Addition of Six New Genera to the Flora of Odisha: A Report

Ramakanta Mishra¹, Gouri Sankar Juga Prakash Jena², Smaranika Nayak¹, Kunja Bihari Satapathy³*, Ashirbad Mohapatra⁴

¹Department of Botany, Bio systematic Laboratory, Utkal University, Vani Vihar, Bhubaneswar, Odisha, INDIA.
²Department of Botany, SG College, Kanikapada, Jajpur, Odisha, INDIA.
³School of Applied Sciences, Centurion University of Technology and Management, Bhubaneswar, Odisha, INDIA.
⁴Department of Botany, Sri Jayadev College of Education and Technology, Naharkanta, Bhubaneswar, Odisha, INDIA.

ABSTRACT

In the present study six genera of plants were recorded as new additions to the angiospermic flora of Odisha state, India along with their detailed description, phenology and distribution. During the extensive exploration in different districts of the state, Calystegia sepium (L.) R.Br. (Convolvulaceae), Cymbalaria muralis G.Gaertn., B.Mey. and Scherb. (Plantaginaceae), Gloxinia perennis (L.)Druce (Gesneriaceae), Fumaria indica (Hausskn.) Pugsley (Papaveraceae), Lobularia maritima (L.) Desv. (Brassicaceae), Tacca leontopetaloides (L.) Kuntze (Dioscoreaceae) were collected and after a thorough microscopic observation and detailed review of the available literature and references, these six genera were found to be new records for the flora of Odisha state, India. Now-a-days, in all over the globe, plant diversity is not only being depleted but also some species are found to become threatened and endangered and more so, many of the natural vegetation become extinct in course of time. A detailed and thorough scientific approach was made on the proper status of these six new recorded genera and discussed in details for their taxonomical, nomenclatural, biological and ecological data (i.e. accepted scientific name, synonyms, geographical distribution and conservation status).

Key words: New report, Odisha, Phytodiversity.

INTRODUCTION

Now-a-days, in all over the globe, plant diversity is not only being depleted but also some species are found to become threatened and endangered and more so, many of the natural vegetation become extinct in course of time. In the present stage, systematic documentation of plant diversity has given the instantaneous research significance and to this end, the first and foremost research urgency is to scientifically document the taxonomic diversity and distribution of plants at local, regional and global scales. The vegetation of any region varies with the change in altitude, precipitation and temperature. Odisha is of prime interest for botanical systematics and geobotany because of its geographical location for its diversity of landforms and geology and its proximity to multiple floristic regions that shape the constitution and diversity of vegetation. The state which occupies an area of 155, 707 sq.km. or 4.87% of the surface area of India, is enriched not only in the number of species but also a high percentage of endemics, besides harbouring a wide coastal area of 485 kms. It lies between 17°.785” N and 22°.730” N latitudes and between 81°.375” E and 87°.537” E longitudes. Odisha has 48,903 km² of forest area covering 31.41% of the state’s total geographical land mass. The six forest types include the dense forest (7,060 km²), medium dense forest (21,366 km²), open forest (forest devoid of closed canopy; 20,477 km²) and scrubby forest (4,734 km²). Apart from this, the state is also endowed with bamboo forests (10,518 km²) and mangroves (221 km²). The forest area of the state is gradually decreasing due to timber smuggling, mining,
grazing and industrialization. Meteorologically the state experiences four seasons namely winter (December to February), pre-monsoon season (March to May), south-west monsoon season (June to September) and north east monsoon season (October–December). Many researchers during botanical explorations documented 2727 numbers of taxa of vascular plants from Odisha that constituted 6.60% of the flora of India.[10] The floristic composition in this state is diversified with plenty of medicinal, rare and endemic plant varieties, many of those are subjected to lot of threats with regard to their occurrence and distributions in their natural habitats. The tribal use of many such plant species as folk medicine can be attributed to the loss of these indigenous floras. Besides, most of the mountainous terrains and remote areas of the state are incompletely or little explored, thus making it difficult or impossible to arrive at complete documentation of its phytodiversity. In view of the above constraints, it can be construed that there is a lot of further scope and need to fill gaps in our knowledge of overall floristic observations of the state before having a final word on complete inventory of diversity of plants that inhabits this bio resources-rich region. Degradation of forest ecosystems and homogenization of agro-ecosystems leading to ever increasing loss of natural flora are areas that need to be addressed. This is the apt time to generate awareness among the local population about rich phytodiversity of the state and their value in regional development as also about consequences of their excessive exploitation and climate change and other impending threats to them, if we would like to sustain and conserve biodiversity for the future generations.

MATERIALS AND METHODS

During different field surveys (2015-2019) plant specimens were collected from different localities and necessary measurements as well as photographs were taken in the field. Systematized taxonomic procedures have been followed for collection and herbarium preparation.[23] The collected samples were matched with the preserved specimen of regional herbaria (Regional Plant Resource Centre, Post Graduate Department of Botany, Utkal University and CSIR-Institute of Minerals and Materials Technology, Bhubaneswar, Odisha) and observed that these specimens have not been collected earlier and preserved. Thorough study of all the relevant literatures[13-32] as well as the present floras of the area[13,33,34] it was found that these species have not been reported from Odisha and thus observed as new plant records for the state. However, these specimens were identified by using the e-Flora of China.[35-39] The collected voucher specimens were preserved and deposited to the Post Graduate Department of Botany, Utkal University, Vani Vihar, Bhubaneswar, Odisha.

ENUMERATION

Calystegia sepium (L.) R. Br. Prodr. 483. 1810. [CONVOLVULACEAE]


Vernacular name(s): Broothigantaa, Darbalata (O), Bear bind, Bracted bindweed, Devil's guts, Devil's vine, False bindweed, Great bindweed, Hedge bindweed, Hedgebell, Hedge-lily, Hedge morning glory, Lily-bind, Old man's cap, Rutland beauty (E).

Description: Habit: perennial herbaceous climber up to 8-10 ft long. Stem: twining, porraceous to rubicund, glabrous to puberulous, terete, alternate leaves moderately distributed along these stems. Leaves: simple, alternate, exstipulate, petiolate, petioles gracilliform, about 1/2 as long as the leaves, 5-15×2.5-5 cm, sagittate or hastate-triangular, margins leioic and scarcely ciliate, basal lobes orbicular or angular and squared-off in shape, sinuses sharply indented between the basal lobes, campestrial or orbicular, abaxial surface medium green, glabrous, adaxial surface moderately green, glabrous or pubescent. Inflorescence: solitary axillary. Flower: pedicellate, pedicel 4-16 cm long, square or angled, bracteate, 2 bracts, 1.4-3.8 cm long, ovate or oblong, sepaloid, cordate at the base, complete, hermaphrodite, actinomorphic, pentamorous, hypogynous. Calyx: 5 sepals, moderate to medium green, frequently with rubicund margins, conspicuously hidden by a pair of copious bracts, broadly oval-ovoid in shape, keeled, polysepalous, persistent, quincuncial, acute. Corolla: petals 5, gamopetalous, infundibuliform, 4-8 cm long, scarcely 5-lobed, valvate in bud, leucoish, occasionally pale roseus with broad candid stripe, corolla throat luteus. Androecium: 5 stamens, epipetalous, alternipetalous, inserted towards the base of corolla tube; anthers diheccous, basifixed, introrse, longitudinally dehiscent, sagittate. Gynoecium: usually tetracarpellar formed by false septation, syncarpous, superior, monoloculus,
Plant is commonly found along shaded rocks and walls. It is distributed very frequently in areas of crop land, N 20° 2' 125" and E 85° 25' 146", 02. 8. 2017, RM 3009 (Herbarium, Utkal University, Vani Vihar, Bhubaneswar).

Associated species: Plant is commonly found associated with other climbers like Mikania micrantha, Pergularia daemia, Oxystelma esculenta etc.


Vernacular name(s): Kalukki, Khanjanika (O); Coliseum-ivy, Pennywort, Oxford-ivy, Ivy-leaved toad flex, Mother-of-thousands, Wandering-sailor, Italian bastard navel-wort (E)

Description: Habit: creeping, perennial, epilithic or epipetric herbs. Habitat: on shady rocks and walls. Stem: mostly glabrous, occasionally villous, tenuiform, reddish-brown trailing stems up to 70 cm long that root at the nodes. Leaves: Cauline, simple, alternate, opposite at the base of the plant), petiolate, petiole long, 1-1.5 cm, abaxially greenish, adaxially frequently purplish, glabrous, reniform to hemicircular, occasionally suborbicular, basally cordate, 1-4 cm broad, palmately veined and lobed, lobes shallow, tri-ennae lobed, rounded to deltate, ending in a acute or mucronate point. Inflorescence: solitary, axillary. Flower: ebracteate, ebracteolate, pedicellate, frequently elongating in fruit, slender, ca. 2.3 cm long, hermaphrodite, perfect, zygomorphic, hypogynous. Calyx: sepals 5, equal, lobes 1.4-3x0.4-1 mm, apex acute, basally connate, radially symmetric, tintinabulate, lobes linear to lanceolate, sub-equal, glabrous. Corolla: gamopetalous, light purpureus or light caeruleus or lilac, occasionally roseus to rubicund corolla, bilaterally symmetrical, bilabiately and personate, tubular, tube base not gibbous, 6-9 mm long, 2 adaxial and 3 abaxial lobes, with a luteus palate and an abaxial pumilus spur; flowers produce nectar. Androecium: 4 stamens, epipetalous, didynamous, not exserted from the throat of the corolla, basally adnate to corolla, anthers di-thecous, staminode absent, filaments incurved, abaxial 2-5 mm, adaxial 3-6 mm, pollen sacs oblongiformal, glabrous. Gynoecium: bicipellary, syncarpous, superior, bilocular, numerous tomatropus ovules in each locale, axile placation, carpels antero-posteriorly placed, style simple, single, slender, 3-5 mm, base persistent in the fruit, stigma straight, moderately clavate, nectar secreting disc present below the ovary. Fruit: a capsule, 0.5 cm broad, globose, glabrous and bear less than fifty seeds, mature capsule pedicels are about 4.3 cm long, 2 locules are of distinct sizes and do not open at the same time, the beneath side and copious locule opens first, one or two seeds remain attached to the capsule. Seed: surface of the seed frequently asymmetric because ornamented with conspicuously acute ridges and generally a few tubercles, elipsoid-globose, nigrescent, differ in size, seed of upper locale are parvulus asymmetric surface permits seeds to stick together, forming clumps, ca. 1 mm long and about 0.5-1 mm wide (Plate: 1 C and D).

Flowering and Fruiting: April-October

Distribution: Widely spread in whole European country, some Asian country and also in North America.

Ecology: Hedge and thickets adjacent to crop land.

Specimen examined: Jajpur, Mallikapur, disturbed areas of crop land, N 20° 21' 125" and E 85° 25' 146", 02. 8. 2017, RM 3009 (Herbarium, Utkal University, Vani Vihar, Bhubaneswar).

Associated species: Plant is generally found associated with other plant like Pilea microphylla and Lindenbergia muralia.

Note: Three subspecies are recognized; only subspp. muralis occurs in India. It is distributed very frequently throughout the world. Subspecies visianii (Kümm. ex Jáv.) D.A. Webb and subspp. pubescens (J. Presl and C. Presl) D.A. Webb occur in Italy and the Balkan Peninsula. This species is introduced in India for ornamental purpose but now it is naturalized.

Fumaria indica (Hausskn.) Pugsley, Journ. Linn. Soc. Bot. 44: 313. 1919. [PAPAVERACEAE]

**Description:** Habit: pusillus, subtile, heavily ramified, leafy diffuse herb, 4-27 (-50) cm long. Habitat: terrestrial mesophyte. Stem: erect, slender, herbaceous, glaucous, glabrous. Leaves: alternate, exstipple, 3-10×1-2.5 cm broad, stalk elongated to sub-sessile, heavily dissected, two-three pinnatisect or decompound, with (two) three-five pairs of lateral pinnae and a terminal one; pinnae long-petiolulated to sub-sessile; 1-4 cm long, 0.4-2.5(3) cm broad, very frequently ternately lobed; each lobe entire, individual lobe deeply, finely lobulated in linear ultimate segments called lobules up to 4 (-9) mm long, 1-1.5 mm broad, platyform to sparsely channeled. Inflorescence: racemose-raceme, lowly pedunculated to subsessile, leaf-opposed, 5-13 (-15)-flowered, 8-22 mm long. Flower: bracteate, bracts as long as or scarcely longer than pedicels; linear, lowly membranous, leucoish, pedicellate, pedicel erect, 1.3-2.5 (3) mm long, with median ridge and scarcely expanded margins, moderately broader beneath the fruit or at its apex, complete, zygomorphic, appearing terminal, but from which it differs by its long bracts. This species was previously reported in Haines flora (1922-1924) from Bihar but not from Odisha.


**Vernacular name(s):** Chitranghantaa (O), Canterbury bells, True Gloxinia (E).

**Description:** Habit: perennial herb with squamular rhizomes, 75 cm - 1 m tall. Habitat: terrestrial mesophyte. Stem: simple or cladate, subwoody at base, succulent above, erect or ascending, nearly glabrous. Leaves: opposite, subequal in a pair, petiolate, petiole 1.4-12.0 cm long, moderately pilose; blade papyraceous when dry, orbicular, ovate to rarely obovate, 5.5-14.7(-18) cm x 3.4-9.5(-14) cm, margin coarsely crenate to serrate, apex obtuse to acute, base sometimes oblique, truncate, rounded to usually cordate, above glabrous to sparsely strigose, below glabrous or with a few scattered hairs. Inflorescence: racemose, indeterminate raceme. Flowers: bracteate, ebracteolate, complete, hermaphroditic, zygomorphic, appearing terminal, but lower flower actually solitary on a raceme-like stem, epedunculate, pedicellate, pedicel 0.5-4.0 cm long, more or less glabrous, epigynous. Calyx: sepals 5, gamosepalous, persistent, campanulate, porrectous, occasionally streaked with rubicund tinge, lobes free, spreading, subequal, lanceolate to oblong, 0.7-1.9 x 0.4-0.8 cm, margin entire or toothed, apex broadly acute, outside and inside glabrous. Corolla: gamopetalous, oblique, leucoish, roseus, lavender to purple, 2.5-4.0
Lunaria (L.) Encycl. 1: 98 1783

Fl. Franç. 2:46.1779

Deutschl. Fl. ed. 2, 6: 70. 1902

halimifolia

Voss Vilm. Blumengärtn. ed. 3 1: 77. 1753

Hort. Berol. Alt. 2: 157 1822

1815. [BRASSICACEAE]

Globossa, Chloris barbata

Associated species: (Herbarium, Utkal University, Vani Vihar, Bhubaneswar).

N 21 of forests, rocks and river banks.

Ecology: It prefers to grow in shady and humid areas of forests, rocks and river banks.

Specimen examined: Mayurbhanj, Bisipur-Dhanapana N 21° 22' 945" and E 86° 17' 745", 22.11.2016, RM 3011 (Herbarium, Utakal University, Vani Vihar, Bhubaneswar).

Associated species: Plant is found among the common grasses like Bothriochloa pertusa, Clypeola dactylon, Ischane strigulosa, Choris barbata etc.

Lobularia maritima (L.)Desv., J. Bot. Agric. 3: 162. 1815. [BRASSICACEAE]


Vernacular name(s): Shirakanda (O), Sweet Alyssum (E).

Description: Habit: perennial herbs, occasionally suffrutescent. (4-)15-25(-50) cm tall, argenteus-pubescent. Habitat: terrestrial mesophyte. Stems: erect, ascending, procumbent, basally ramified, tomentose. Leaves: cauline, not rosulate, simple, alternate, exstipulate, blade base inauriculate, linear, lanceolate, or oblanceolate, (1-)1.7-2.6(-5) cm × (0.5-)1.5-4(-7) mm, hirsute, base attenuate, margin entire, apex acute to sub obtuse. Inflorescence: a raceme multi flowered, elongated generally in fruit. Fruiting pedicels: divaricate or ascending, orthic, pilose, (3.5)5-8(-12) mm, pilose. Flower: ebracteate, ebracteolate, complete, hermaphrodite, actinomorphic, tetramerous, hypogynous. Calyx: 4 sepals, polypetalous, in 2 whorls of 2 each; sepals prasinus or purpureus, oblong, 1.4-1.9(3)×0.4-1 mm, hispid, acute. Corolla: 4 petals, polypetalous, cruciform, petals leucoish or deep purpureus, obovate or lowly orbicular, 2.3-5×1.4-2.7(-3.5) mm, suddenly narrowed to claw, claw one mm. Androecium: stamens 6, scarcely tetradynamous, spreading or sub-euncate, filaments dilated at base, anthers ovate, obtuse at apex, filaments white or purple, 1.2-2 mm, anthers ovate, 0.3-0.5 mm, dithecous, introrse, longitudinally dehiscent, nectar glands eight, four lateral vestigial, four median cylindrical. Gynoecium: bicornellate, syncarpous, superior, unilocular but becoming bilocular due to development of false septicum or replum, ovules anatropous, 2-14 per ovary; parietal placentation, style one, style to 0.5 mm, stigma capitate. Fruit: dehiscent silicles, ovate, orbicular, (2-)2.5-3(-4.5)×(1.3-)1.7-2(-3.5) mm, latiseptate, shortly stipitate, valves papyrus, with a distinct mid-vein, replum orbicular; septicum complete, membraniform, translucent, cylindrical. Seeds: uniseriate, light to rubrophaceoic, one per ovary, lenticular, ovate or suborbicular, (1-)1.3-1.5(-2)×(0.5-)0.9-1(-1.7), wingless or with a narrow wing to 0.1 mm wide (Plate: 2 C and D).

Flowering and Fruiting: March-June.

Distribution: Widespread in tropical climate like Africa, Senegal, Connecticut, Maine Massachusetts, Rhode Island, Vermont, Asian country include China, India, Pakistan and Sri Lanka.

Ecology: Occur in stony area, waste grounds, road sides mainly man made disturbed habitats.
Specimen examined: Jatni, Centurion University campus, N 20° 30′ 060″ and E 85° 82′ 539″, 17.7.2018, RM 3016 (Herbarium, Utka University, Vani Vihar, Bhubaneswar).

Associated species: Plant is found among the common grasses like Bothriochloa pertusa, Cynodon dactylon, Chloris barbata, Evolvulus alsinoides and E. nummularius.


Vernacular name(s): Devakanda (O and San), Baghmoochh (H), Fiji arrowroot, Polynesian arrowroot, East Indian arrowroot, Tahiti arrowroot (E).

Description: Habit: perennial rhizomatous herb, 2-3 m tall. Habitat: terrestrial mesophyte. Tubers: globular to broadly ellipsoid-globose, cork dark phaeoic to phaeoic, transverse section leucoish. Leaves: radical, 1-3, petiolate, petiole erect, base sheathing, blade broadly obovate, ovate, or oblong-ovate, palmately trilobed, each of the tri-segments pinnately lobed or dissected, lobes pinnate, prominently nerved, 50-120×30-60 cm, abaxially dark green, glabrous to scabrellous, adaxially lowly green, scabrous, apex acute. Inflorescences: umbel, terminal, generally one, occasionally two on an erect caval scape, generally up to 1.8 m tall, complete inflorescence delineated by an involucre of 4-8 bract up to ca. 5×4 cm; involucral bracts 4-12; umbel, 15-40
flowered in 2 whorls. Flowers: bracteates, virid with purple margins and innumerable more or less pendent floral bracts, filiform, merulo-purpureus, bracteolate, bracteoles linear, narrower than bracts, 20-25 cm, hermaphrodite, actinomorphic, 5.18×5-14 mm, drooping, pallid, flavo-prasinus or blackish purplish green. Perianth: tinctinulate, hexalobed, persistent, pallid, palido-prasinus, or dark purpuro-prasinus, outer lobes elliptic to ovoid, inner ones broadly to narrowly ovate. Androecium: stamens 6, candid or light yellow to phaeoic or purple, inserted lobes of perianth, filaments pumilus, apex cucullate or spatulate, anthers bilocular, introrse. Gynoecium: ovary inferior, 2-6×2-5 mm, uniloculed, placenta 3, parietal, ovules many, anatropous, style pumilus, stigma trilobed, with individual lobe dissected into two, usually petaloid, campylar over style. Fruit: a berry, globular, ellipsoid-globular, or oval-globular, 1.3-2.7 cm pendulous, pale to porraceous, at maturity pale aurantiate, tepals persistent at the apex. Seeds many, oval to ellipsoidal, flattened, 5-8×1.5-3 mm, glabrous, globose, fulvo-phaeoic, testa leucoch, spongy, 14-20-ribbed (Plate: 2 E and F).

**Flowering and Fruiting:** September-October.

**Distribution:** Widely spread in tropical Africa, Madagascar, South and Southeast Asia, Samoa and Fiji, Micronesia, Australasia, New Guinea, Asia (India, China, Sri Lanka) Pacific island etc.

**Ecology:** Open forest, dry and shady habitat.

**Specimen examined:** Similipal, near periphery of the sanctuary, along paths and roads, N 21° 21' 112" and E 86° 20' 187", 02.9.2018, RM 3017 (Herbarium, Utkal University, Vani Vihar, Bhubaneswar).

**Associated species:** Plant is generally found associated with many plants like *Gynodion dactylon*, *Edelisima indica*, *Portulaca oleracea*, *Boerhavia diffusa* etc.

**CONCLUSION**

The present investigation revealed six new plant genera which were found new additions to flora of Odisha, India. Odisha is dominated by cultivated fields and highly populated area with closely established old and new human settlements, townships and districts. Some of the forests are cleared for the developmental works and remain only waste places and road side in the study area have much higher species richness as compared to the agricultural field and little forest areas. The authors have gone through all the relevant published literatures and visited all the regional herbarium institutes present in the state to confirm the occurrence, distribution and habitat of the above described species. The need for further botanical exploration in Odisha is underscored by the rapid accumulation of recent new addition of unreported genera of plants. There is no evidence of any relevant documentation found in the Flora of Orissa with reference to the occurrence of these six collected plant genera, hence these collected plant specimens are reported for the first time contributing to the flora of Odisha state. The information on geographical extension of these six genera of plant species is of immense contribution in conservation of these species and it is very important from taxonomical and phytogeographical point of view.

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**CONFLICT OF INTEREST**

The authors declare that they have no conflict of interest.

**ABBREVIATIONS**

Ca.: Circa; Cm: Centimeter; m: Meter; mm: millimeter.

**REFERENCES**

Mishra, et al.: Some New Additions to the Flora of Odisha


