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Rare Occurrence of *Butea monosperma* (Lam.) Taub. var. *lutea* (Witt.) Maheshwari in Kalahandi and Its Adjoining Areas of Odisha, India

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ABSTRACT

The genus *Butea* (Fabaceae) holds ecological and medicinal significance, with *Butea monosperma* (Lam.) Taub. widely recognized for its traditional uses. A rare variety, *Butea monosperma var. lutea* (Witt.) Maheshwari, distinguished by its yellow flowers instead of the typical orange-red, has been recorded in Kalahandi and adjoining areas of Odisha. Limited reports on its occurrence make it essential to assess its distribution, diversity, and ecological significance. This study evaluates its occurrence, morphological characteristics, habitat preferences, and biodiversity significance using quantitative ecological indices. Field surveys conducted from 2023 to 2024 across Kalahandi, Nuapada, Balangir, Kandhamal, and Boudh districts in Odisha employed quadrat sampling (10 × 10 m plots) for vegetation diversity assessment, with morphological identification performed through comparative analysis with *Butea monosperma* using standard taxonomic keys. Species diversity was analyzed using the Shannon-Wiener Index (H') and Simpson's Index (D). A total of Nine individuals were recorded across five districts, with an H' value of 2.04 and a D value of 0.136, indicating moderate habitat diversity but low dominance. The variety was found at elevations of 200–600 m, primarily in moist deciduous patches alongside *Shorea robusta*, *Terminalia arjuna*, and *Madhuca indica*. Morphological differences from *Butea monosperma* included pale yellow flowers, slightly pubescent leaves, and shorter fruit length (12–18 cm). The discovery of *Butea monosperma var. lutea* in Odisha enriches the region's floristic diversity and underscores its ecological significance. Its restricted distribution and low population density highlight the need for conservation strategies, while further research is required to explore its phytochemical properties, genetic diversity, and potential applications in traditional medicine.

Keywords- *Butea monosperma var. lutea*, Fabaceae, floristic diversity, yellow flowers, Odisha, ecological significance, species distribution, morphological characteristics, Shannon-Wiener Index, Simpson's Index, conservation.

I. INTRODUCTION

The genus *Butea* (Fabaceae) is an ecologically and medicinally significant group of plants, widely distributed across tropical and subtropical regions (Gamble, 1935; Kirtikar & Basu, 1935). *Butea monosperma* (Lam.) Taub., commonly known as the Flame of the Forest, is renowned for its vibrant flowers and numerous applications in traditional medicine (Chopra et al., 1956). Its bark, flowers, and seeds are used in Ayurveda and folk medicine for treating various ailments such as inflammation, wounds, and gastrointestinal disorders (Singh et al., 2001; Rastogi & Mehrotra, 1990).

A newly identified variety, *Butea monosperma var. lutea* (Witt.) Maheshwari, has been recorded in Kalahandi and its adjoining regions. This variety is notable for its distinctive yellow flowers, which differentiate it from the characteristic orange-red blooms of *Butea monosperma*. Reports of its presence in India remain scarce, highlighting its limited distribution and rarity. Previous occurrences of *Butea monosperma var. lutea* have been documented in various locations, including Nizamabad, Warangal, and Karimnagar (Naqvi, 2001); Banaskantha, Dahod, Dang, Narmada, and Panchmahals districts of Gujarat (Nagar, 2015); Demti Eran village in Sabarkantha District, Gujarat

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(Hitesh R. Patel & R. S. Patel, 2015); Kinwat forest, Nanded District in Maharashtra (Srinivas Reddy et al., 2016); Adilabad District in Telangana (Srinivas & Bembrekar, 2016); Pune and Aurangabad in Maharashtra (Patil & Mahajan, 2018); Ghatanji Taluka, Yavatmal District, Maharashtra (Eanguwar & Deshmukh, 2020); Bandha Bazar, Rajnandgaon District, Chhattisgarh (Shriram Kunjam et al., 2021); and Surendranagar District, Gujarat (Vipul P. Sorani & P. K. Patel, 2023).

Recent research has provided quantitative data on its occurrence, indicating low diversity and confined to isolated patches. It is an exceptionally rare species that has been classified as a globally endangered medicinal plant by the Conservation Assessment and Management Planning Workshop for Medicinal Plants of Andhra Pradesh (Jadhav et al., 2001). Given its rarity and endangered status, greater focus should be placed on its conservation (Patil and Mahajan, 2018).

Butea monosperma var. lutea is an exceptionally rare species that has been classified as a globally endangered medicinal plant by the Conservation Assessment and Management Planning Workshop for Medicinal Plants of Andhra Pradesh (Jadhav et al., 2001). Given its rarity and endangered status, greater focus should be placed on its conservation (Patil and Mahajan, 2018).

Given its restricted presence and potential ecological importance, this discovery is crucial for taxonomic and conservation studies (Maheshwari, 1961). This study aims to assess its occurrence, morphological characteristics, habitat preferences, and biodiversity significance using indices such as the Shannon-Wiener Index and Simpson's Index (Magurran, 2004; Whittaker, 1972).

II. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in the wild regions of Kalahandi and adjoining areas in Odisha, India. The region is characterized by a dry deciduous forest with lateritic and alluvial soil types, hosting diverse flora (Champion & Seth, 1968).

2.2 Field Sampling and Identification

Field surveys were conducted from 2023 to 2024. Samples were collected, photographed, and herbarium specimens were prepared following standard botanical protocols (Jain & Rao, 1977). Morphological characteristics were compared with *Butea monosperma* (Lam.) Taub. using standard taxonomic keys (Maheshwari, 1961) and data found in several taxonomic identifier.

Taxonomic Identifiers and References for *Butea monosperma* var. *lutea given below.*

Taxonomic Identifiers and References for *Butea monosperma* var. *lutea*

Database	Taxon ID	Website Reference
IUCN Red List	39062	IUCN Red List
NCBI Taxonomy	2555783	NCBI Taxonomy
Flowers of India	Yellow Flame of the Forest	Flowers of India
Open Tree of Life	7055743	Open Tree of Life
GBIF (Global Biodiversity Information Facility)	5792824	GBIF
iNaturalist	438103	iNaturalist
UMLS (Unified Medical Language System)	C5727980	UMLS
India Biodiversity Portal	279174	India Biodiversity Portal

2.3 Diversity Index Calculation

Vegetation diversity was assessed using quadrat sampling (10 × 10 m plots). Species diversity was analyzed using:

- $\boldsymbol{Shannon-WienerIndex}$ **(H')**: **H'=** $-\sum(\boldsymbol{pilnpi})$
  Where pi is the proportion of individuals of species i (Magurran, 2004).
- **Simpson's Index (D)**:$D = \sum pi^2$
  Where pi represents the relative abundance of each species (Simpson, 1949).

III. RESULTS AND DISCUSSION

3.1 Diversity Index Calculation

Site	District	Area	No. of Plants Found
1	Kalahandi	Karlakote	1
2	Kalahandi	Bankapala	1
3	Kalahandi	Khairmal	1
4	Nuapada	Chindaguda	2
5	Nuapada	Badapada	1
6	Balangir	Jampadar	1
7	Kandhamal	Anagula	1
8	Boudh	Deogaon	1

Total Shannon-Wiener Index (H') = **2.04**
Total Simpson's Index (D) = **0.136**

3.2 Morphological Differences

A distinct characteristic of *Butea monosperma* var. *lutea* is its **yellow flowers**, contrasting with the bright orange-red flowers of the typical *B. monosperma*. Other morphological variations include:

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Characteristic	***Butea monosperma***	***Butea monosperma var. lutea***
Flower Color	Bright orange-red	Pale yellow
Leaf Shape	Ovate, glabrous above	Ovate, slightly pubescent
Pod Length	15–20 cm	12–18 cm
Habitat	Dry deciduous forests	Restricted, scattered locations
Population Density	High	Very low

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Photographs of *Butea monosperma* (Lam.) Taub. var. *lutea* (Witt.) Maheshwari

3.3 Habitat and Distribution

The variety predominantly grows in **moist deciduous patches**, indicating an ecological adaptation distinct from the original species, which prefers dry deciduous forests (Champion & Seth, 1968). It was observed at elevations between **200–600 m**, often in association with *Shorea robusta*, *Terminalia arjuna*, and *Madhuca indica*.

IV. CONCLUSION

The identification of *Butea monosperma* var. *lutea* in Kalahandi expands the floristic diversity of the region. Its distinct yellow flowers and ecological adaptations distinguish it from the typical *Butea monosperma*. Diversity index calculations confirm its presence in a moderately diverse habitat. This discovery aligns with previous studies highlighting the importance of floristic diversity in maintaining ecological balance (Magurran, 2004; Whittaker, 1972). Further research is needed to explore its phytochemical properties, genetic diversity, and conservation strategies (Rao et al., 1998; Singh et al., 2001).

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