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Study on Seed Dispersal Potentiality of Asian Elephant (Elephas maximus) in the Northern Odisha, India

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Abstract
Dung assessment and seed germination studies on eaten seeds were used to investigate frugivory and seed dissemination by the Asian elephant, Elephas maximus, in a mid-elevation tropical evergreen forest in India. During the months of December 2018 to December 2020, 150 dung boli were analyzed the Seedlings and seeds. Thefaeces heaps contained 21 different woody species. Experiments on seed germination revealed that seeds from dung germinate well.Ingestible seeds were viable. 71.4 percent of the seedlings in the dung heaps grew to be saplings According to the research, the Asian elephant is a in its area, it is a valid seed disperser in tropical woods.

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I. Introduction

Elephants are mega herbivores, meaning they eat a lot of leaf tissue, especially fruiting bodies. They also have extensive home ranges, which allow them to distribute seeds across long distances. Several research shown that African elephants play an important role in seed distribution for a variety of plant types (Short 1981; Keon 1983; Lieberman *et al.* 1987; Dudley1999; Cochrane 2003). In comparison to African elephants, few investigations have been conducted on Asian elephants' capacity to disperse seeds (Vinod&Cheeran 2000; Kitamura *et al*. 2007). Due to their food, digestive system, and wandering patterns, both Asian and African elephants are expected to be good dispersers(Campos-Arceiz and Blake 2011and*Sekar et al.* 2015). The goal of this study was to detect the seeds spread by Asian elephants and to measure their germination ability under variable circumstances in order to establish the function of Asian elephants in seed dispersion of the area's major vegetation types.

II. Materials And Methods

Study area

Odisha is located on the east coast of the Indian subcontinent having 155,707 km² geographical areas which constitutes 4.74% area of the country. It lies in the tropical zone between Latitudes of 17°47'N and 22°34'N and longitudes of 81°22'E and 81°22'E. Physiorgaphically, the state can be divided into four regions, *viz.*, Eastern Ghats, Northern, Plateau, Coastal Plains and Central Tableland. The northern land of Odisha owing its peculiar geographical location and wide range of physical range, embraces a diversified floristic composition and consequently a vast economic potential. This land harbors tropical moist deciduous forest comprises mainly, Sal, Asan, Teak, Piasal, Arjun, bamboo etc. This northern land surrounded by neighboring state of West Bengal and Jharkhand. The current study has been surveyed in five selected forest land of Kuldiha (21°25'57''N, 86°36'58''E), Nilagiri (21°28'59''N, 86°46'06''E), Krishnachandrapur (21°49'42''N, 86°52'28''E), Badampur (21°44'21''N, 86°59'42''E), and Bhattchatar(21°54'59''N 59'13''E).The temperature ranges from 38°C to 41°C during summer and in winter the temperature goes below 7°C. The annual rainfall measure in Baleshwar about 1565mm/year and Mayurbhanj is comes under North central plateau agro climatic region, recorded about 1648.20mm/year. The northern land harbors magnificent number of flora and fauna.

Identification of plant seeds in elephant dung

A total of 150 dung piles were studied from various portions of the research region. Two boli were taken from each dung pile and placed in a tray to be sorted by hand. All of the whole or fragmented seeds were collected and placed in a sample container. Following that, the seeds were identified by comparison them to a consolidated group of plant seeds made up of both cultivated and non-cultivated plant species present in the region.

Determination of germination potential in situ

If seeds were discovered during macroscopic study of two boli from a dung pile, some of the remaining dung boli were noted and examined until the boli disintegrated entirely. To assess the influence of shade, dung piles were collected from both shaded and open ecosystems and the experiment was conducted throughout both the dry and rainy seasons. As a result, the germination ability of wet open (n=50), wet shade (n=70), dry open (n=50), and dry shade (n=60) seeds was studied in situ.

III. Result and Discussion

Out of the 150 dung piles examined 103 (68%) contained seeds of one or more plant species. Out of which 21(65.6 %) number of species were identified and rest 11 (34.3 %) were unidentified. In situ germination trial no seed germinationwas observed in the 110 dung boli tested during the dry season. However, during the wet seasonseed germination was observed in 33.3% of the dung boli tested. Further, germination was found to be higher (50%) in dung boli left in the open area compared to the dung boli left in the shade (21.4%).

The majority of the seeds in the excrement have the ability to germinate. However, under natural conditions, just a few seeds germinated. The key determinant of seed germination in elephant dung is the relative humidity. Seed germination was found in the dung heaps deposited during the wet season, but not in the dung piles put during the dry season. Seeds contained in dung deposited during the dry season, on the other hand, may remain latent until the next rainy season before germinating. Because all of the dung piles placed during the dry season decomposed entirely before the rainy season began, this hypothesis could not be tested in this study. Furthermore, as compared to dung heaps left in the shadow, dung piles left in open locations had a higher germination rate.

Table 1- List of seed present in dung boli of elephant.

SL. No	**Plant/ Seed**	**Scientific Name**
1	Mango	*Mangiferaindica*
2	Jack Fruit	*Artocarpusheterophyllus*
3	Bel	*Aeglemarmelos*
4	Jastimadhu	*Xantolistomentosa*
5	Mahula	*Madhucaindica*
6	Sal	*Shorearobusta*
7	Arjuna	*Terminaliaarjuna*
8	Black plum	*Syzygiumcumini*
9	Kaju	*Anacardiumoccidentale*
10	Bettle Nut	*Areca catechu*
11	Gauava	*Psidiumguajava*
12	Kumbhi	*Careyaarborea*
13	Barkoli	*Ziziphus jujube*
14	Nadipaja	*Litseamonopetala*
15	*Annonasquamosa*	*Careyaarborea*
16	Talo	*Borassusflabellifer*
17	Tamarind	*Tamarindusindica*
18	Wood Apple	*Limoniaacidissima*
19	Grass	*Unknown*
20	Paddy Husk	*Oryzasativa*
21	Bamboo	*Bambusabambo*
22	Unidentified Species	*11*

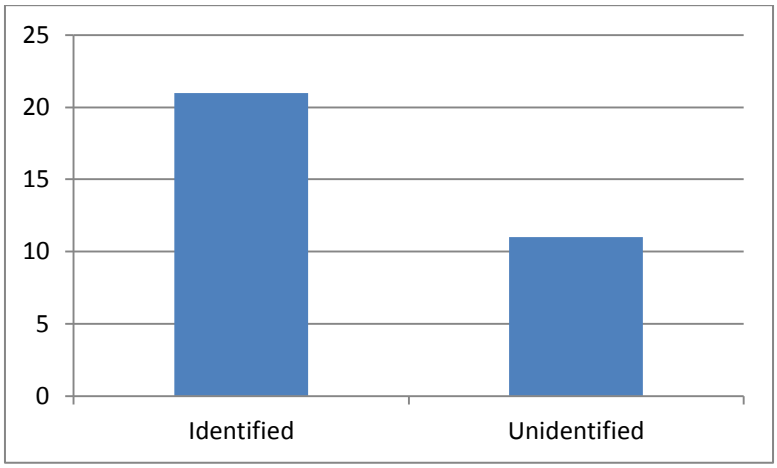

Fig. 01- Identified and unidentified plant species present in dung boli

Table 2.Comparison of the in situ germination potentialofseedsinintactdungbolikeptinopen and shaded areas during wet and dry season

Treatment		n	Dung boli
Dry season	shade	60	no germination
	open	50	no germination
Wet season	shade	70	15
	open	50	25

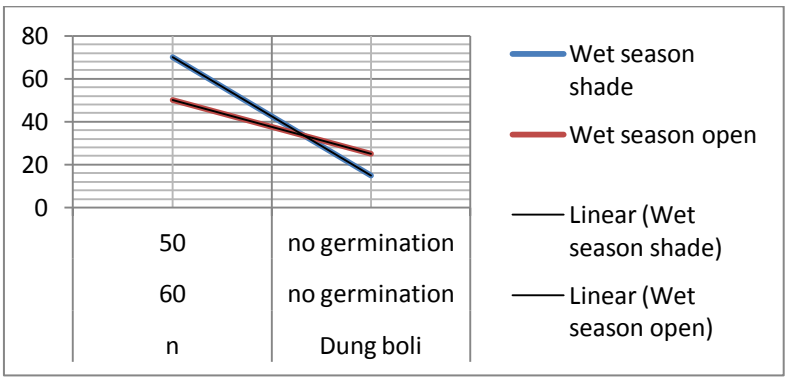

Fig.02- Germination of plants in two different seaso

Fig.03- Elephants Dung BoliFig.04- Natural Tamarind Germination Fig.05- Natural Kumbhi plant Germination

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Conflict of Interest: The Authors declares no conflict of Interest.

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