaginellaceae	47	42	0.78	0.77	1.55
36	Scrophulariaceae	40	38	0.66	0.70	1.36
37	Verbenaceae	38	38	0.63	0.70	1.32
38	Rutaceae	39	36	0.64	0.66	1.30
39	Hypoxidaceae	35	31	0.58	0.57	1.15
40	Commelinaceae	33	29	0.54	0.53	1.08
41	Blechnaceae	31	29	0.51	0.53	1.04
42	Cyatheaceae	31	28	0.51	0.51	1.03
43	Polygalaceae	30	27	0.50	0.50	0.99
44	Lecythidaceae	28	28	0.46	0.51	0.98
45	Lycopodiaceae	28	27	0.46	0.50	0.96
46	Meliaceae	27	26	0.45	0.48	0.92
47	Ochnaceae	25	25	0.41	0.46	0.87
48	Oleandraceae	26	24	0.43	0.44	0.87
49	Rosaceae	23	23	0.38	0.42	0.80
50	Elaeocarpaceae	23	20	0.38	0.37	0.75
51	Costaceae	20	18	0.33	0.33	0.66
52	Aristolochiaceae	19	18	0.31	0.33	0.64
53	Pandaceae	16	16	0.26	0.29	0.56
54	Anacardiaceae	15	15	0.25	0.28	0.52
55	Moraceae	14	14	0.23	0.26	0.49

56	Icacinaceae	14	13	0.23	0.24	0.47
57	Ixonanthaceae	14	13	0.23	0.24	0.47
58	Hanguanaceae	13	13	0.21	0.24	0.45
59	Tiliaceae	13	12	0.21	0.22	0.43
60	Sapotaceae	13	11	0.21	0.20	0.42
61	Leeaceae	12	10	0.20	0.18	0.38
62	Gleicheniaceae	10	10	0.17	0.18	0.35
63	Ctenolophonaceae	9	9	0.15	0.17	0.31
64	Cecropiaceae	10	8	0.17	0.15	0.31
65	Celastraceae	8	8	0.13	0.15	0.28
66	Rhizophoraceae	8	8	0.13	0.15	0.28
67	Taccaceae	8	8	0.13	0.15	0.28
68	Theaceae	8	7	0.13	0.13	0.26
69	Burseraceae	7	7	0.12	0.13	0.24
70	Convolvulaceae	7	7	0.12	0.13	0.24
71	Vitaceae	7	7	0.12	0.13	0.24
72	Acanthaceae	7	6	0.12	0.11	0.23
73	Pittosporaceae	6	6	0.10	0.11	0.21
74	Convallariaceae	6	5	0.10	0.09	0.19
75	Loganiaceae	5	5	0.08	0.09	0.17
76	Asclepiadaceae	4	4	0.07	0.07	0.14
77	Aspleniaceae	4	4	0.07	0.07	0.14
78	Symplocaceae	4	4	0.07	0.07	0.14
79	Ancistrocladaceae	3	3	0.05	0.06	0.10
80	Styracaceae	3	3	0.05	0.06	0.10
81	Apocynaceae	2	2	0.03	0.04	0.07
82	Aralidiaceae	2	2	0.03	0.04	0.07
83	Dipteridaceae	2	2	0.03	0.04	0.07
84	Podocarpaceae	2	2	0.03	0.04	0.07
85	Pteridaceae	2	2	0.03	0.04	0.07
86	Orchidaceae	1	1	0.02	0.02	0.03
87	Violaceae	1	1	0.02	0.02	0.03
	TOTAL	6059	5450	100	100	200

D = density, F = frequency, RD = relative density, RF = relative frequency, FVI = family value index

ISSN 1916-9752 E-ISSN 1916-9760