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, Ziziphus mauritiana, 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.         | Areceae         | Fruiting   | Tala        |
| 8       | cocos nucifera L.               | Areceae         | Fruiting   | Nadia       |
| 9       | Anogeissus latifolia (DC.) Guillem. & Perr. | Combretaceae | Young shoots | Dhaure     |
| 10      | Combretum decandrum Jacq.       | Combretaceae    | Leaves     | Atuuri      |
| 11      | Terminalia bellirica (Gaertn.) Roxb. | Combretaceae | Leaves     | Bahada      |
| 12      | Terminalia chebula Retz.        | Combretaceae    | Leaves, fruit | Harata     |
| 13      | Terminalia tomentosa Wight & Arn. | Combretaceae | Leaves     | Assan       |
| 14      | Ipomoea aquatica Forrsk.        | Convolvulaceae  | Entire plant | Kalamra    |
| 15      | Dillenia pentagyna Roxb.        | Dilleniaceae    | Leaves, fruit | Rai        |
| 16      | Shorea robusta Gaertn.          | Dipterocarpaeae | Leaves, bark | Sal        |
| 17      | Diospyros melanoxylon Roxb.     | Ebenaceae       | Leaves, fruit | 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 palashi |
| 21      | Cajanus cajan (L.) Mills.       | Fabaceae       | Entire plant | Harad       |
| 22      | Cassia fistula L.               | Fabaceae       | Leaves     | Sunari      |
| 23      | Dalbergia paniculata Roxb.      | Fabaceae       | Young shoots | Bababakula  |
| 24      | Mimosa pudica L.                | Fabaceae       | Entire plant | Lajakuli    |
| 25      | Pterocarpus marsupium Roxb.     | Fabaceae       | Leaves     | Bija        |
| 26      | Senna siameu (Lam.) H.S.Irwin & Barneby | Fabaceae | Fruit | Chakunda  |
| 27      | Helicteres isora L.             | Malvaceae       | Leaves     | Chiriguria. Orola |
| 28      | Pterospermum acerifolium (L.) Wild. | Malvaceae | Leaves | Kanaka chhampa |
| 29      | Memecylon umbellatum Burm. f.   | Melastomataceae | Leaves | Nireso      |
| 30      | Sutmida febrifuga (Roxb.) A. Juss. | Meliaceae   | Leaves     | Ruhini      |
| 31      | Artocarpus heterophyllus Lam.   |Moraceae        | Fruit     | Panas       |
| 32      | Ficus benghalensis L.           |Moraceae        | Leaves, fruit | Bara      |
| 33      | Syzygium cumini (L.) Skeels     |Myrtaceae        | Leaves, fruit | Jambu      |
| 34      | Phyllanthus emblica L.          |Phyllanthaceae   | Leaves, fruit | Aonla      |
| 35      | Apluda matica 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 baansa |
| 41      | Bothriochloa bladhii (Reut.) 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 lappaceu (L.) Desv.  |Poaceae         | Entire plant |            |
| 47      | Chloris barbata Sw.             |Poaceae         | Entire plant |            |
| 48      | Chrysopogon fulus (Spreng.) Choiv. | Poaceae      | Entire plant |            |
| No. | Species Name                          | Family       | Part Used             |
|-----|--------------------------------------|--------------|-----------------------|
| 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  | Dactylolentium egypticum (L.) Wild.  | Poaceae      | Entire plant          |
| 54  | Dichanthium annulatum (Forssk.) Stapf | Poaceae      | Entire plant          |
| 55  | Dichanthium caricosum (L.) A. Camus  | Poaceae      | Entire plant          |
| 56  | Dictomis 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 (Roeb.) Nees      | Poaceae      | Entire plant          |
| 65  | Eragrostis gangetica (Roeb.) 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  | Isilema anthephorooides Hack.        | Poaceae      | Entire plant          |
| 72  | Isilema hackeli 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          |
| 78  | Panicum notatum Retz.                | Poaceae      | Entire plant          |
| 79  | Paspalidium flavidum (Retz.) A. Camus | Poaceae      | Entire plant          |
| 80  | Paspalum canareae (Steud.) Veldk.    | Poaceae      | Entire plant          |
| 81  | Paspalum scrobiculatum L.            | Poaceae      | Entire plant          |
| 82  | Pennisetum pedicellatum Trin.        | Poaceae      | Entire plant          |
| 83  | Pseudosorghum fasciculare (Roeb.) A. Camus | Poaceae      | Entire plant          |
| 84  | Rottboellia cochinchinensis (Lour.) W. D. Clayton | Poaceae      | Entire plant          |
| 85  | Saccharum officinarum L.             | Poaceae      | Entire plant          |
| 86  | Schizachyrium brevifolium (Sw.) Nees ex Buese | Poaceae      | Entire plant          |
| 87  | Schizachyrium exile (Hochst.) Pilger  | Poaceae      | Entire plant          |
| 88  | Selima nervosum (Rottler) Stapf.     | Poaceae      | Entire plant          |
| 89  | Setaria intermedia Roem. & Schult.   | Poaceae      | Entire plant          |
| 90  | Setaria pumila (Poir) Roem. & Schult. | Poaceae      | Entire plant          |
| 91  | Sorgahum 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          |
| 96  | Ziziphus mauritiana Lam.             | Rhamnaceae   | Leaves, fruit          |
| 97  | Ziziphus oenopolia (L.) Mill.        | Rhamnaceae   | Leaves, fruit          |
| 98  | Ziziphus xylopyrus (Retz.) Willd.    | Rhamnaceae   | Leaves, fruit          |
| No. | Species                                         | Family | Part   | Place     |
|-----|------------------------------------------------|--------|--------|-----------|
| 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 | Khakna    |
| 106 | Flacourtia jangomas (Lour.) Raeusch.           | Salicaceae | Leaves | Bhanicha |
| 107 | Madhuca indica J.F.Gmel.                      | Sapotaceae | Leaves, fruit | Mahula |
| 108 | Smilax zeylanica L.                            | Smilacaceae | Leaves | Muturi    |
| 109 | Solanum melongena L.                           | Solanaceae | Entire plant | Baigan  |
| 110 | Cissus quadrangularis L.                       | Vitaceae | Leaves  | Hadabhangia |

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

### Number of Species

- **Trees**
- **Grasses**
- **Shrub**
- **Herb**

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