

Vegetation Analysis in Relation to Availability of Food Plants for Migratory Elephants in Gurami, Swargabati and Indkata Forests of South West Bengal

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Abstract

A study was conducted in three forests in South Bengal for vegetation analysis in relation availability of food plants consumed by migratory elephants. Results indicated that the sal (*Shorea robusta*) was predominantly found (50.75%) in the studied forests. Thirteen plant species such as *A. latifolia*, *D. melanoxylon*, *M. lalifolia*, *P. marsupium* and *L. parviflora* along with *S. robusta* accounted 94.09%. Only seven species had IVI score more than 10.0. Seven tree species namely *D. melanoxylon*, *B. latifolia*, *L. grandis*, *A. lebbeck*, *P. marsupium*, *A. marmelos* and *S. anacardium* were mainly found to be consumed by the migratory elephants. People living in the vicinity of forests collected many of these elephant's food plant for their domestic uses.

Key words : Vegetation analysis, IVI score, Migratory elephants, Food plants, South west Bengal.

The forest types in South West Bengal are tropical dry deciduous champion and Seth (1968) and are practically dominated by pure coppice of *Shorea robusta* with associates like *A. latifolia*, *L. parviflora*, *B. latifolia*, *S. anacardium*, *S. aborea*, *D. melanoxylon* and *M. latifolia*. However, cultivation has been extended across the forest fringes in favorable spots resulting in lack of compactness and rather tortuous external boundaries of the forests. Moreover, these forests are burdened with rights of all kinds ranging from grazing to collection of wood. Majority of the landless families are dependent on forests for their livelihood. Crop raiding by elephants in South west Bengal has become a problem ever since these animals are migrating from Dalma Wildlife Sanctuary, Jharkhand. During their stay elephants also use certain plants found in the forests as their food. However, the people living in the vicinity of forests normally cut and collect many of these plants for their different uses. Elephant's food plants such as *D. melanoxylon*, *B. latifolia* and *P. marsupium* have been gradually wiped out as a result of repeated cuttings from the forests. This could be the reasons of

the dependency of elephants more on agricultural crops (Anonymous 1975).

Methods

Three representative major forests, namely Gurami, Swargabati and Indkata were subjected to vegetation analysis following the method described by Sivaganesan (1991). A total of each transect measuring 20 m × 15 m covering a total of 2.34 hectare forest area was brought under study. Species and number of all trees and major shrubs falling within the transect were recorded. Trees with more than 20 cm girth at breast height (1.3 m) were considered as matured trees (>20 cm gbh). Different parameters have been generated using the following formulae.

$$\text{Density} = \frac{\text{Total number of individuals of particular species}}{\text{Total number of sampling units studied}}$$

$$\text{Relative frequency (RF)} = \frac{\text{Frequency of a species}}{\text{Total frequency of all species}} \times 100$$

Table 1. Recorded tree species in Gurami forest in South Bengal (sampled area 0.78 ha).

Common or local name	Species	Total number	Density / ha	Relative frequency (%)	Relative density (%)	Relative dominance (%)	Importance value indices
Sal	<i>Shorea robusta</i>	2258	2894.87	8.38	67.99	94.18	170.55
Dhaw	<i>Anogeissus latifolia</i>	51	65.38	3.87	1.53	0.38	5.78
Sidha	<i>Lagerstroemia parviflora</i>	84	107.69	5.80	2.52	0.71	9.03
Kend	<i>Diospyros melanoxylon</i>	33	42.30	2.90	0.99	0.37	4.26
Piyal	<i>Buchanania latifolia</i>	118	151.28	8.06	3.55	0.73	12.34
Asan	<i>Terminalia tomentosa</i>	4	5.12	0.96	0.12	0.05	1.13
Kumbhi	<i>Careya arborea</i>	14	17.94	3.22	0.42	0.10	3.74
Jiyal	<i>Lannea grandis</i>	7	8.97	1.61	0.21	0.05	1.87
Mohul	<i>Madhuca latifolia</i>	33	42.30	4.19	0.99	0.30	5.48
Siris	<i>Albizia lebeck</i>	45	57.69	3.87	1.35	0.10	5.32
Chanlai	<i>Wendlandia exserta</i>	134	171.79	6.12	4.03	0.32	10.47
Rahara	<i>Soymida febrifuga</i>	6	7.69	1.93	0.18	0.05	2.16
Kalajam	<i>Eugenia jambolana</i>	46	58.97	4.19	1.38	0.16	5.73
Haldu	<i>Adina cordifolia</i>	43	55.12	4.51	1.29	0.32	6.12
Bahera	<i>Terminalia belerica</i>	21	26.92	4.83	0.63	0.21	5.67
Piasal	<i>Pterocarpus marsupium</i>	284	364.10	7.74	8.55	1.28	17.57
Sonalu	<i>Cassia fistula</i>	29	37.17	3.54	0.87	0.16	4.57
Bel	<i>Aegle marmelos</i>	6	7.69	1.61	0.18	0.10	1.89
Akashmoni	<i>Acacia auriculiformis</i>	7	8.97	0.96	0.21	0.00	1.17
Simul	<i>Bombax malabaricum</i>	5	6.41	1.29	0.15	0.00	1.44
Neem	<i>Azadirachta indica</i>	9	11.53	1.61	0.27	0.05	1.93
Haritaki	<i>Terminalia chebula</i>	5	6.41	1.29	0.15	0.05	1.49
Bhela	<i>Semecarpus anacardium</i>	4	5.12	1.29	0.12	0.05	1.46
Parasi	<i>Cleistanthus colinus</i>	16	20.51	2.90	0.48	0.10	3.48
Kusum	<i>Schlichera trijuga</i>	9	11.53	2.58	0.27	0.00	2.85
Pitali	<i>Trewia nudiflora</i>	12	15.38	1.93	0.36	0.00	2.29
Amla	<i>Phyllanthus emblica</i>	7	8.97	1.93	0.21	0.00	2.14
Gular	<i>Ficus glomerata</i>	3	3.84	0.64	0.09	0.00	0.73
Palash	<i>Butea frondosa</i>	5	6.41	0.96	0.15	0.00	1.11
Arjun	<i>Terminalia arjuna</i>	1	1.28	0.32	0.03	0.05	0.40
Barmalla	<i>Callicarpa arborea</i>	7	8.97	1.61	0.21	0.00	1.82
Kadam	<i>Anthocephalus cadamba</i>	2	2.56	0.64	0.06	0.00	0.70
Pola	<i>Kydia calycina</i>	8	10.25	1.29	0.24	0.00	1.53
Setisal	<i>Dalbergia latifolia</i>	5	6.41	1.29	0.15	0.00	1.44

Density of a species

$$\text{Relative density (RD)} = \frac{\text{Density of a species}}{\text{Total density of all species}} \times 100$$

$$\text{Relative dominance (RDO)} = \frac{\text{Dominance of a species}}{\text{Total dominance of all species}} \times 100$$

$$\text{Importance value indices (IVI)} = \text{RF} + \text{RD} + \text{RDO}$$

Food plants consumed by the migratory elephants were recorded through evidences of branch breaking, main-stem breaking, stem twisting, bark peeling, uprooting and tusk markings (Ishwaran 1983).

Results and Discussion

Vegetation Analysis

A total of 12,898 trees belonging to 48 species were enumerated from the sample area of 2.34 ha in three forests (Tables 1 to 3). The predominant species was *S. robusta* with an overall density of 2,797.86 per hectare accounting for 50.75% of all the recorded trees in the studied forests. Gurami forest recorded highest density of *S. robusta* (2,894.87/ha) followed by those in Indkata (2,780.76/ha) and Swargabati (2,717.94/ha) in that order. Out of different tree species recorded in this zone, only thirteen species viz.,

Table 2. Recorded tree species in Swargabati forest in South Bengal (sampled area 0.78 ha).

Common or local name	Species	Total number	Density /ha	Relative frequency (%)	Relative density (%)	Relative dominance (%)	Importance value indices
Sal	<i>Shorea robusta</i>	2120	2717.94	6.20	42.67	93.01	141.88
Dhaw	<i>Anogeissus latifolia</i>	153	196.15	5.48	3.07	0.50	9.05
Sidha	<i>Lagerstroemia parviflora</i>	159	203.84	5.25	3.20	0.73	9.18
Kend	<i>Diospyros melanoxylon</i>	1477	1893.58	5.96	29.73	1.27	36.96
Piyal	<i>Buchanania latifolia</i>	124	158.97	5.96	2.49	0.64	9.09
Asan	<i>Terminalia tomentosa</i>	241	308.97	5.25	4.85	1.02	11.12
Kumbhi	<i>Careya arborea</i>	27	34.61	3.34	0.54	0.12	4.00
Jiyal	<i>Lannea grandis</i>	85	108.97	5.25	1.71	0.96	7.92
Mohul	<i>Madhuca latifolia</i>	195	250.00	6.20	3.92	1.00	11.12
Siris	<i>Albizzia lebbek</i>	11	14.10	1.67	0.22	0.10	1.99
Chanlai	<i>Wendlandia exserta</i>	33	42.30	3.81	0.66	0.08	4.55
Rahara	<i>Soymida febrifuga</i>	25	32.05	3.57	0.50	0.14	4.21
Kalajam	<i>Eugenia jambolana</i>	13	16.66	2.38	0.26	0.00	2.64
Haldu	<i>Adina cordifolia</i>	34	43.58	3.57	0.68	0.16	4.41
Bahera	<i>Terminalia belerica</i>	27	34.61	3.10	0.54	0.14	3.78
Piasal	<i>Pterocarpus marsupium</i>	26	33.33	3.34	0.52	0.20	4.06
Sonalu	<i>Cassia fistula</i>	13	16.66	2.14	0.26	0.04	2.44
Bel	<i>Aegle marmelos</i>	5	6.41	1.19	0.10	0.08	1.37
Neem	<i>Azadirachta indica</i>	2	2.56	0.47	0.04	0.00	0.51
Haritaki	<i>Terminalia chebula</i>	33	42.30	3.81	0.66	0.08	4.55
Bhela	<i>Semecarpus anacardium</i>	77	98.71	5.01	1.54	0.08	6.63
Parasi	<i>Cleistanthus colinus</i>	21	26.92	2.86	0.42	0.00	3.28
Nona	<i>Anona reticulata</i>	3	3.84	0.71	0.06	0.00	0.77
Sankata	<i>Acacia suma</i>	4	5.12	0.95	0.08	0.00	1.03
Kusum	<i>Schlichera trijuga</i>	5	6.41	0.71	0.10	0.00	0.81
Challa / Papri	<i>Holoptelea integrifolia</i>	8	10.25	1.43	0.16	0.00	1.59
Latikaram	<i>Hymenodictyon excelsaum</i>	9	11.53	1.67	0.18	0.00	1.85
Amla	<i>Phyllanthus emblica</i>	3	3.84	0.71	0.06	0.04	0.81
Dumur	<i>Ficus hispida</i>	5	6.41	1.19	0.10	0.04	1.33
Seouli	<i>Myctanthes arbortristes</i>	2	2.56	0.47	0.04	0.00	0.51
Chhatim	<i>Alstonia scholaris</i>	1	1.28	0.23	0.02	0.00	0.25
Kaj	<i>Bridelia retusa</i>	4	5.12	0.95	0.08	0.00	1.03
pola	<i>Kydia calycina</i>	8	10.25	1.67	0.16	0.00	1.83
Tamarind	<i>Tamarindus indica</i>	2	2.56	0.47	0.04	0.00	0.51
Palash	<i>Butea frondosa</i>	5	6.41	0.95	0.10	0.00	1.05
Am	<i>Mangifera indica</i>	1	1.28	0.23	0.02	0.00	0.25
Pitali	<i>Trewia nudiflora</i>	5	6.41	1.19	0.10	0.00	1.29
Neuri	<i>Elaeodendran glaucum</i>	2	2.56	0.47	0.04	0.00	0.51

S. robusta (50.75%), *A. latifolia* (2.34%), *L. parviflora* (2.78%), *D. melanoxylon* (15.92%), *B. latifolia* (3.87%), *T. tomentosa* (2.79%), *L. grandis* (1.36%), *M. latifolia* (4.61%), *T. belerica* (1.34%), *P. marsupium* (4.64%), *S. anacardium* (1.30%), *A. lebbek* (0.80%) and *Wendlandia exserta* (1.54%), jointly accounted for 94.09%. The relative density of *S. robusta* was more in Gurami forest (67.99%) than those in other two forests of this zone. Lower relative density of this species in Swargabati forest (42.67%) was due to dominance of other tree species. Relative dominance

of *S. robusta* had a range between 93.01 (Swargabati) and 94.18% (Gurami). The relative frequency of all recorded species varied from 0.25 to 8.38%. Only seven species had IVI score greater than 10.0. *S. robusta* scored highest IVI value i. e. 170.55 in Gurami, 141.88 in Swargabati and 145.52 in Indkata.

Major Food Plants Available for Elephants

Major food plants are those that occur proportionately more frequently in the diet of elephants. A

Table 3. Recorded tree species in Indkata forest in South Bengal (sampled area 0.78 ha).

Common or local name	Species	Total number	Density /ha	Relative frequency (%)	Relative density (%)	Relative dominance (%)	Importance value indices
Sal	<i>Shorea robusta</i>	2169	2780.76	6.73	47.06	91.73	145.52
Dhaw	<i>Anogeissus latifolia</i>	98	125.64	4.92	2.12	0.40	7.44
Sidha	<i>Lagerstroemia parviflora</i>	116	148.71	5.18	2.51	0.72	8.41
Kend	<i>Diospyros melanoxylon</i>	544	697.43	6.73	11.80	1.45	19.98
Piyal	<i>Buchanania latifolia</i>	258	330.76	6.73	5.59	0.99	13.31
Asan	<i>Terminalia tomentosa</i>	115	147.43	3.88	2.49	0.76	7.13
Kumbhi	<i>Careya arborea</i>	63	80.76	3.36	1.36	0.16	4.88
Jiyal	<i>Lannea grandis</i>	84	107.69	6.21	1.82	0.52	8.55
Mohul	<i>Madhuca latifolia</i>	367	470.51	6.21	7.96	1.07	15.24
Siris	<i>Albizia lebbek</i>	48	61.53	2.59	1.04	0.12	3.75
Chanlai	<i>Wendlandia exserta</i>	32	41.02	3.36	0.69	0.20	4.25
Rahara	<i>Soymida febrifuga</i>	19	24.35	2.07	0.41	0.16	2.64
Kalajam	<i>Eugenia jambolana</i>	38	48.71	3.36	0.82	0.04	4.22
Haldu	<i>Adina cordifolia</i>	18	23.07	1.81	0.39	0.08	2.28
Bahera	<i>Terminalia belerica</i>	125	160.25	5.44	2.71	0.18	8.33
Piasal	<i>Pterocarpus marsupium</i>	289	370.51	6.73	6.27	0.76	13.76
Sonalu	<i>Cassia fistula</i>	25	32.05	2.07	0.54	0.20	2.81
Bel	<i>Aegle marmelos</i>	11	14.10	1.81	0.23	0.08	2.12
Chalta	<i>Dillenia indica</i>	1	1.28	0.25	0.02	0.00	0.27
Simul	<i>Bombax malabaricum</i>	2	2.56	0.25	0.04	0.00	0.29
Neem	<i>Azadirachta indica</i>	2	2.56	0.51	0.04	0.00	0.55
Haritaki	<i>Terminalia chebula</i>	13	16.66	2.59	0.28	0.08	2.95
Bhela	<i>Semecarpus anacardium</i>	87	111.53	6.21	1.88	0.12	8.21
Parasi	<i>Cleistanthus colinus</i>	30	38.46	2.07	0.65	0.04	2.76
Amra	<i>Spondias mangifera</i>	3	3.84	0.25	0.06	0.00	0.31
Kusum	<i>Schlichera trijuga</i>	9	11.53	1.55	0.19	0.00	1.74
Pitali	<i>Trewia nudiflora</i>	19	24.35	2.59	0.41	0.00	3.0
Amla	<i>Phyllanthus emblica</i>	3	3.84	0.77	0.06	0.04	0.87
Chhatim	<i>Alstonia scholaris</i>	2	2.56	0.25	0.04	0.00	0.29
Setisal	<i>Dalbergia latifolia</i>	3	3.84	0.51	0.06	0.00	0.57
Dumur	<i>Ficus hispida</i>	1	1.28	0.25	0.02	0.04	0.31
Bangab	<i>Diospyros montana</i>	3	3.84	0.51	0.06	0.00	0.57
Latikaram	<i>Hymenodictyon excelsaum</i>	7	8.97	1.29	0.15	0.00	1.44
Palash	<i>Butea frondosa</i>	4	5.12	0.51	0.08	0.00	0.59
Sankata	<i>Acacia suma</i>	1	1.28	0.25	0.02	0.00	0.27

total of 3,623 major food plants comprising 28.08% of the total plants were present in the studied forests (Tables 1 to 3). Seven tree species namely *D.melanoxylon*, *B. latifolia*, *L. grandis*, *A. lebbek*, *P. marsupium*, *A. marmelos* and *S. anacardium* were found to be consumed mainly by the migratory elephants. The dominant food plant among seven food plants was *D. melanoxylon* accounting for 81.82 and 41.18% in Swargabati and Indkata respectively. The overall distributions of different food plants in these three forests were 56.69, 13.80, 4.85, 2.87, 16.53, 0.60 and 4.63 for *D.melanoxylon*, *B. latifolia*, *L. grandis*, *A. Lebbek*, *P. marsupuim*, *A. marmelos* and *S.*

anacardium respectively. Densities of major matured food tree species consumed by elephants however were found to be considerably less in the present study. Therefore, the biomass utilization by elephants through these food plants in the forest was found to be less. That could be one of the possible reasons for elephants to depend more on agricultural crops. Forest users cut and collect many of these plants for their domestic uses. Repeated cutting of many elephants's food plants such as *D. melanoxylon*, *B. latifolia* and *P. marsupium* has caused a rapid declining of these plants from the forests of South Bengal (Anonymous 1975). As a management strategy, there-

fore, these plants should be protected by dissuading people from cutting. The preferred food plants consumed by migratory elephants in forests of other parts of India do not corroborate with the present findings (Srivastava 2002). This is possibly due to heavy reliance of elephants on agricultural crops to meet their major food requirements.

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