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Study on Elephant Feeding Habit of Satkosia Tiger Reserve, Odisha, India

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Abstract The Asian elephant's (*Elephas maximus*) feeding behavior with food preference was studied in Satkosia Tiger Reserve area between 2011 to 2014.The major objective of the present study is to document the fodder plant species consumption by elephants. Though the study area houses a good number of plant species only 110 species were identified as elephant fodder plants. The food trail of elephant was observed as branch breaking, bark peeling, twig breaking, flower plucking and stem twisting uprooting in different regions of study area during different seasons. Alteration of predominantly browsing strategy with that of grazing around the year was related to seasonal variation of food plants. Consumption of grass species (55%) was highest as compared to trees (37%), shrubs (5%), and herbs (3%). The elephants extensively fed on the plant species like *Aegle marmelos, Careya arborea, Bauhinia racemosa, Kydia calycina, Bauhinia vahlii, Asparagus racemosus, Helicteres isora, Mallotus philippinensis, Madhuca indica, Zizyphus mauritiona, Mimosa pudica, , Smilax zeylanica* and Diosporea species. They were fond fruits of *Mangifera indica* in summer. A high degree of variation in dicot- monocot ratio (47:63)) was marked during identification of elephant fodder plant by direct observation. Microscopic analysis of dung showing a high degree of variation in average dicot- monocot ratio suggested that the food plant selection of elephant was highly opportunistic and seasonal.

Keywords Asian Elephant, *Elephas Maximus,* Feeding Habit, Satkosia Tiger Reserve

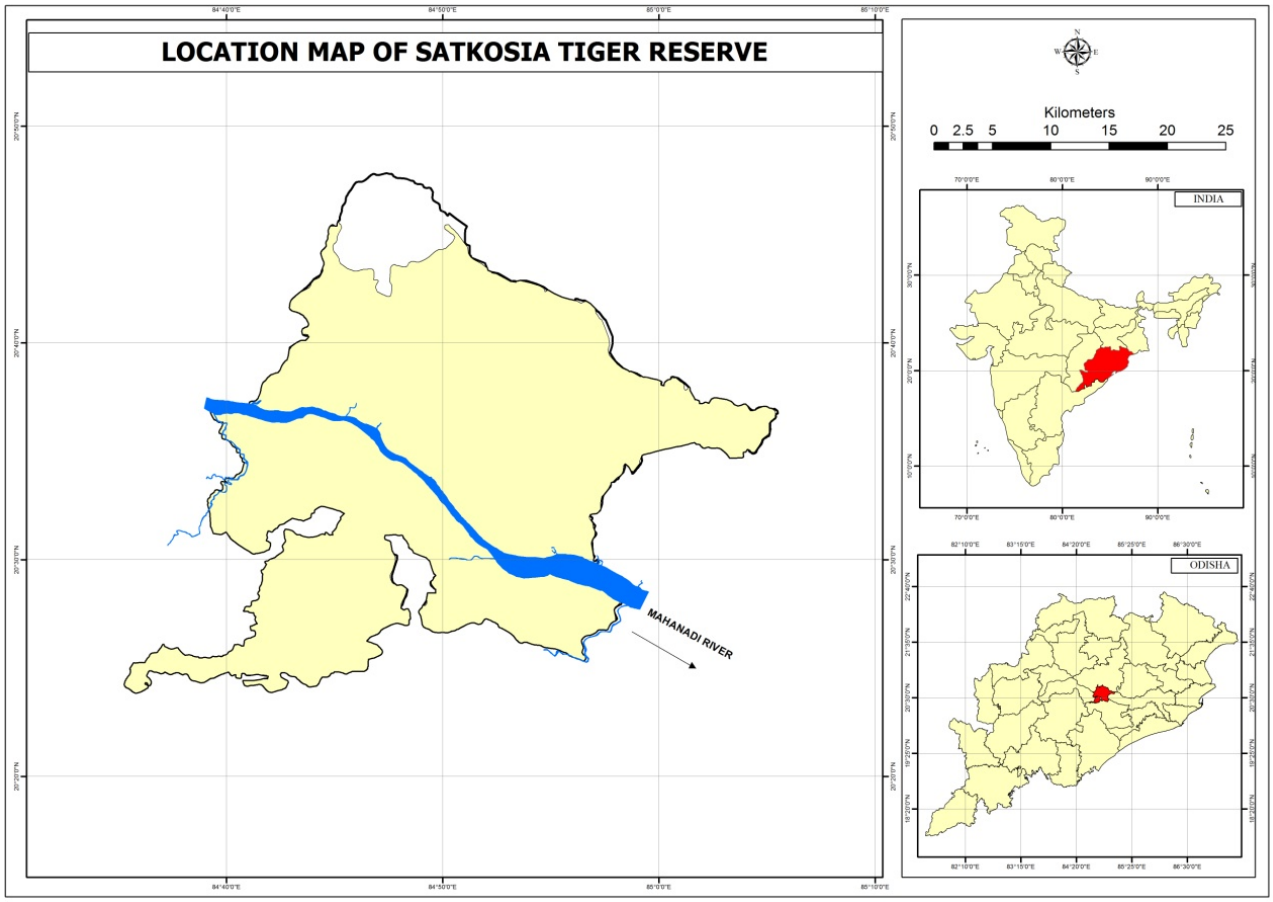
1. Introduction

Animal's range of movement increases with greater body size and energy requirement [1]. Long distance travel during seasonal movement offers clear ecological advantages to elephants [2]. Availability of food, water, barriers to free movement, spatial distribution and diversity in habitat types influence the home range size. *The more* diverse the region, the smaller could be the home range, since elephants could be able to meet their varied seasonal requirements within a relativity restricted area. Factors such as nutritive value and toxicity are important in influencing the selection of food plants by elephants. Every animal has specific biological features and ecological requirements for survival. At birth, an elephant on an average weighs around 90 kilograms and stands about 1 m tall. The height at the shoulder of an adult elephant measures between 2.2m to 3 m. Adults weigh between 2041 to 4990 kg. An elephant needs to consume large quantities of food every day. They are not specialist feeders and browse and graze on a variety of plants. More than 110 species has already been identified which serves an elephant fodder. An ideal elephant habitat should therefore have a variety of natural food species. The proportion of different plant types in their diet will vary depending upon the habitat and season. Elephants may spend up to 14-19 hours a day feeding during which they may consume up to 150 kg of food.

Numerous studies on the food plants of African and Asian elephants have shown that the proportions of various plant species in the diet vary widely from one region to another [3, 4, 5, 6]. The present study aims to document food plants of elephant in Satkosia Tiger Reserve, which is a major migration place for elephant of Athagarh Division, Dhenkanal Division and Athmallik Division.

2. Study Area

Satkosia Tiger Reserve comprises of two adjoining sanctuaries of central Odisha, namely Satkosia Gorge Sanctuary and Baisipalli Sanctuary. The geographical co-ordinates within which the core is located are 20° 25' 12" N 84° 40' 20" E to 20° 45' 36" N 85° 05' 24" E. Satkosia Tiger Reserve is one of the best deciduous ecosystems which represent a diverse floral and faunal extravaganza. It is a magnificent gorge ecosystem having many rare and endangered species. Satkosia is the meeting point of two bio-geographic regions of India; the Deccan Peninsula and the Eastern Ghats, contributing immense biodiversity.



The Satkosia Tiger Reserve was notified by Govt of Odisha in 2007, the reserve is spread over 4 districts; Angul, Cuttack, Nayagarh and Boudh. The reserve has an area of 964 sq km with 524 sq km as core area. The area is also a part of the Mahanadi elephant reserve. The northern part of the reserve along the Mahanadi river bed is under the jurisdiction of Satkosia Wildlife Division, Angul while the southern part is under Mahanadi Wildlife Division, at Nayagarh District. The Satkosia gorge is the natural habitat of the two endangered species of fresh water crocodilians namely the gharial and mugger.

3. Methodology

Two methods were employed for documenting the food plants of elephant within the study areas. The first was direct observation. After observing the feeding of animals (using binoculars) and noting the feeding signs, on-site inspections of food plants were made to identify plant species. The second method was interviews with elephant trackers, elephant squad, forest dwellers and local people who have sighted elephants many times and were able to observe them while feeding. The parts of plants consumed such as leaf, fruit, etc. were recorded in both the above methods .The plant species were photographed and identified with the help of taxonomists.

4. Results

The food plants of elephants were traced through a number of trekking excursions to the elephants' habitats. Various devices were employed to look for signs of the preference of elephants towards plants of the forests, through either direct sighting or through evidence available from the plant parts used by the elephants. A variety of plant species and plant parts were found to be consumed by elephant. All list of plants and their parts eaten by elephants are given in Table-I & Table II

5. Discussion

In present study, A total 110 (Dicot -47, Monocot- 63) plant species belonging to 25 families were reported as food plant of elephant. Family Poaceae was dominant representing 61 species, followed by family Fabaceae which represent 9 species. Out of 110 plant species, belonging to Grass – 61, Herb - 3, Shrub – 5 and Tree – 41.This shows that in Satkosia Tiger reserve, Elephants diet is mainly trees and grasses. But in dry season when grasses are not available they have to depend on other plants.

Other than grasses, Elephants mainly prefer foliage of the plant species mentioned in table no. 1.

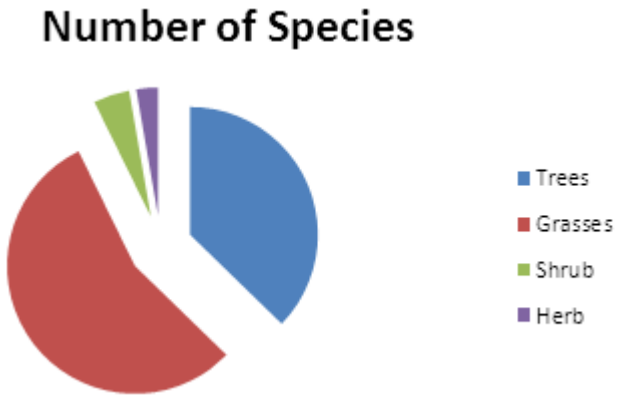
Table 1. Elephant food plants

Sr. No.	Botanical Name	Family	Parts Used	Oriya Name
1	*Careya arborea* Roxb.	Lecythidaceae	Leaves	Kumbhi
2	*Buchanania cochinchinensis* (Lour.) M.R.Almeida	Anacardiaceae	Leaves	Chara
3	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	Leaves	Moi
4	*Mangifera indica* L.	Anacardiaceae	Fruiting	Amba
5	*Semecarpus anacardium* L.f.	Anacardiaceae	Leaves	Valia
6	*Holarrhena pubescens* Wall. ex G.Don	Apocynaceae	Leaves	Kureyi
7	*Borassus flabellifer* L.	Arecaceae	Fruiting	Tala
8	*Cocos nucifera* L.	Arecaceae	Fruiting	Nadia
9	*Anogeissus latifolia* (DC.) Guillem. & Perr.	Combretaceae	Young shoots	Dhaure
10	*Combretum decandrum* Jacq.	Combretaceae	Leaves	Atundi
11	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Leaves	Bahada
12	*Terminalia chebula* Retz.	Combretaceae	Leaves, fruite	Harada
13	*Terminalia tomentosa* Wight & Arn.	Combretaceae	Leaves	Asan
14	*Ipomoea aquatica* Forssk.	Convolvulaceae	Entire plant	Kalama
15	*Dillenia pentagyna* Roxb.	Dilleniaceae	Leaves, fruite	Rai
16	*Shorea robusta* Gaertn.	Dipterocarpaceae	Leaves, bark	Sal
17	*Diospyros melanoxylon* Roxb.	Ebenaceae	Leaves, fruite	Kendu
18	*Albizia odoratissima* (L.f.) Benth.	Fabaceae	Young shoots	Tantra
19	*Bauhinia vahlii* Wight & Arn.	Fabaceae	Leaves, twigs	Lata kanchan
20	*Butea monosperma* (Lam.) Taub.	Fabaceae	Leaves	Lata palash
21	*Cajanus cajan* (L.) Millsp.	Fabaceae	Entire plant	Harad
22	*Cassia fistula* L.	Fabaceae	Leaves	Sunari
23	*Dalbergia paniculata* Roxb.	Fabaceae	Young shoots	Barabakulia
24	*Mimosa pudica* L.	Fabaceae	Entire plant	Lajakuli
25	*Pterocarpus marsupium* Roxb.	Fabaceae	Leaves	Bija
26	*Senna siamea* (Lam.) H.S.Irwin & Barneby	Fabaceae	Fruit	Chakunda
27	*Helicteres isora* L.	Malvaceae	Leaves	Chirguria. Orola
28	*Pterospermum acerifolium* (L.) Willd.	Malvaceae	Leaves	Kanaka chhampa
29	*Memecylon umbellatum* Burm. f.	Melastomataceae	Leaves	Nireso
30	*Soymida febrifuga* (Roxb.) A. Juss.	Meliaceae	Leaves	Ruhini
31	*Artocarpus heterophyllus* Lam.	Moraceae	Fruite	Panas
32	*Ficus benghalensis* L.	Moraceae	Leaves, fruite	Bara
33	*Syzygium cumini* (L.) Skeels	Myrtaceae	Leaves, fruite	Jambu
34	*Phyllanthus emblica* L.	Phyllanthaceae	Leaves, fruite	Aonla
35	*Apluda mutica* L.	Poaceae	Entire plant	
36	*Arthraxon hispidus* (Thunb.) Makino	Poaceae	Entire plant	
37	*Arthraxon lancifolius* (Trin.) Hochst.	Poaceae	Entire plant	
38	*Arundinella pumila* (Hochst. ex A. Rich.) Steud.	Poaceae	Entire plant	
39	*Arundinella setosa* Trin.	Poaceae	Entire plant	
40	*Bambusa bambos* (L.) Voss	Poaceae	Leaves	Kanta baunsa
41	*Bothriochloa bladhii* (Retz.) S. T. Blake	Poaceae	Entire plant	
42	*Bothriochloa pertusa* (L.) A. Camus	Poaceae	Entire plant	
43	*Brachiaria ramosa* (L.) Stapf	Poaceae	Entire plant	
44	*Brachiaria reptans* (L.) C. A. Gardner & C. E. Hubb.	Poaceae	Entire plant	
45	*Capillipedium assimile* (Steud.) A. Camus	Poaceae	Entire plant	
46	*Centotheca lappacea* (L.) Desv.	Poaceae	Entire plant	
47	*Chloris barbata* Sw.	Poaceae	Entire plant	
48	*Chrysopogon fulvus* (Spreng.) Choiv.	Poaceae	Entire plant	

49	*Coix lacryma-jobi* Koenig ex Roxb.	Poaceae	Entire plant	
50	*Cymbopogon flexuosus* (Nees ex Steud.) Wats.	Poaceae	Entire plant	
51	*Cyrtococcum oxyphyllum* (Hochst. ex Steud.) Stapf	Poaceae	Entire plant	
52	*Cyrtococcum patens* (L.) A. Camus	Poaceae	Entire plant	
53	*Dactyloctenium aegypticum* (L.) Willd.	Poaceae	Entire plant	
54	*Dichanthium annulatum* (Forssk.) Stapf	Poaceae	Entire plant	
55	*Dichanthium caricosum* (L.) A. Camus	Poaceae	Entire plant	
56	*Diectomis fastigiata* (Sw.) Kunth	Poaceae	Entire plant	
57	*Dimeria connivens* Hack.	Poaceae	Entire plant	
58	*Dimeria ornithopoda* Trin.	Poaceae	Entire plant	
59	*Enteropogon dolichostachyus* (Lag.) Keng ex Lazarides	Poaceae	Entire plant	
60	*Eragrostiella brachyphylla* (Stapf) Bor	Poaceae	Entire plant	
61	*Eragrostis amabilis* (L.) Wight & Arn.	Poaceae	Entire plant	
62	*Eragrostis atrovirens* (Desf.) Trin. ex Steud.	Poaceae	Entire plant	
63	*Eragrostis ciliaris* (L.) R.Br.	Poaceae	Entire plant	
64	*Eragrostis ciliata* (Roxb.) Nees	Poaceae	Entire plant	
65	*Eragrostis gangetica* (Roxb.) Steud.	Poaceae	Entire plant	
66	*Eragrostis pilosa* (L.) P. Beauv.	Poaceae	Entire plant	
67	*Eragrostis viscosa* (Retz.) Trin.	Poaceae	Entire plant	
68	*Eremopogon foveolatus* (Del.) Stapf	Poaceae	Entire plant	
69	*Isachne globosa* (Thunb.) Kuntze	Poaceae	Entire plant	
70	*Ischaemum ciliare* Retz.	Poaceae	Entire plant	
71	*Iseilema anthephoroides* Hack.	Poaceae	Entire plant	
72	*Iseilema hackelii* Shrestha & Gandhi	Poaceae	Entire plant	
73	*Leersia hexandra* Sw.	Poaceae	Entire plant	
74	*Mnesithea laevis* (Retz.) Kunth.	Poaceae	Entire plant	
75	*Oplismenus burmannii* (Retz.) P. Beauv.	Poaceae	Entire plant	
76	*Oplismenus compositus* (L.) P. Beauv.	Poaceae	Entire plant	
77	*Oryza sativa* L.	Poaceae	Entire plant	Dhana
78	*Panicum notatum* Retz.	Poaceae	Entire plant	
79	*Paspalidium flavidum* (Retz.) A. Camus	Poaceae	Entire plant	
80	*Paspalum canarae* (Steud.) Veldk.	Poaceae	Entire plant	
81	*Paspalum scrobiculatum* L.	Poaceae	Entire plant	
82	*Pennisetum pedicellatum* Trin.	Poaceae	Entire plant	Napier grass
83	*Pseudosorghum fasciculare* (Roxb.) A. Camus	Poaceae	Entire plant	
84	*Rottboellia cochinchinensis* (Lour.) W. D. Clayton	Poaceae	Entire plant	
85	*Saccharum officinarum* L.	Poaceae	Entire plant	Akhu
86	*Schizachyrium brevifolium* (Sw.) Nees ex Buese	Poaceae	Entire plant	
87	*Schizachyrium exile* (Hochst.) Pilger	Poaceae	Entire plant	
88	*Sehima nervosum* (Rottler) Stapf.	Poaceae	Entire plant	
89	*Setaria intermedia* Roem. & Schult.	Poaceae	Entire plant	
90	*Setaria pumila* (Poir) Roem. & Schult.	Poaceae	Entire plant	
91	*Sorghum halepense* (L.) Pers.	Poaceae	Entire plant	
92	*Sporobolus indicus* (L.) R. Br.	Poaceae	Entire plant	
93	*Themeda triandra* Forssk.	Poaceae	Entire plant	
94	*Vetiveria zizanioides* (L.) Nash	Poaceae	Entire plant	
95	*Zea mays* L.	Poaceae	Entire plant	Maka
96	*Ziziphus mauritiana* Lam.	Rhamnaceae	Leaves, fruite	Barakoli
97	*Ziziphus oenopolia* (L.) Mill.	Rhamnaceae	Leaves, fruite	Kantei koli
98	*Ziziphus xylopyrus* (Retz.) Willd.	Rhamnaceae	Leaves, fruite	Ghonta

99	*Gardenia gummifera* L.f.	Rubiaceae	Leaves	Purudu
100	*Mitragyna parvifolia* (Roxb.) Korth.	Rubiaceae	Leaves	Kurmoyi /Mitikinia
101	*Morinda citrifolia* L.	Rubiaceae	Leaves	Anchu
102	*Aegle marmelos* (L.) Corrêa	Rutaceae	Fruit	Belo
103	*Chloroxylon swietenia* DC.	Rutaceae	Leaves	Bheru
104	*Limonia acidissima* Groff	Rutaceae	Fruite	Kaitha
105	*Casearia tomentosa* Roxb.	Salicaceae	Leaves	Khakra
106	*Flacourtia jangomas* (Lour.) Raeusch.	Salicaceae	Leaves	Bhaincha
107	*Madhuca indica* J.F.Gmel.	Sapotaceae	Leaves, fruite	Mahula
108	*Smilax zeylanica* L.	Smilacaceae	Leaves	Muturi
109	*Solanum melongena* L.	Solanaceae	Entire plant	Baigan
110	*Cissus quadrangularis* L.	Vitaceae	Leaves	Hadabhanga

Table 2. Species share of plant groups in food of Elephants:



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