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COMMUNICATION

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Angiosperm diversity in Bhadrak region of Odisha, India

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Abstract: We present the information about angiosperm species in Bhadrak District of Odisha, India. In so doing, we assess the state of floristic knowledge across ecoregions of the district and pinpoint our understanding of the district flora. This study is first of its kind conducted in the district showing current status of the angiosperm diversity. A total of 383 species (262 native species and 121 non-native species) belonging to 282 genera under 93 families are recorded as per APG III classification. These taxa are distributed in 12 superorders and 39 orders; 26.7% of the native species were reported from the superorder Fabids, 20.6% from superorder Malvids, 19.8% from superorder Lamids and 15.6% from superorder Commelinids. One hundred and twenty one non-native species were represented in 12 superorders. Native species of the order Fabales (35), Poales and Lamiales (27) each, Malphigiales (18), Malvales (14), Gentianales (13), Caryophyllales and Solanales (12) each and Myrtales and Sapindales (11) each, account for about 68.7% of the species in the district. Eighty one non-native species belong to these orders. The analysis of the plant species based on growth habits showed highest proportion of herbs followed by trees, shrubs and climbers. Some of the reported species are used for the treatment of various ailments and also for edible purposes. Plant species diversity, distribution and population structure provide baseline information for conservation and sustainable management of available resources.

Keywords: Biofencing, floristic inventory, invasive species, medicinal plants, vegetation.

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Author contribution: TP carried out the floristic study, collected the data and wrote the manuscript. BKP, SDR, RKM and RBM identified the species, interpreted the data and designed the manuscript. All authors have read and approved the final manuscript.

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INTRODUCTION

The structure, composition, and vegetative functions are most significant ecological attributes of a particular ecosystem, which show variations in response to environmental as well as anthropogenic variables (Timilsina et al. 2007; Gairola et al. 2008; Shaheen et al. 2012). Major threats to ecosystems and biodiversity are habitat loss & fragmentation, overexploitation, pollution, invasions of alien species, and global climate change (IUCN 2003) with disruption of community structure. The anthropogenic pressures, heavy grazing, and the natural calamities have led to degradation of natural habitats of many species. Such practices are discouraging the native species and promoting the hardy non-native species having little value for the local ecosystem (Pant & Samant 2012). Floristic inventory and diversity studies help to understand the species composition and diversity status of a region (Phillips et al. 2003), which also offer vital information for conservation (Gordon & Newton 2006). Quantitative inventories, moreover, help identify species that are in different stages of vulnerability (Padalia et al. 2004) as well as the various factors that influence the existing vegetation in any region (Parthasarathy 1999). The flowering plants of India comprise about 15,000 species under 2,250 genera and 315 families and represent 6% of the world's known flowering plants (Nayar 1977). At present there are 18,666 species of angiosperms found in India (Mao & Dash 2019). According to Irwin & Narasimhan (2011), 49 angiosperm genera are endemic to India. At present 58 genera & 4,303 taxa of angiosperms are endemic to India (Singh et al. 2015).

Odisha, a state of ancient land and temples lying between 17.49N to 22.34N latitude and 81.27E to 87.29E longitude is situated on the eastern coast of the Indian peninsula. Bordered on the north by Jharkhand, on the west by Chhattisgarh, on the south by Andhra Pradesh, on the north-east by West Bengal and on the south-east by Bay of Bengal with a coastline of 482km, the state covers an area of 155,707km². This state is a land of rich floral diversity. More than 2,630 species of angiosperms under 194 families (Sahoo et al. 1999) have been recorded in the state. These include trees of commercial significance and plants with medicinal properties. Many botanists have documented the plant diversity of Odisha for nearly two centuries. Roxburgh (1819) was the first to include some plants of southern Odisha. Dunlop (1844) published a list of plants in the garden of the branch Agri-Horticultural Society of Cuttack. Some account of vegetation of Odisha is found

in Hooker & Thomson's *Flora Indica* (1855). Hooker (1897) refers to the stray collections from Odisha. Haines' *The Botany of Bihar and Orissa* (1925) and its supplement by Mooney (1950) and Gamble's *Flora of the Presidency of Madras* (1936) are the pioneer works before independence. After independence, many floristic works have been published, thus contributing significantly to the floristic diversity of Odisha. Numerous publications (Jain et al. 1975; Saxena 1976, 1978; Behera et al. 1979; Brahmam & Saxena 1980; Mishra et al. 1983; Choudhury 1984; Choudhury & Pattanaik 1985; Dubey & Panigrahi 1986; Das et al. 1994) either as district floras or checklists of plants of different areas in the state have been brought out. Saxena and Brahmam's *The Flora of Orissa* published in 1996 is the most comprehensive and authentic work on the floristic diversity of this region. Recently, Reddy et al. (2007) and Sahu et al. (2007) made significant contribution to the flora of Odisha. A perusal of literature, however, reveals that there is a lack of base line information on the floristic composition of Bhadrak District of Odisha. Hence this study was undertaken to explore the angiospermic diversity of the region along with its multifarious uses in rural areas. This study will allow further evaluation of district's current conservation status and contribute to the flora of coastal Odisha.

MATERIALS AND METHODS

Study site

Odisha is the ninth largest state of India by area and the eleventh largest by population. With the Eastern Ghats range of hills almost passing through the heart of the state, high Similipala hills on its north and around 482km of coast line on its east, Odisha has varied ecosystems from marine to semi-arid on the west, which provides 'niches' for diverse animal and plant communities (Patnaik 1996). The vegetation found in this region is tropical moist deciduous forest type (Champion & Seth 1968).

Bhadrak District (21.066°N & 86.5°E) is located in northeastern Odisha. It spreads over 2,505km² having 1.507 million inhabitants (2011 Census). Four other districts namely Balasore, Kendrapara, Jajpur and Koenjher surround Bhadrak District while a part is bounded by the Bay of Bengal (Figure 1). The district covers about 1.61% of the total land area of the state and contributes 3.59% of the state's population. About 86.66% of the inhabitants are villagers and the people are engaged in agricultural practices as their primary occupation. Being situated in close proximity to Bay of

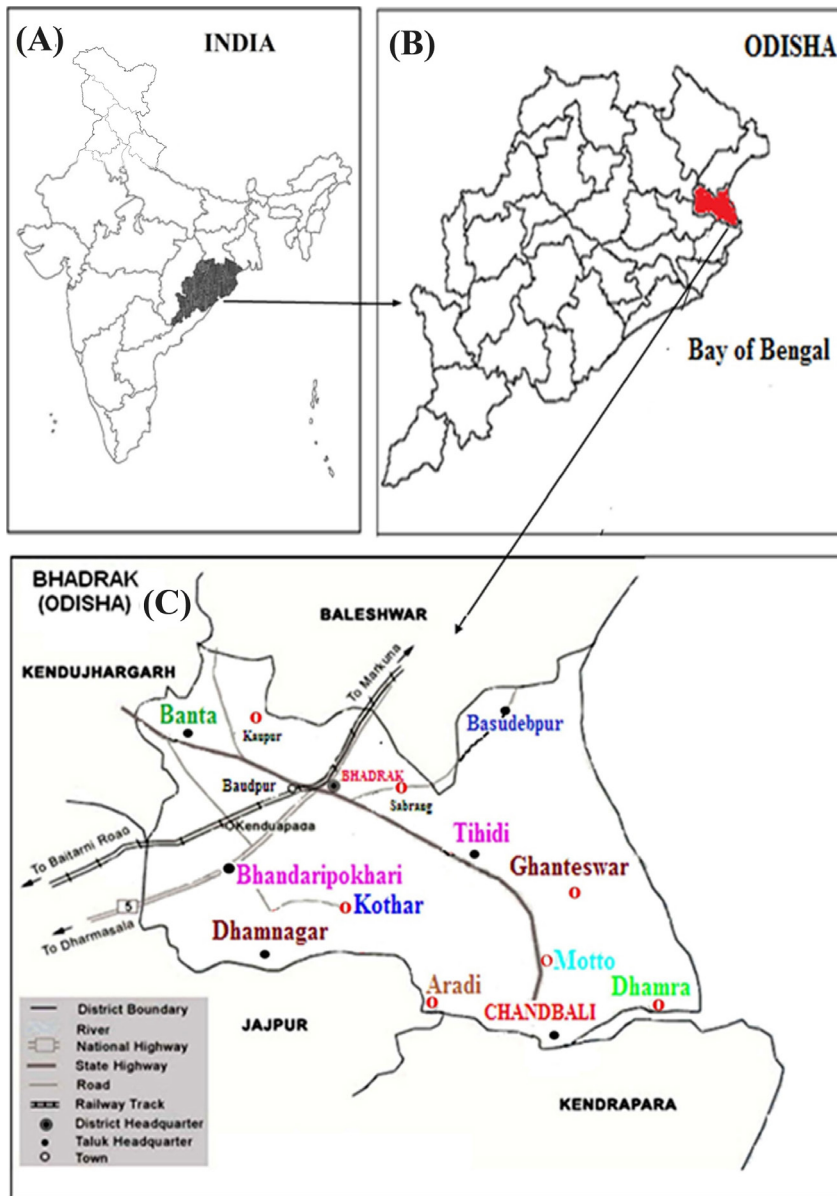


Figure 1. A—Location of Odisha State in the eastern region of India | B—Odisha State indicating Bhadrak District | C—study area showing different blocks of Bhadrak District.

Bengal, the district is characterized by periodic earth tremors, thunder storms in the rains and dust storms in April and May.

Data collection

Extensive field surveys (July 2014 to June 2016) were carried out fortnightly to document and enlist the angiospermic floras in different seasons and diverse habitats, i.e., cultivated fields, waste lands, river banks, roadsides, water bodies, marshes, pathways, parks, private gardens and other relevant localities of the district following established and standard procedures (Jain 1987; Martin 1995). The information was obtained through a combination of tools and techniques of

structured questionnaires, complemented by free interviews and informal conversations (Martin 1995; Huntington 2000). The information regarding the plant species has been gathered mostly from local farmers, elderly and knowledgeable persons, who were considered by their communities as having exceptional knowledge about plants. One-hundred-and-fifty-three (128 men and 25 women) persons were interviewed. Among the interviewees, 10% were of ages 21-40 years, 40% were 61 years old or more, and 50% were of ages of 41-60 years. Personal interviews and group discussions carried out in the local language revealed specific information about the plants, which were further compared and authenticated by crosschecking (Cunningham 2001).

During field study, some of the field characters like habit, habitat, flowering period and local names if any were collected and recorded from the informants. The economic uses of these species if any were discussed with the local people. Plant samples were identified or confirmed with available regional floras (Haines 1925; Saxena & Brahmam 1996). Collected literatures by other scholars concerning nativity of species (Negi & Hajra 2007; Reddy 2008; Singh et al. 2010; Khuroo et al. 2012) were consulted. The plant species are enumerated and arranged as per Angiosperm Phylogeny Group III Classification (APG III 2009). The voucher specimens were deposited in the herbarium of the Department of Botany, Chandbali College, Chandbali.

RESULTS

The present study documents a total of 383 species (262 native species and 121 non-native species) distributed in 282 genera, representing 93 families as per APG III classification (Table 1; Images 1–9). These taxa are distributed in 12 superorders (Figure 2) and 39 orders; 26.7% of the native species were reported from the superorder Fabids, 20.6% from superorder Malvids, 19.8% from superorder Lamids and 15.6% from superorder Commelinids. One hundred and twenty one non-native species were represented in 12 superorders. Native species of the order Fabales (35), Poales and Lamiales (27) each, Malpighiales (18), Malvales (14), Gentianales (13), Caryophyllales and Solanales (12) each and Myrtales and Sapindales (11) each, account for about 68.7% of the species in the district (Figure 3). Eighty one non-native species belong to these orders. The top 10 families are depicted in Figure 4. Family Fabaceae contributed the largest number of species (35 sp.), followed by Poaceae (21 sp.), Malvaceae (14 sp.), Convolvulaceae (12 sp.) and Euphorbiaceae (9 sp.). Twenty seven families of the native and 10 families of non-native were represented by one species, contributing 10.3% and 8.3% respectively of the total number families in the inventory. It is demonstrated that native species represented a higher proportion (262 species; 68.4%) than the non-natives (121 species; 31.6%). The genus *Ipomoea* ranked highest with six species followed by *Euphorbia*, *Clerodendrum*, *Ficus*, and *Terminalia* each with four species. The analysis of the recorded plant species based on growth habits showed highest proportion of herbs followed by trees, shrubs and climbers (Figure 5).

The economic use of different plant species is

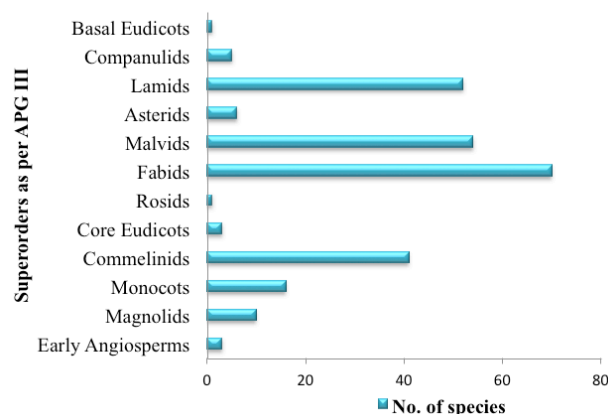


Figure 2. Distribution of native species in superorders as per APG III

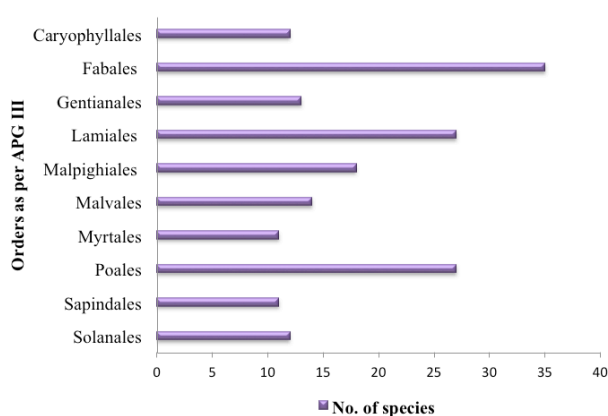


Figure 3. Distribution of native species in orders as per APG III.

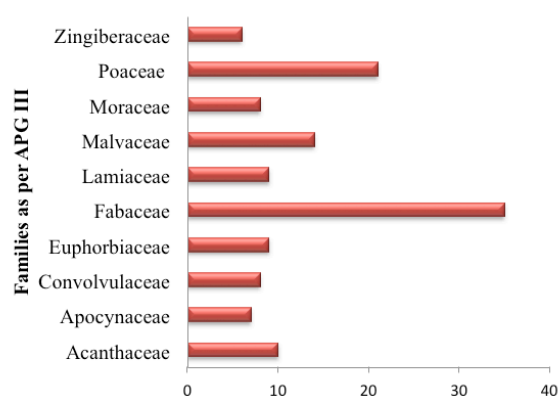


Figure 4. Top ten families with number of species as per APG III.

represented in Figure 6. Prominent species used for the treatment of various ailments were *Abrus precatorius* L., *Abutilon indicum* (L.) Sweet, *Acacia nilotica* (L.) Delile, *Justicia adhatoda* L., *Aegle marmelos* (L.) Corrêa, *Andrographis paniculata* (Burm.f.) Wall.ex. Nees,

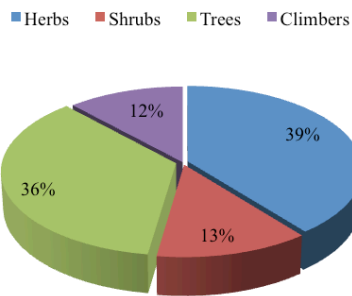


Figure 5. Growth form analysis of native species

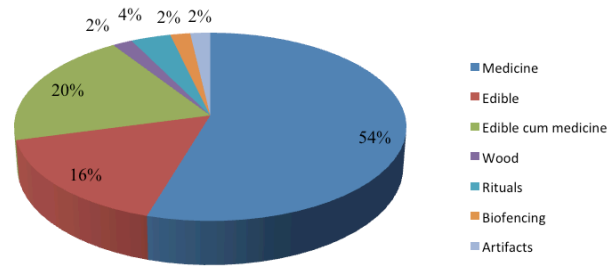


Figure 6. Economically important plants collected at the study site.

Asparagus racemosus Willd., *Azadirachta indica* A.Juss., *Bacopa monnieri* (L.) Pennell, *Boerhavia diffusa* L., *Butea monosperma* (Lam.) Taub., *Calophyllum inophyllum* L., *Catharanthus roseus* (L.) G.Don., *Centella asiatica* (L.) Urb., *Cissus quadrangularis* L., *Curcuma longa* L., *Cynodon dactylon* (L.) Pers., *Cyperus rotundus* L., *Eclipta prostrata* (L.) L., *Enydra fluctuans* Lour., *Evolvulus alsinoides* (L.) L., *Glinus oppositifolius* (L.) A.DC., *Gymnema sylvestre* (Retz.) R.Br.ex Schult., *Holarrhena pubescens* Wall. ex G. Don., *Ipomoea aquatica* Forssk., *Jatropha curcas* L., *Lawsonia inermis* L., *Macrotyloma uniflorum* (L.) Verdc., *Moringa oleifera* Lam., *Murraya koenigii* (L.) Spreng., *Nyctanthes arbor-tristis* L., *Ocimum sanctum* L., *Oxalis corniculata* L., *Phyllanthus emblica* L., *Pongamia pinnata* (L.) Pierre., *Punica granatum* L., *Rauwolfia serpentina* (L.) Benth.ex Kurz, *Ricinus communis* L., *Saraca asoca* (Roxb.) De Wilde, *Sesamum indicum* L., *Solanum surattense* Burm. f., *Streblus asper* Lour., *Strychnos nux-vomica* L., *Syzygium cumini* (L.) Skeels, *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn., *Terminalia bellirica* (Gaertn.) Roxb., *Tinospora cordifolia* (Willd.) Hook.f. & Thomson, *Tridax procumbens* L., *Vitex negundo* L. and *Zingiber officinale* Roscoe. These plants are used for the treatment of variety of diseases such as diabetes, gastrointestinal disorders, fever, gynaecology, cardiovascular disorders, skin diseases, urinary disorders, rheumatism, jaundice, respiratory disorders and dental caries. Similarly, some of the of the reported plant species are used for edible purposes, for example *Alocasia macrorrhizos* (L.) G.Don., *Alternanthera sessilis* (L.) R. Br., *Amaranthus viridis* L., *Amorphophallus paeoniifolius* (Dennst.) Nicolson, *Anacardium occidentale* L., *Ananas comosus* (L.) Merr., *Artocarpus heterophyllus* Lam., *Artocarpus lakoocha* Roxb., *Averrhoa carambola* L., *Basella alba* L., *Boerhavia diffusa* L., *Centella asiatica* (L.) Urb., *Colocasia esculenta* (L.) Schott, *Diospyros melanoxylon* Roxb., *Dillenia indica* L., *Enydra fluctuans* Lour., *Feronia limonia* (L.) Swingle, *Glinus oppositifolius* (L.) A. DC., *Ipomoea aquatica* Forssk., *Macrotyloma uniflorum* (L.) Verdc., *Mangifera*

indica L., *Mimusops elengi* L., *Oxalis corniculata* L., *Sonneratia apetala* Buch. Ham., *Trapa natans* L. and *Ziziphus mauritiana* Lam. are used as vegetables. A number of edible plants like *Alternanthera sessilis* (L.) R. Br., *Bacopa monnieri* (L.) Pennell, *Boerhavia diffusa* L., *Centella asiatica* (L.) Urb., *Eclipta prostrata* (L.) L., *Enydra fluctuans* Lour., *Hygrophila auriculata* Schum. (Heine), *Ipomoea aquatica* Forssk., *Murraya koenigii* (L.) Spreng. and *Oxalis corniculata* L. are reported to have both therapeutic and dietary functions and hence are used as medicinal food remedy.

Plant species like *Aeschynomene aspera* L., *Borassus flabellifer* L., *Cyperus alopecuroides* Rottb., *Phoenix sylvestris* (L.) Roxb. and *Chrysopogon zizanioides* (L.) Roberty in the present study is used for various household articles. Similarly, the leaves of *Phoenix sylvestris* (L.) Roxb. are used in many religious and socio-cultural functions in the district. The important timber and fuel yielding plant species recorded in our study are *Albizia lebeck* (L.) Benth., *Alstonia scholaris* (L.) R.Br., *Bambusa vulgaris* L., *Casuarina equisetifolia* L., *Dalbergia sissoo* Roxb., *Litsea glutinosa* (Lour.) C.B. Rob, *Mangifera indica* L., *Polyalthia longifolia* (Sonn.) Thwaites, *Pongamia pinnata* (L.) Pierre, *Pterocarpus marsupium* Roxb., *Samanea saman* (Jacq.) Merr., *Syzygium cumini* (L.) Skeels and *Tamarindus indica* L. Similarly, a variety of plant species are used for biofencing pupose. Examples include, *Bambusa vulgaris* L., *Bougainvillea spectabilis* Willd., *Calotropis gigantea* R.Br., *Clerodendrum inerme* (L.) Gaertn., *Duranta repens* L., *Euphorbia tirucalli* L., *Gliricidia sepium* (Jacq.) Kunth ex Walp., *Ipomoea carnea* Jacq., *Jatropha curcas* L., *Pandanus fascicularis* Lam. and *Vitex negundo* L. Some of the plants like *Areca catechu* L., *Cynodon dactylon* (L.) Pers., *Desmostachya bipinnata* (L) Stapf, *Mangifera indica* L., *Nelumbo nucifera* Gaertn. and *Piper betel* L. are used for various rituals by the inhabitants of the district.

A good number of plant species are used as tooth stick for general brushing. Examples include *Acacia nilotica* (L.) Willd., *Aegle marmelos* (L.) Corrêa, *Azadirachta*

Table 1. List of angiosperm taxa recorded from Bhadrak District, arranged according to the Angiosperm Phylogeny Group Classification III.

Superorder/ Order	Family & Species	Common name	Habit	Nativity
Early Angiosperms				
Nymphaeales	Nymphaeaceae			
	<i>Nymphaea nouchali</i> Burm. f.	Kain	Herb	Native
	<i>Nymphaea pubescens</i> Willd.	Rangakain	Herb	Native
	<i>Euryale ferox</i> Salisb.	Kanta Padma	Herb	Native
MAGNOLIIDS				
Piperales	Aristolochiaceae			
	<i>Aristolochia indica</i> L.	Balbolena	Climber	Native
	Piperaceae			
	<i>Piper betel</i> L.	Pana	Climber	Native
	<i>Piper longum</i> L.	Pipal	Climber	Native
	<i>Piper nigrum</i> L.	Golmaricha	Climber	Native
	<i>Peperomia pellucida</i> (L.) Kunth		Herb	Invasive/SAM
Laurales	Lauraceae			
	<i>Cassytha filiformis</i> L.	Nirmuli	Climber	Native
	<i>Cinnamomum tamala</i> Nees.	Tejpatra	Tree	Native
	<i>Cinnamomum zeylanicum</i> Blume	Dalchini	Tree	Native
Magnoliales	Annonaceae			
	<i>Annona squamosa</i> L.	Neuwa	Tree	Native
	<i>Annona reticulata</i> L.	Atta	Tree	Invasive/TAM
	<i>Artabotrys hexapetalous</i> (L.f.) Bhandari	Chinichampa	Shrub	Native
	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Debdaru	Tree	Exotic/SR
	Magnoliaceae			
	<i>Magnolia champaca</i> (L.) Baill.ex Pierre	Champa	Tree	Native
MONOCOTS				
Alismatales	Aponogetonaceae			
	<i>Aponogeton natans</i> (L.) Engl. & Krause	Jhechu	Herb	Native
	<i>Aponogeton undulatus</i> Roxb.	Kesarkanda	Herb	Native
	Araceae			
	<i>Alocasia macrorrhizos</i> (L.) G. Don	Badasaru	Herb	Native
	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	Olua	Herb	Native
	<i>Caladium bicolor</i> (Aiton) Vent.		Herb	Native
	<i>Colocasia esculenta</i> (L.) Schott	Saru	Herb	Native
	<i>Pistia stratiotes</i> L.	Borajhanji	Herb	Invasive/TAM
	Hydrocharitaceae			
	<i>Hydrilla verticillata</i> (L. f.) Royle	Chingudiadala	Herb	Native
	<i>Ottelia alismoides</i> (L.) Pers.	Panikundri	Herb	Native
Dioscoreales	Dioscoreaceae			
	<i>Dioscorea alata</i> L.	Khamba-alu	Climber	Invasive/ SEA
	<i>Dioscorea pentaphylla</i> L.	Tungialu	Climber	Native
Pandanales	Pandanaceae			
	<i>Pandanus fascicularis</i> Lam.	Kia	Shrub	Native
	<i>Pandanus foetidus</i> Roxb.	Lunikia	Shrub	Native
Liliales	Colchicaceae			
	<i>Gloriosa superba</i> L.	Ognisikha	Climber	Native
Asparagales	Amaryllidaceae			
	<i>Crinum asiaticum</i> L.	Arsa	Herb	Native
	<i>Scadoxus multiflorus</i> (Matyn) Raf.		Herb	Exotic/TAF
	Asparagaceae			
	<i>Agave americana</i> L.	Baramasi	Shrub	Exotic/AM

Superorder/ Order	Family & Species	Common name	Habit	Nativity
	<i>Asparagus racemosus</i> Willd.	Satabari	Climber	Native
	<i>Sansevieria roxburghiana</i> Schult. & Schult.f.	Muruga	Herb	Native
	Xanthorrhoeaceae			
	<i>Aloe vera</i> (L.) Burm. f.	Gheekunwari	Herb	Native
COMMELINIDS				
Arecales	Areaceae			
	<i>Areca catechu</i> L.	Gua	Tree	Native
	<i>Borassus flabellifer</i> L.	Tala	Tree	Invasive/TAF
	<i>Calamus rotang</i> L.	Betta	Shrub	Native
	<i>Cocos nucifera</i> L.	Nadia	Tree	Native
	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajuri	Tree	Native
	<i>Phoenix paludosa</i> Roxb.	Hental	Tree	Native
Commelinales	Commelinaceae			
	<i>Commelina benghalensis</i> L.	Kansiri	Herb	Native
	<i>Tradescantia spathacea</i> Sw.		Herb	Native
	Pontederiaceae			
	<i>Eichhornia crassipes</i> (Mart.) Solms	Bilatidala	Herb	Invasive/TAM
Poales	Bromeliaceae			
	<i>Ananas comosus</i> (L.) Merr.	Sapuri	Herb	Native
	Poaceae			
	<i>Bambusa arundinacea</i> (Retz.) Willd.	Kantabaunsa	Tree	Native
	<i>Bambusa vulgaris</i> Schrad.	Baunsa	Tree	Native
	<i>Chloris barbata</i> Sw.		Herb	Invasive/TAM
	<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Guguchia	Herb	Native
	<i>Coix lacryma-jobi</i> L.	Grgara	Shrub	Exotic/TAS
	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) Wats.	Dhanatwari	Herb	Native
	<i>Cynodon dactylon</i> (L.) Pers.	Duba	Herb	Invasive/TAF
	<i>Dactyloctenium aegyptium</i> (L.) Willd.		Herb	Native
	<i>Desmostachya bipinnata</i> (L) Stapf	Kusa	Herb	Native
	<i>Digitaria sanguinalis</i> (L) Scop.		Herb	Native
	<i>Digitaria ciliaris</i> (Retz.) Koeler		Herb	Native
	<i>Echinochloa colona</i> (L.) Link	Swanghas	Herb	Invasive/SAM
	<i>Echinochloa crusgalli</i> (L.) P. Beauv.	Dhera	Herb	Invasive/SAM
	<i>Eragrostis gangetica</i> (Roxb.) Steud.		Herb	Native
	<i>Eleusine indica</i> (L.) Gaertn.	Anamandia	Herb	Native
	<i>Heteropogon contortus</i> (L.) P. Beauv.		Herb	Native
	<i>Oplismenus burmanii</i> (Retz.) P. Beauv.		Herb	Native
	<i>Oryza rufipogon</i> Griff.	Balunga	Herb	Native
	<i>Paspalidium flavidum</i> (Retz.) A. Camus		Herb	Native
	<i>Pennisetum alopecuroides</i> Steud.		Herb	Native
	<i>Phragmites karka</i> (Retz.) Trin.ex Steud.		Shrub	Native
	<i>Saccharum officinarum</i> L.	Akhu	Herb	Native
	<i>Saccharum spontaneum</i> L.	Kashatundi	Herb	Invasive/TWA
	<i>Setaria pumila</i> (Poir.) Roem. & Schult.		Herb	Native
	<i>Setaria verticillata</i> (L.) P. Beauv.		Herb	Native
	<i>Sporobolus indicus</i> (L.) R. Br.		Herb	Native
	<i>Chrysopogon zizanioides</i> (L.) Roberty [= <i>Vetiveria zizanioides</i> (L.) Nash]	Bena	Herb	Native
	Cyperaceae			
	<i>Cyperus alopecuroides</i> (Rottb. Descr.)	Hensuati	Herb	Native
	<i>Cyperus difformis</i> L.	Swonli	Herb	Exotic/TAM

Superorder/ Order	Family & Species	Common name	Habit	Nativity
	<i>Cyperus rotundus</i> L.	Mthaghas	Herb	Invasive/ER
	<i>Eleocharis palustris</i> (L.) Roem. & Schult.		Herb	Native
	<i>Kyllinga nemoralis</i> (J.R. & G. Forst.) Dandy ex Hutch. & Dalziel		Herb	Native
	<i>Scirpus articulatus</i> L.		Herb	Native
	<i>Scirpus grossus</i> L.	Santara	Herb	Native
	Typhaceae			
	<i>Typha angustifolia</i> L.	Hangla	Herb	Invasive/TAM
Zingiberales	Musaceae			
	<i>Musa paradisiaca</i> L.	Kadali	Herb	Native
	Zingiberaceae			
	<i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta [= <i>Costus speciosus</i> (J.Koenig) Sm.	Kokola	Herb	Native
	<i>Curcuma amada</i> Roxb.	Amada	Herb	Native
	<i>Curcuma aromatica</i> Salisb.	Palua	Herb	Native
	<i>Curcuma longa</i> L.	Haldi	Herb	Native
	<i>Elettaria cardamomum</i> (L.) Maton	Gujurati	Herb	Native
	<i>Zingiber officinale</i> Roscoe	Ada	Herb	Native
BASAL EUDICOTS				
Proteales	Nelumbonaceae			
	<i>Nelumbo nucifera</i> Gaertn.	Padma	Herb	Native
CORE EUDICOTS				
Dilleniales	Dilleniaceae			
	<i>Dillenia indica</i> L.	Awoo	Tree	Native
Ranunculales	Menispermaceae			
	<i>Cissampelos pareira</i> L.	Akanbindi	Climber	Exotic/SAM
	<i>Tiliacora racemosa</i> Colebr.	Kalajati noi	Climber	Native
	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thomson	Guluchilata	Climber	Native
	Papaveraceae			
	<i>Argemone mexicana</i> L.	Kantakusuma	Herb	Invasive/CAM & SAM
ROSIDS				
Vitales	Vitaceae			
	<i>Cissus quadrangularis</i> L.	Hadabhangra	Shrub	Native
FABIDS				
Zygophyllales	Zygophyllaceae			
	<i>Tribulus terrestris</i> L.	Gokhara	Herb	Invasive/TAM
Celastrales	Celastraceae			
	<i>Celastrus paniculata</i> Willd.	Leibhedra	Shrub	Native
Oxalidales	Oxalidaceae			
	<i>Averrhoa carambola</i> L.	Karmanga	Tree	Native
	<i>Oxalis corniculata</i> L.	Ambiliti	Herb	Invasive/ER
Malpighiales	Euphorbiaceae			
	<i>Acalypha hipsida</i> Burm. f.	Sibajata	Herb	Native
	<i>Acalypha indica</i> L.		Herb	Native
	<i>Euphorbia hirta</i> L. [= <i>Chamaesyce hirta</i> (L.) Millsp.]		Herb	Invasive/TAM
	<i>Croton sparsiflorus</i> Morong	Nandababuli	Herb	Invasive/SAM
	<i>Euphorbia antiquorum</i> L.	Deuliasiju	Shrub	Native
	<i>Euphorbia hirta</i> L.	Harharika	Herb	Invasive/TAM
	<i>Euphorbia heterophylla</i> L.		Herb	Invasive/TAM
	<i>Euphorbia nivulia</i> Buch.-Ham	Bad siju	Tree	Native

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	<i>Euphorbia thymifolia</i> L.	Patrasiju	Shrub	Native
	<i>Euphorbia tirucalli</i> L.	Dangulisiju	Shrub	Exotic/KEN
	<i>Euphorbia tithymaloides</i> L.		Shrub	Native
	<i>Excoecaria agallocha</i> L.	Guan	Tree	Native
	<i>Jatropha curcas</i> L.	Jara	Shrub	Exotic/TAM
	<i>Jatropha gossypifolia</i> L.	Baigaba	Shrub	Exotic/TAM
	<i>Ricinus communis</i> L.	Jada	Shrub	Exotic/SAF
	<i>Synadenium grantii</i> Hook f.		Shrub	Invasive/TAM
	<i>Tragia involucrata</i> L.	Bichhuati	Herb	Native
	<i>Trewia nudiflora</i> L.	Panigambhari	Tree	Native
	Linaceae			
	<i>Linum usitissimum</i> L.	Pesu	Herb	Native
	Passifloraceae			
	<i>Passiflora foetida</i> L.	Jhumkalata	Climber	Invasive/SAM
	Calophyllaceae			
	<i>Calophyllum inophyllum</i> L.	Polang	Tree	Native
	Phyllanthaceae			
	<i>Breynia vitis-idaea</i> (Burm. f.) C.E.C. Fisch.	Pohalakuli	Shrub	Exotic/WI
	<i>Phyllanthus emblica</i> L.	Anola	Tree	Native
	<i>Phyllanthus fraternus</i> Webster	Bhuiarla	Herb	Native
	Rhizophoraceae			
	<i>Bruguiera cylindrica</i> (L.) Blume	Kaliachua	Tree	Native
	<i>Bruguiera parviflora</i> (Roxb.) Wright & Arn. ex Griff.	Dot	Tree	Native
	<i>Kandelia candel</i> (L.) Druce	Rasunia	Tree	Native
	<i>Rhizophora mucronata</i> Poir.	Rai	Tree	Native
	Violaceae			
	<i>Hybanthus enneaspermus</i> (L.) F. Muell.		Herb	Native
Fabales	Fabaceae			
	<i>Abrus precatorius</i> L.	Kaincha	Climber	Native
	<i>Acacia nilotica</i> (L.) Delile	Babulla	Tree	Native
	<i>Acacia leucophloea</i> (Roxb.) Willd.		Tree	Native
	<i>Aeschynomene aspera</i> L.	Solo	Herb	Native
	<i>Albizia lebbeck</i> (L.) Benth.	Sirish	Tree	Native
	<i>Alysicarpus monilifer</i> (L.) DC.		Herb	Native
	<i>Bauhinia purpurea</i> L.	Nalikanchana	Tree	Native
	<i>Bauhinia variegata</i> L.	Kanchan	Tree	Native
	<i>Butea monosperma</i> (Lam.) Taub.	Palasa	Tree	Native
	<i>Caesalpinia bonduc</i> (L.) Roxb.	Gilo	Climber	Native
	<i>Caesalpinia crista</i> L.	Nantei	Climber	Native
	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Krushnachuda	Tree	Native
	<i>Senna alata</i> (L.) Roxb. [= <i>Cassia alata</i> L.]		Herb	Invasive/TAM
	<i>Senna auriculata</i> (L.) Roxb. [= <i>Cassia auriculata</i> L.]		Tree	Native
	<i>Cassia fistula</i> L.	Sunari	Tree	Native
	<i>Senna occidentalis</i> (L.) Link [= <i>Cassia occidentalis</i> L.]	Kalachakunda	Herb	Invasive/TAM
	<i>Sennatoria</i> (L.) Roxb. [= <i>Cassia tora</i> L.]	Chakunda	Herb	Invasive/TAM
	<i>Clitoria ternatea</i> L.	Aparajita	Climber	Native
	<i>Crotalaria juncea</i> L.	Chanapata	Shrub	Native
	<i>Crotalaria spectabilis</i> Roth.	Jhumka	Herb	Native
	<i>Dalbergia sissoo</i> Roxb.	Sisoo	Tree	Native

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	<i>Derris scandens</i> (Roxb.) Benth.	Mohagano	Climber	Native
	<i>Erythrina indica</i> Lam.	Paladhua	Tree	Native
	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.		Tree	Native
	<i>Lablab purpureus</i> (L.) Sweet	Shimba	Climber	Native
	<i>Leucaenia leucocephala</i> (Lam.) de Wit	Rajokasundari	Tree	Native
	<i>Macrotyloma uniflorum</i> (L.) Verdc.	Kolatha	Herb	Native
	<i>Mimosa pudica</i> L.	Lajakuli	Herb	Invasive/BR
	<i>Mucuna pruriens</i> (L.) DC.	Baidanka	Climber	Native
	<i>Pithecellobium dulce</i> Roxb.	Simakaina	Tree	Native
	<i>Pongamia pinnata</i> (L.) Pierre	Karanj	Tree	Native
	<i>Prosopis cineraria</i> (L.) Druce	Sami	Tree	Native
	<i>Prosopis juliflora</i> (Sw.) DC.		Tree	Invasive/MEX
	<i>Pterocarpus marsupium</i> Roxb.	Piasala	Tree	Native
	<i>Samanea saman</i> (Jacq.) Merr.	Chakunda	Tree	Native
	<i>Saraca asoca</i> (Roxb.) De Wilde.	Ashoka	Tree	Native
	<i>Sesbania grandiflora</i> (L.) Poir.	Agasthi	Tree	Native
	<i>Tamarindus indica</i> L.	Tentuli	Tree	Exotic/AF
	<i>Tephrosia purpurea</i> (L.) Pers.	Banakolathi	Herb	Native
	<i>Vigna mungo</i> (L.) Hepper	Biri	Herb	Native
	<i>Vigna radiata</i> (L.) R. Wilczek	Mugo	Herb	Native
	<i>Vigna unguiculata</i> (L.) Walp.	Judanga	Climber	Native
Rosales	Cannabaceae			
	<i>Cannabis sativa</i> L.	Ganjei	Herb	Invasive/CAS
	Moraceae			
	<i>Artocarpus heterophyllus</i> Lam.	Panasa	Tree	Native
	<i>Artocarpus lakoocha</i> Roxb.	Jeutha	Tree	Native
	<i>Ficus benghalensis</i> L.	Baro	Tree	Native
	<i>Ficus elastica</i> Roxb.	Rubber	Tree	Native
	<i>Ficus hipsida</i> L.f.	Dimri	Tree	Native
	<i>Ficus religiosa</i> L.	Aswastha	Tree	Native
	<i>Morus alba</i> L.	Tutkoli	Tree	Native
	<i>Streblus asper</i> Lour.	Sahada	Tree	Native
	Rhamnaceae			
	<i>Ziziphus mauritiana</i> Lam.	Barakoli	Tree	Invasive/AUS
	<i>Ziziphus oenoplia</i> (L.) Mill.	Kankoli	Shrub	Native
Cucurbitales	Cucurbitaceae			
	<i>Benincasa hipsida</i> (Thunb.) Cogn.	Panikakharu	Climber	Invasive/SEA
	<i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai	Tarbhuj	Climber	Invasive/WAF
	<i>Coccinia indica</i> Wight & Arn.	Kunduri	Climber	Native
	<i>Lagenaria siceraria</i> (Molina) Standley	Laoo	Climber	Invasive/AF
	<i>Luffa acutangula</i> (L.) Roxb.	Pitataradi	Climber	Native
	<i>Trichosanthes cucumerina</i> L.	Banapotala	Climber	Native
	<i>Trichosanthes dioica</i> Roxb.	Potala	Climber	Native
	<i>Trichosanthes tricuspidata</i> Lour.	Mahakal	Climber	Native
Fagales	Casuarinaceae			
	<i>Casuarina equisetifolia</i> L.	Jhaun	Tree	Native
MALVIDS				
Myrtales	Combretaceae			
	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjuna	Tree	Native
	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahada	Tree	Native
	<i>Terminalia catappa</i> L.	Kathabadam	Tree	Native

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	<i>Terminalia chebula</i> Retz.	Harida	Tree	Native
	Lythraceae			
	<i>Lawsonia inermis</i> L.	Menjuati	Shrub	Native
	<i>Punica granatum</i> L.	Dalimba	Shrub	Native
	<i>Sonneratia apetala</i> Buch.-Ham.	Kerua	Tree	Native
	<i>Sonneratia caseolaris</i> (L.) Engl.	Orua	Tree	Native
	<i>Trapa natans</i> L.	Pani Singada	Herb	Invasive/ER
	Myrtaceae			
	<i>Eucalyptus tereticornis</i> Sm.		Tree	Exotic/AUS
	<i>Psidium guajava</i> L.	Pijuli	Tree	Exotic/TAM
	<i>Syzygium cumini</i> (L.) Skeels	Jamukoli	Tree	Native
	<i>Syzygium jambos</i> (L.) Alston	Gulabjamun	Tree	Exotic/SEA
	<i>Syzygium samarangense</i> (Blume) Merr. & Perry	Jamrul	Tree	Native
	Onagraceae			
	<i>Ludwigia adscendens</i> (L.) H. Hara	Jagal	Herb	Invasive/TAM
	<i>Ludwigia octovalvis</i> (Jacq.) Raven		Herb	Invasive/TAF
	<i>Ludwigia perennis</i> L.	Latkera	Herb	Invasive/TAF
	<i>Ludwigia prostrata</i> Roxb		Herb	Native
Brassicales	Caricaceae			
	<i>Carica papaya</i> L.	Amrutabhanda	Tree	Exotic/TAM
	Moringaceae			
	<i>Moringa oleifera</i> Lam.	Sajana	Tree	Native
	Brassicaceae			
	<i>Brassica campestris</i> Hook. f. & Thomson	Sorish	Herb	Exotic/MR
	<i>Brassica juncea</i> (L.) Czern. & Coss.	Raisorisha	Herb	Exotic/CAS
	Cleomaceae			
	<i>Cleome gynandra</i> L.	Arakasago	Herb	Invasive/TAM
	<i>Cleome monophylla</i> L.	Rangasorish	Herb	Invasive/TAF
	<i>Cleome rutidosperma</i> DC.		Herb	Invasive/TAM
	<i>Cleome viscosa</i> L.	Anasorisho	Herb	Invasive/TAM
	Capparaceae			
	<i>Capparis zeylanica</i> L.	Asadua	Climber	Native
	<i>Crataeva nurvala</i> Buch.-Ham.	Barun	Tree	Native
	Salvadoraceae			
	<i>Salvadora persica</i> L. var. <i>wightiana</i> Verdc.	Miriga	Shrub	Native
Sapindales	Anacardiaceae			
	<i>Anacardium occidentale</i> L.	Saitamba	Tree	Invasive/CAM
	<i>Mangifera indica</i> L.	Amba	Tree	Native
	<i>Spondias mangifera</i> Willd.	Salma	Tree	Native
	Meliaceae			
	<i>Azadiracta indica</i> A. Juss.	Nimba	Tree	Native
	Rutaceae			
	<i>Aegle marmelos</i> (L.) Corrêa	Bela	Tree	Native
	<i>Citrus aurantifolia</i> (Christm.) Swingle	Kagjilembu	Tree	Native
	<i>Citrus grandis</i> (L.) Osbeck	Batapi	Tree	Invasive/SEA
	<i>Citrus medica</i> L.	Lembu	Tree	Native
	<i>Citrus reticulata</i> Blanco	Kamala	Tree	Native
	<i>Feronia limonia</i> (L.) Swingle	Kaitho	Tree	Native
	<i>Murraya koenigii</i> (L.) Spreng.	Bhursunga	Tree	Native
	Sapindaceae			
	<i>Cardiospermum halicacabum</i> L.	Kanphuta	Climber	Native

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	<i>Sapindus emarginatus</i> Vahl	Reetha	Tree	Native
Malvales	Malvaceae			
	<i>Abutilon indicum</i> (L.) Sweet	Pedipedika	Herb	Native
	<i>Bombax ceiba</i> L.	Simli	Tree	Native
	<i>Corchorus aestuans</i> L.	Bananalita	Herb	Invasive/TAM
	<i>Corchorus capsularis</i> L.	Nalita	Herb	Native
	<i>Corchorus olitorius</i> L.		Herb	Native
	<i>Corchorus trilocularis</i> L.		Herb	Invasive/TAF
	<i>Gossypium herbaceum</i> (L.) Mast.	Kapa	Herb	Invasive/SAF
	<i>Grewia asiatica</i> L.	Pharsakoli	Tree	Native
	<i>Hibiscus esculentus</i> L.	Bhendi	Shrub	Invasive/AF
	<i>Hibiscus rosa-sinensis</i> L.	Mandar	Shrub	Exotic/CH
	<i>Hibiscus sabdariffa</i> L.	Khata Kaunria	Shrub	Native
	<i>Hibiscus tiliaceus</i> L.	Bania	Tree	Native
	<i>Hibiscus vitifolius</i> L.		Shrub	Native
	<i>Malachra capitata</i> (L.) L.		Shrub	Invasive/TAM
	<i>Malvaviscus arboreus</i> Cav.	Lankamandar	Shrub	Exotic/TAM
	<i>Melochia corchorifolia</i> L.	Telpuri	Shrub	Exotic/TAM
	<i>Pavonia zeylanica</i> (L.) Cav.		Herb	Native
	<i>Sida acuta</i> Burm.f.	Sunakhadika	Shrub	Invasive/TAM
	<i>Sida cordata</i> (Burm. f.) Borss. Waalk.	Bisiripi	Herb	Native
	<i>Sida cordifolia</i> L.	Bisiripi	Herb	Native
	<i>Sida rhombifolia</i> L.	Sahabeda	Shrub	Exotic/TAM
	<i>Sida spinosa</i> L.	Bajramuli	Herb	Native
	<i>Sterculia foetida</i> L.	Janglibadam	Tree	Native
	<i>Thespesia populneoides</i> (Roxb.) Kostel	Habali	Tree	Native
Saxifragales	Crassulaceae			
	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Amarpoi	Herb	Native
Santalales	Santalaceae			
	<i>Santalum album</i> L.	Chandan	Tree	Native
Caryophyllales	Aizoaceae			
	<i>Sesuvium portulacastrum</i> (L.) L.	Godabani	Herb	Native
	<i>Trianthema portulacastrum</i> L.	Purinisaga	Herb	Native
	Polygonaceae			
	<i>Antigonon leptopus</i> Hook. & Arn.		Climber	Invasive/TAM
	<i>Polygonum barbatum</i> L.	Nara	Herb	Native
	<i>Polygonum glabrum</i> Willd	Bihongi	Herb	Native
	<i>Polygonum plebeium</i> R.Br.	Muthisaga	Herb	Native
	Molluginaceae			
	<i>Glinus oppositifolius</i> (L.) A.DC.	Pitasaga	Herb	Native
	Amaranthaceae			
	<i>Achyranthes aspera</i> L.	Apamaranga	Herb	Native
	<i>Alternanthera sessilis</i> (L.) R.Br.ex DC.	Madranga	Herb	Invasive/TAM
	<i>Amaranthus spinosus</i> L.	Kantaneutia	Herb	Invasive/TAM
	<i>Amaranthus gangeticus</i> L.	Nalikosala		Invasive/CAM
	<i>Amaranthus viridis</i> L.	Leutia	Herb	Invasive/CAM
	<i>Chenopodium album</i> L.	Bathuasaga	Herb	Invasive/ER
	<i>Gomphrena serrata</i> L.		Herb	Invasive/TAM
	<i>Suaeda maritima</i> (L.) Dumort.	Girasaga	Herb	Native
	<i>Suaeda monoica</i> Forssk.ex Gmel.		Herb	Native
	Portulacaceae			
	<i>Portulaca oleracea</i> L.	Badabalbaula	Herb	Invasive/SAM

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	<i>Portulaca quadrifida</i> L.	Balbaula	Herb	Invasive/TAM
	Nyctaginaceae			
	<i>Boerhavia diffusa</i> L.	Puruni	Herb	Invasive/TAM
	<i>Mirabilis jalapa</i> L.	Chandrakanta	Herb	Invasive/PE
	<i>Bougainvillea spectabilis</i> Willd.	Kagajaphula	Shrub	Exotic/BR
	Basellaceae			
	<i>Basella alba</i> L.	Poi	Climber	Native
	Cactaceae			
	<i>Opuntia stricta</i> (Haw.) Haw. var. <i>dillenii</i> (Ker Gawl.) L. D. Benson	Nagapheni	Shrub	Invasive/TAM
	<i>Pilosocereus arrabidaei</i> (Lem.) Byles & G.D. Rowley	Deulisiju	Shrub	Native
	Plumbaginaceae			
	<i>Plumbago zeylanica</i> L.	Chintamani	Herb	Invasive/TAF
	Tamaricaceae			
	<i>Tamarix troupii</i> Hole	Jaula	Tree	Native
ASTERIDS				
Cornales	Cornaceae			
	<i>Alangium salviifolium</i> (L. f.) Wangerin	Ankula	Tree	Native
	Ebenaceae			
	<i>Diospyros melanoxylon</i> Roxb.	Kendu	Tree	Native
Ericales	Lecythidaceae			
	<i>Barringtonia acutangula</i> (L.) Gaertn.	Hinjal	Tree	Native
	<i>Couropita guianensis</i> Aubl.	Nageswar	Tree	Native
	Sapotaceae			
	<i>Madhuca indica</i> J.F. Gmel.	Mahula	Tree	Native
	<i>Manilkara achras</i> (Mill.) Fosberg	Sapota	Tree	Invasive/CAM
	<i>Mimusops elengi</i> L.	Baula	Tree	Native
LAMIDS				
Gentianales	Apocyanaceae			
	<i>Adenium obesum</i> (Forssk.) Roem. & Schult.		Shrub	Native
	<i>Alstonia scholaris</i> (L.) R. Br.	Chhatin	Tree	Native
	<i>Calotropis gigantea</i> R. Br.	Dhala-arakha	Shrub	Invasive/TAF
	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Arakha	Shrub	Invasive/TAF
	<i>Cathranthus roseus</i> (L.) G. Don	Sadabihari	Herb	Invasive/TAM
	<i>Ervatamia divaricata</i> (L.) Burkill	Tagar	Shrub	Native
	<i>Gymnema sylvestre</i> (Retz.) R.Br.exSchult.	Gurmari	Climber	Native
	<i>Holarrhenapubescens</i> Wall. ex G. Don [= <i>Holarrhena antidiysenterica</i> Wall. ex A. DC.]	Indrajalo	Shrub	Native
	<i>Nerium oleander</i> L.	Karabiro	Shrub	Exotic/CH
	<i>Pergularia daemia</i> (Forssk.) Chiov.	Uturudi	Climber	Native
	<i>Plumeria rubra</i> L.	Kathachampa	Tree	Exotic/MEX
	<i>Rauvolfia serpentina</i> (L.) Benth.ex Kurz	Patalgoruda	Shrub	Native
	<i>Rauvolfia tetraphylla</i> L.		Shrub	Exotic/WI
	<i>Thevetia peruviana</i> (Pers.) K. Schum.	Kaniyara	Tree	Exotic/AM
	Loganiaceae			
	<i>Strychnos nux-vomica</i> L.	Kochila	Tree	Native
	Rubiaceae			
	<i>Anthocephalus cadamba</i> Roxb.	Kadamba	Tree	Native
	<i>Ixora coccinea</i> L.		Shrub	Native
	<i>Morinda pubescens</i> Sm.	Acchu	Tree	Native
	<i>Oldenlandia corymbosa</i> L.	Charpodia	Herb	Native
	<i>Paederia foetida</i> L.	Prasaruni	Shrub	Native

Superorder/ Order	Family & Species	Common name	Habit	Nativity
Lamiales	Acanthaceae			
	<i>Andrographis paniculata</i> (Burm.f.)Wall. ex Nees	Bhuinnimba	Herb	Native
	<i>Acanthus ilicifolius</i> L.	Harkanch	Herb	Native
	<i>Avicennia alba</i> Blume	Bani	Tree	Native
	<i>A. marina</i> (Forssk.) Vierh.	Dhalabani	Tree	Native
	<i>A. officinalis</i> L.	Kalabani	Tree	Native
	<i>Barleria prionitis</i> L.	Daskeraanta	Shrub	Native
	<i>Justiciaadhatoda</i> L. [= <i>Adhatoda vasica</i> Nees]	Basanga	Shrub	Native
	<i>Hygrophila auriculata</i> Heine	Koelekha	Herb	Native
	<i>Justicia gendarussa</i> Burm.f.	Kalabasanga	Herb	Native
	<i>Ruellia prostrata</i> Poir.		Herb	Native
	Lamiaceae			
	<i>Clerodendrum inerme</i> (L.) Gaertn.	Chinyanrhi	Herb	Native
	<i>Clerodendrum indicum</i> (L.) Kuntze	Nagri	Shrub	Native
	<i>Clerodendrum philippinum</i> Schauer.	Dilbari	Shrub	Native
	<i>Clerodendrum phlomoides</i> L. f.	Donkari	Shrub	Native
	<i>Leucas aspera</i> (Willd.) Link	Gaiso	Herb	Native
	<i>Mentha spicata</i> L.	Podina	Herb	Invasive/ER
	<i>Ocimum basilicum</i> L.	Durlava	Herb	Native
	<i>Ocimum sanctum</i> L.	Tulasi	Shrub	Native
	<i>Tectona grandis</i> L.	Saguan	Tree	Native
	<i>Vitex negundo</i> L.	Begunia	Tree	Native
	Scrophulariaceae			
	<i>Bacopa monnieri</i> (L.) Pennell	Brahmi	Herb	Native
	<i>Limnophila aquatica</i> (Roxb.) Alston	Keralata	Herb	Native
	<i>Lindernia crustacea</i> (L.)F.v.Muell.		Herb	Native
	Martyniaceae			
	<i>Martynia annua</i> L.	Baghanakhi	Shrub	Exotic/TAM
	Plantaginaceae			
	<i>Scoparia dulcis</i> L.	Chirarita	Herb	Invasive/TAM
	Bignoniaceae			
	<i>Kigelia africana</i> (Lam.) Benth.		Tree	Invasive/RH
	<i>Oroxylum indicum</i> (L.) Kurz	Phanaphania	Tree	Native
	Pedaliaceae			
	<i>Pedaliium murex</i> L.	Gokara	Herb	Invasive/TAM
	<i>Sesamum indicum</i> L.	Khasa	Herb	Native
	Oleaceae			
	<i>Nyctanthes arbor-tristis</i> L.	Gangaseoli	Tree	Native
	Verbenaceae			
	<i>Duranta repens</i>	Bilatikanta	Shrub	Exotic/AM
	<i>Gmelina arborea</i> Roxb.	Gambhari	Tree	Native
	<i>Lantana camara</i> L.	Gandhagauria	Shrub	Invasive/TAM
	<i>Lippia javanica</i> (Burn.f.)Spreng	Naguari	Herb	Native
Solanales	Convolvulaceae			
	<i>Argyreia nervosa</i> (Burm. f.) Bojer	Mundanoi	Climber	Native
	<i>Cuscuta reflexa</i> Roxb.	Nirmuli	Climber	Invasive/MR
	<i>Evolvulus alsinoides</i> (L.) L.	Bichhamalia	Herb	Native
	<i>Evolvulus nummularius</i> (L.) L.		Herb	Invasive/TAM
	<i>Ipomoea alba</i> L.	Kunjolata	Climber	Native
	<i>Ipomoea aquatica</i> Forssk.	Kalamasaga	Climber	Native

Superorder/ Order	Family & Species	Common name	Habit	Nativity
	<i>Ipomoea batatas</i> L.	Kandamula	Climber	Native
	<i>Ipomoea carnea</i> Jacq.	Amari	Shrub	Invasive/TAM
	<i>Ipomoea marginata</i> (Desr.) Verdc.		Climber	Native
	<i>Ipomoea mauritiana</i> Jacq.	Bhuinkakharu	Herb	Native
	<i>Ipomoea sepiaria</i> Koenig ex Roxb.	Mushkani	Herb	Native
	Solanaceae			
	<i>Datura metel</i> L.	Kaladudura	Herb	Invasive/TAM
	<i>Datura stramonium</i> L.	Dudura	Herb	Invasive/TAM
	<i>Solanum melongena</i> L.	Baigan	Herb	Native
	<i>Solanum nigrum</i> L.	Tutguna	Herb	Invasive/TAM
	<i>Solanum virginianum</i> L. [= <i>Solanum surattense</i> Burm. f.]	Beji-begun	Herb	Native
	<i>Solanum trilobatum</i> L.	Nabhiankuri	Shrub	Native
	<i>Solanum viarum</i> Dunal	Bhegibaigan	Herb	Invasive/TAM
Boraginales	Boraginaceae			
	<i>Heliotropium indicum</i> L.	Hatisundha	Herb	Native
CAMPANULIDS				
Asterales	Asteraceae			
	<i>Bidens pilosa</i> L.		Herb	Exotic/TAM
	<i>Acanthospermum hispidum</i> DC.	Gokhura	Herb	Invasive/BR
	<i>Ageratum conyzoides</i> L.	Poksunga	Herb	Invasive/TAM
	<i>Echinops echinatus</i> Roxb.	Batresh	Herb	Invasive/AFG
	<i>Eclipta prostrata</i> (L.) L.	Bhrungaraj	Herb	Invasive/TAM
	<i>Enydra fluctuans</i> DC.	Hidmichi	Herb	Native
	<i>Gnaphalium polycaulon</i> Pers.		Herb	Invasive/TAM
	<i>Helianthus annuus</i> L.	Suryamukhi	Herb	Exotic/NAM
	<i>Mikania micrantha</i> Kunth		Climber	Invasive/TAM
	<i>Parthenium hysterophorus</i> L.	Gajarghas	Herb	Invasive/NAM
	<i>Spilanthes paniculata</i> Wall ex DC.		Herb	Native
	<i>Synedrella nodiflora</i> (L.) Gaertn.		Herb	Invasive/WI
	<i>Tagetes erecta</i> L.	Gendu	Herb	Exotic/MEX
	<i>Tridax procumbens</i> L.	Bisalyakarani	Herb	Invasive/CAM
	<i>Xanthium indicum</i> J. Koenig ex Roxb.		Shrub	Invasive/TAM
	<i>Vernonia cinerea</i> (L.) Less.	Poksunga	Herb	Native
	<i>Vicoa indica</i> (L.) DC.	Banasebati	Herb	Native
Apiales	Apiaceae			
	<i>Centella asiatica</i> (L.) Urb.	Thalkudi	Herb	Native
	<i>Coriandrum sativum</i> L.	Dhania	Herb	Exotic/MR

Abbreviations: AF—Africa | AFG—Afghanistan | AM—America | AUS—Australia | BR—Brazil | CAM—Central America | CAS—Central Asia | CH—China | ER—Europe | KEN—Kenya | MEX—Mexico | MR—Mediterranean region | NAM—North America | PE—Peru | RH—Rhodesia | SAF—South Africa | SAM—South America | SEA—South East Asia | SR—Sri Lanka | TAF—Tropical Africa | TAM—Tropical America | TAS—Tropical Asia | TWA—Tropical West Asia | WI—West Indies.

indica A. Juss., *Bambusa vulgaris* L., *Butea monosperma* (Lamk.) Taub., *Calotropis procera* (Aiton) W.T. Aiton, *Cinnamomum tamala* Nees, *Jatropha curcas* L., *Lantana camara* L., *Mimusops elengi* L., *Pandanus fascicularis* Lam., *Phoenix sylvestris* (L.) Roxb., *Pongamia pinnata* (L) Pierre, *Psidium guajava* L., *Streblus asper* Lour., *Syzygium cumuni* (L.) Skeels and *Vitex negundo* L. Besides, bark, leaf and rhizome as such or being processed are used as tooth powder. Also raw leaf, bark, root flower bud and pericarp are chewed to remove the bad breath and infection. In few cases the latex, juice or oil extracted from seeds are either directly applied on the effected tooth and gums or gurgled for relief. Moreover, these plant species are exclusively for toothache due to caries, gum diseases and pyorrhea. Oils extracted from seeds of some plants like *Brassica juncea* (L.) Czern., *Helianthus annuus* L. and *Sesamum indicum* L. are either gurgled or applied as lotion on inflammatory gums. And the seeds of *Solanum virginianum* L. are burnt and smoked like cigarette for relief from toothache. Moreover, the leaves of *Aegle marmelos* (L.) Corrêa and *Ocimum sanctum* L. are chewed to prevent bad breath from mouth. Invasive species such as *Ageratum conyzoides* L., *Eichhornia crassipes* (Mart.) Solms, *Lantana camara* L., *Mikania micrantha* Kunth and *Parthenium hysterophorus* L. are causing great concern in many parts of the district.

DISCUSSION

Plants in all ecosystems play a dominant role in determining the life histories of millions of animal species, serve as the foundation of most food webs, and perform a crucial role in human welfare and economic development. The result on the angiosperm diversity of Bhadrak District shows a total of 383 species (262 native species and 121 non-native species) distributed in varied habitats. The general trends of plant species collected in this study are concordant with previous studies in India. For example, a total of 277 plant species belonging to 72 families have been reported in Karnal District, Haryana (Kumar & Singh 2013). A total of 110 species belonging to 82 genera and 40 families are recorded in Khammam District, Telangana State (Rao et al. 2015). A total of 252 species belonging to 197 genera distributed in 64 families are recorded in an estuarian ecosystem, Tamil Nadu (Karthigeyan et al. 2013). A total of 138 angiosperm taxa under 120 genera and 50 families are recorded in Dhanbad District, Jharkhand (Rahul & Jain 2014). Samanta & Panda (2016) recorded a total of 80 families, 226 genera, and 270 species at Digha, West

Bengal. No published information recorded on the diversity of angiosperm plant species of Bhadrak District, Odisha. The richest families are: Fabaceae (35 sp.), Poaceae (21 sp.), Malvaceae (14 sp.), Convolvulaceae (12sp.), Acanthaceae (10sp.) and Euphorbiaceae (9 sp.). The predominance of family Fabaceae is supported by studies from Víctor et al. (2009), Irwin & Narasimhan (2011), Ramasamy et al. (2012), Anaclara et al. (2013), Ferreira et al. (2013), Jayanthi & Jalal (2015), and Parthian et al. (2016). The growth forms found are trees, shrubs, climbers, and herbs, with the herbaceous component representing the largest number of species. The dominance of herbaceous communities is reported in other parts of world (Víctor et al. 2009; Anaclara et al. 2013; Ferreira et al. 2013), and also in India (Irwin and Narasimhan 2011; Ramasamy et al. 2012; Jayanthi & Jalal 2015; Parthipan et al. 2016). In the present investigation, about 54% of the documented plant species have medicinal utility for a variety of ailments. For instance, the most cited plant species to cure skin disorders in the current investigation are, *Azadirachta indica* A. Juss., followed by *Senna obtusifolia* (L.) H.S. Irwin & Barneby, *Annona squamosa* L., *Pongamia pinnata* (L.) Pierre, *Lantana camara* L., *Tridax procumbens* L., *Argemone mexicana* L., *Calophyllum inophyllum* L., *Andrographis paniculata* Nees, *Amaranthus spinosus* L., *Bauhinia variegata* L., *Butea monosperma* (Lam.) Taub. Similar plant use is recorded earlier in different parts of India (Sharma et al. 2003; Saikia et al. 2006; Jeeva et al. 2007; Kingston et al. 2009; Madhu & Yarra 2011), indicating the importance of traditional medicine in the treatment of skin disorders. Furthermore, various workers have investigated the herbal remedy of the reported plant species used for treatment of different ailment in India (Jeeva et al. 2007; Kar & Borthakur 2008; Binu 2009; Das et al. 2015) and Odisha (Girach et al. 1998; Misra et al. 2012; Pani et al. 2014; Satapathy 2015).

Traditional foods are those which indigenous peoples have access to locally, without having to purchase them and within traditional knowledge and the natural environment from farming or wild harvesting (Kuhnlein et al. 2009). Wild food plants occupy an important place in the rural dietary habits and their consumption particularly during periods of food scarcity and famine is practiced in various regions of the world. Some studies have shown that these plants often provide better nutrition and may be responsible for good health (Grivetti & Ogle 2000; Johns & Eyzaguirre 2006). In Bhadrak District, about 16% plant species are used as subsidiary food and vegetable by indigenous people. Some of the edible plants like *Amorphophallus paeoniifolius*



Image 1. a—*Abrus precatorius* L. | b—*Abutilon indicum* (L.) Sweet | c—*Acacia nilotica* (L.) Delile | d—*Acalypha hipsida* Burm.f. | e—*Acanthus ilicifolius* L. | f—*Achyranthes aspera* L. | g—*Adhatoda vasica* Nees | h—*Aegle marmelos* (L.) Corr. | i—*Ageratum conyzoides* L. | j—*Aloe vera* (L.) Burm.f. | k—*Alstonia scholaris* (L.) R. Br. | l—*Amaranthus spinosus* L. © Taranisen Panda.

(Dennst.) Nicolson, *Ipomoea aquatica* Forssk. and *Trapa natans* L. are domesticated by local people in their individual land/pond but are also available in the wild. Some plant species reported in the present study such as *Colocasia esculenta* (L.) Schott, *Enydra fluctuans* Lour., *Ipomoea aquatica* Forssk., *Trapa natans* L. and *Nymphaea pubescens* Willd. are reported from other places (Daniel 2007; Panda & Misra 2011; Swapna et al. 2011; Misra et al. 2012). Some of the reported wild edible plants such as *Colocasia esculenta* (L.) Schott, *Ipomoea aquatica* Forssk. and *Trapa natans* L. are found to be sold in the local markets particularly by poor and economically marginalised families, thereby generating a supplementary income. Some of the plant species in the present study are reported from other places (Daniel 2007; Panda & Misra 2011; Swapna et al. 2011; Misra et al. 2012). A number of edible plants like *Alternanthera sessilis* (L.) R. Br., *Bacopa monnieri* (L.) Pennell, *Boerhavia diffusa* L., *Centella asiatica* (L.) Urb., *Eclipta prostrata* (L.) L., *Enydra fluctuans* Lour., *Hygrophila auriculata* Schum. (Heine), *Ipomoea aquatica* Forssk., *Murraya koenigii* (L.) Spreng. and *Oxalis corniculata* L. are reported to have both therapeutic and dietary functions and hence are used as medicinal food remedy. This overlap between food and medicines is well known in traditional societies (Panda & Misra 2011; Swapna et al. 2011; Misra et al. 2012).

A good number of artifact items are prepared from *Aeschynomene aspera* L. and *Chrysopogon zizanioides* L. Roberty by the artisans of the district. Similar observations have also been made in earlier studies (Mohanty et al. 2012; Tripathy et al. 2014). Trees are the main source of fuel wood in the study area. The local people cut trees and use them as a fuel wood. Mostly women are engaged in searching for twigs and some branches from the surrounding forests. Most of the people walk long distances in search for fuel wood. And some of them use their own trees for their fuel wood purpose. According to the study results people use many tree species for fuel wood. Some species are more preferred than others. The most preferred species of trees for their fuel wood value are *Albizia lebbeck* (L.) Benth., *Alstonia scholaris* (L.) R.Br., *Bambusa vulgaris* L., *Casuarina equisetifolia* L., *Litsea glutinosa* (Lour.) C.B. Rob., *Polyalthia longifolia* (Sonn.) Thwaites, *Pongamia pinnata* (L) Pierre, *Samanea saman* (Jacq.) Merr. and *Tamarindus indica* L. The most common parts of a tree species used for fuel wood in Bhadrak District are the branches and twigs. The local people use the wood from different species for constructing house, to prepare some household utensils, farm equipment

and construct fences. The study results reveal that the people are dependent on wood tree species for all the above mentioned activities. The use of trees as a source of construction wood is an old activity in Bhadrak District. The stem of *Borassus flabellifer* L. provides strong timber material useful for construction (Kovoor 1983; Depommier 2003). The leaves are used in a variety of artifact construction. For example, for making mats, umbrellas, toys, huts and other household utility products (Kovoor 1983). The pulp is mixed with flour and used to make several edible preparations (Davis & Johnson 1987). The most valuable tree species used for construction purpose by the people are *Acacia* sp., *Dalbergia sissoo* Roxb., *Gmelina arborea* Roxb., and *Pterocarpus marsupium* Roxb. *Acacia nilotica* (L.) Willd. and *Albizia lebbeck* (L.) Benth. is used for agricultural equipments. *Phoenix sylvestris* (L.) Roxb. plant provides a multitude of useful products such as handicrafts and mats, screens, thatching and fencing materials, baskets, crates, fuel wood, brooms and is the main subsistence resource for the poorest people (Rana & Islam 2010).

Live fences are frequent in Bhadrak District separating crop fields, pastures, households, and farm boundaries and forming intricate networks of plant cover across rural landscapes. The local people use the different plant species for biofencing. The most important species used for biofencing purpose are *Acacia nilotica* (L.) Willd., *Albizia lebbeck* (L.) Benth., *Bambusa arundinacea* (Retz.) Willd., *Bambusa vulgaris* L., *Duranta repens* L., *Euphorbia tirucalli* L., *Jatropha curcas* L., *Lantana camara* L., *Pandanus fascicularis* Lam., *Pilosocereus arrabidae* (Lem.) Byles & G.D. Rowley and *Vitex negundo* L. The respondents mentioned that *Areca catechu* L., *Cynodon dactylon* (L.) Pers., *Desmostachya bipinnata* (L) Stapf, *Mangifera indica* L., *Nelumbo nucifera* Gaertn. and *Piper betel* L. are the mostly utilized for ritual purpose.

The present report on the use of plants for dental care draws support from earlier studies (Singh & Narain 2007; Saxena & Roy 2007; Wabale & Kharde 2008; Khan et al. 2009; Jain & Chauhan 2009) in different parts of India. Moreover, when the modern mouthwash solutions do nothing more than camouflaging the unpleasant breath for a limited period (Dhilon 1994), the plant species reported in this study are claimed to remove the foul smell from the mouth along with their other medicinal actions. The higher population explosion and limited resources in India demand that some alternative means of organizing oral health and care be examined and implemented (Anonymous 1994). In this context, phytotherapy resources for oral health care appear relevant as it requires no special resources,



Image 2. a—*Andrographis paniculata* (Burm.f.) Wall.ex. Nees | b—*Ananas comosus* (L.) Merr. | c—*Annona squamosa* L. | d—*Antigonum leptopus* Hook & Arn. | e—*Argemone mexicana* L. | f—*Asparagus racemosus* Willd. | g—*Averrhoa carambola* L. | h—*Azadirachta indica* A. Juss. | i—*Barleria prionitis* L. | j—*Boerhavia diffusa* L. | k—*Bombax ceiba* L. | l—*Butea monosperma* (Lam.) Taub. © Taranisen Panda.

sophistication or expertise in production, preparation and usage.

The history of invasive alien plants in Bhadrak District revealed that many species were introduced for economic purposes like timber, ornamental, and green coverage plantation of barren land and some were migrated to this region by transport of food grains from other regions. Climatic conditions of the region became suitable for them and they showed rapid proliferation to spread all over the district. Most of the weeds were reported in the locality for a very long period of time. A questionnaire survey among the informants revealed that there were hardly any management programmes to control invasive alien plants such as *Eichhornia crassipes* (Mart.) Solms, *Lantana camara* L., *Mikania micrantha* Kunth, *Ageratum conyzoides* L. and *Parthenium hysterophorus* L. *Ageratum conyzoides* L. is expanding at an alarming rate, especially in agricultural fields, road sides and even gardens. The weed is harmful to native species and has become a problem in agro-ecosystems (Negi & Hajra 2007). Freshwater species like *Eichhornia crassipes* (Mart.) Solms is of most nuisance as it causes hindrance by choking all possible water bodies and reducing their utility. Similarly *Lantana camara* L. as one of the most ubiquitous invasive land species, is spreading fast all over the district due to its better competitive ability and allelopathic effect (Sundaram & Hiremath 2012). The perennial *Mikania micrantha* Kunth which is a fast growing species, is covering the habitats of the district and suppressing the growth of agricultural crops as well as natural vegetation through competition and allelopathic effects (Sankaran & Srinivasan 2001; Huang et al. 2009). *Parthenium hysterophorus* L. a dominant weed of the study area, especially wastelands, roadsides, railway tracks and foot paths. This noxious weed is an aggressive colonizer spreading rapidly suppressing native herbaceous flora. The spread of these obnoxious invasive weeds should be controlled and they should be removed from the habitat. The results of preference ranking for four selected threats against the availability of plant species in the study area shows that agricultural expansion is the first ranking threat (most detrimental), followed by urbanization, fuel wood collection and overgrazing. In addition to the above mentioned threats the respondents mentioned that limited government support for species conservation and the gradual waning of the existing traditional systems and coping mechanisms due to external intervention are among the main reasons behind the neglecting of local knowledge and tree management and conservation systems.

CONCLUSION

The present inventory of angiosperm plant resources provides a comprehensive and updated checklist of the floristic diversity of the district which can be utilized in the context of species conservation. Currently different habitats of the district are prone to various anthropogenic activities, such as encroachment and conversion of forest areas into agricultural lands and construction of dams and roads, fragmentation and over exploitation of biological resources, pose threat to the existing biodiversity of the district. Fragmentation process shows effect on species, especially on unique, rare and endemic, threatening their survival and resulting in the extinction of species. The present study in the Bhadrak District is preliminary, and subsequent re-census and monitoring will provide additional data on species composition and diversity changes due to various disturbance regimes, which will be useful in resource management and conservation efforts.

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Image 3. a—*Caesalpinia bonduc* (L.) Roxb. | b—*Calamus rotang* L. | c—*Calophyllum inophyllum* L. | d—*Calotropis gigantea* R. Br. | e—*Senna occidentalis* (L.) Link | f—*Senna tora* (L.) Roxb. | g—*Casuarina equisetifolia* L. | h—*Cathranthus roseus* (L.) G. Don | i—*Centella asiatica* (L.) Urb. | j—*Cissampelos pareira* L. | k—*Cissus quadrangularis* L. | l—*Cleome viscosa* L. © Taranisen Panda.



Image 4. a—*Clerodendrum inerme* (L.) Gaertn. | b—*Commelina benghalensis* L. | c—*Couroupita guianensis* Aubl. | d—*Crataeva nurvala* Buch.-Ham. | e—*Crinum asiaticum* L. | f—*Croton sparsiflorus* Morong | g—*Datura metel* L. | h—*Diospyros melanoxylon* Roxb. | i—*Eclipta prostrata* (L.) L. | j—*Erythrina indica* Lam. | k—*Euphorbia tirucalli* L. | l—*Evolvulus alsinoides* (L.) L. © Taranisen Panda.



Image 5. a—*Feronia limonia* (L.) Swingle | b—*Ficus hipsida* L. f. | c—*Glinus oppositifolius* (L.) A.DC. | d—*Gloriosa superba* L. | e—*Grewia asiatica* L. | f—*Gymnema sylvestre* (Retz.) R.Br.ex Schult. | g—*Heliotropium indicum* L. | h—*Hybanthus enneaspermus* (L.) F. Muell. | i—*Hydrilla verticillata* (L. f.) Royle | j—*Hygrophila auriculata* Heine | k—*Ipomoea aquatic* Forssk. | l—*Ipomoea batatas* L. © Taranisen Panda.



Image 6. a—*Jatropha gossypifolia* L. | b—*Kandelia candel* (L.) Druce | c—*Lantana camara* L. | d—*Lawsonia inermis* L. | e—*Leucas aspera* (Willd.) Link | f—*Madhuca indica* J. F.Gmel. | g—*Martynia annua* L. | h—*Mimosa pudica* L. | i—*Mimosops elengi* L. | j—*Morinda pubescens* Sm. | k—*Moringa oleifera* Lam. | l—*Mucuna pruriens* (L.) DC. © Taranisen Panda.

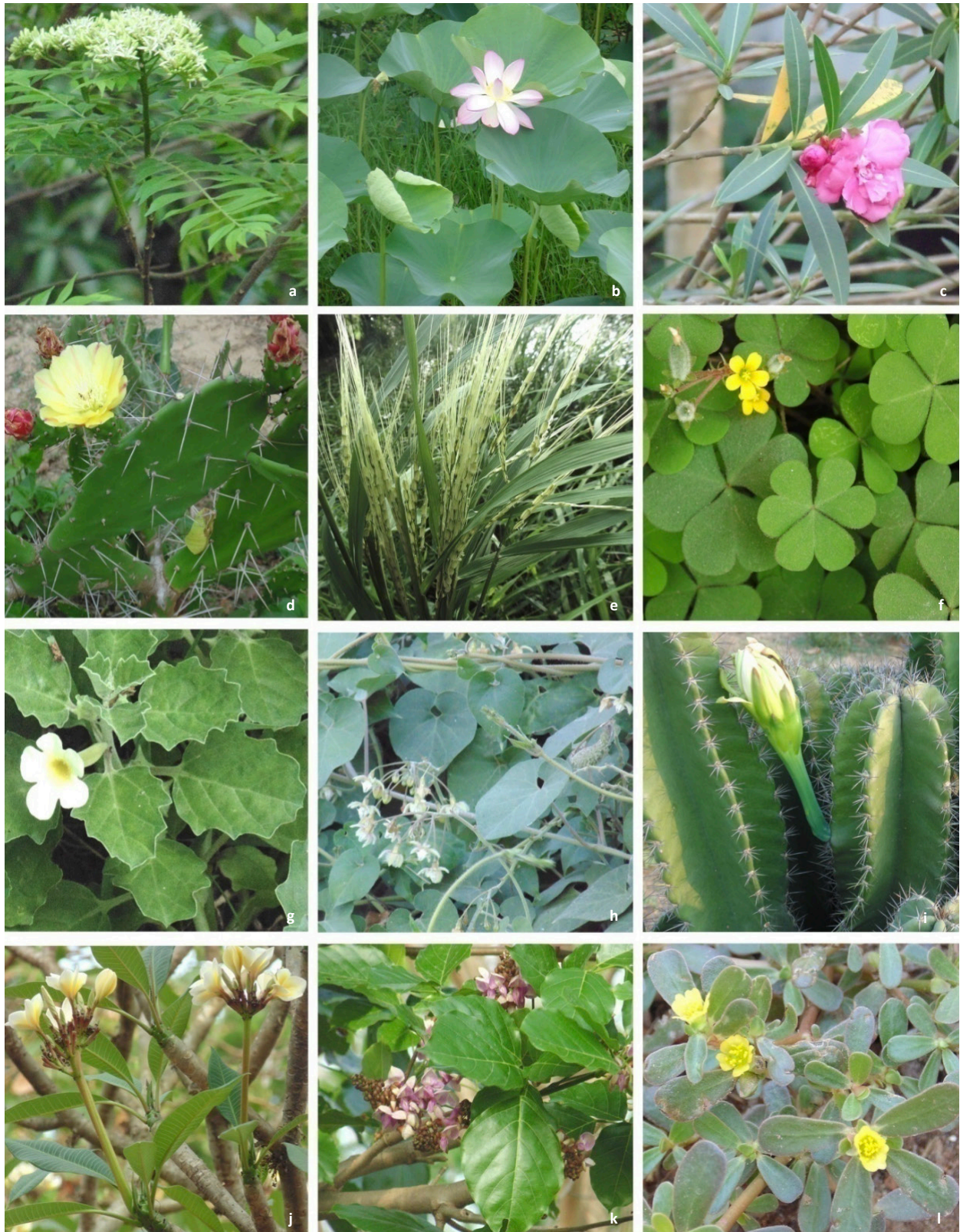


Image 7. a—*Murraya koenigii* (L.) Spreng | b—*Nelumbo nucifera* Gaertn. | c—*Nerium oleander* L. | d—*Opuntia stricta* (Haw.) Haw. var. *dillenii* (Ker Gawl.) L. D. Benson | e—*Oryza rufipogon* Griff. | f—*Oxalis corniculata* L. | g—*Pedalium murex* L. | h—*Pergularia daemia* (Forssk.) Chiov. | i—*Pilosocereus arrabidaei* (Lem.) Byles & G.D.Rowley | j—*Plumeria rubra* L. | k—*Pongamia pinnata* (L.) Pierre | l—*Portulaca oleracea* L.
 © Taranisen Panda.



Image 8. a—*Prosopis juliflora* (Sw.) DC. | b—*Rauvolfia tetraphylla* L. | c—*Saraca asoca* (Roxb.) de Wilde. | d—*Sesamum indicum* L. | e—*Sida cordifolia* L. | f—*Syzygium cumini* (L.) Skeels | g—*Solanum virginianum* L. | h—*Solanum trilobatum* L. | i—*Sonneratia caseolaris* (L.) Engl. | j—*Sterculia foetida* L. | k—*Streblus asper* Lour. | l—*Synadenium grantii* Hook f. © Taranisen Panda.



Image 9. a—*Tamarindus indica* L. | b—*Tephrosia purpurea* (L.) Pers. | c—*Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. | d—*Terminalia catappa* L. | e—*Thespesia populneoides* (Roxb.) Kostel | f—*Tinospora cordifolia* (Willd.) Hook.f. & Thomson | g—*Trapa natans* L. | h—*Tribulus terrestris* L. | i—*Tridax procumbens* L. | j—*Typha angustifolia* L. | k—*Vitex negundo* L. | l—*Zizyphus oenoplia* (L.) Mill. © Taranisen Panda.

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