

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

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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.

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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,

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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.^[1] 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.^[2] 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^[3-32] as well as the present floras of the area^[1,33,34] 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]

Synonym: *Aniseia arifolia* Meisn. Fl. Bras. 7: 319 1869. *Calystegia rosea* Phil. Linnaea 29: 15 1857. *Calystegia sepium* subsp. *americana* (Sims) Brummitt, Ann. Missouri Bot. Gard. 52: 216 1965. *Calystegia sepium* var. *rosea* Choisy, Prodr. 9: 433 1845. *Convolvulus sepium* L. Sp. Pl. 1: 153 1753. *Convolvulus sepium* var. *americanus* Sims, Bot. Mag. pl. 19. 732. 1804. *Volvulus sepium* (L.) Junger, Oesterr. Bot. Z. 41(4): 133–134 1891. *Volvulus sepium* var. *americanus* (Sims) Farw. Rep. (Annual) Commiss. Parks Boulevards Detroit 11: 81 1900.

Vernacular name(s): Brootighantaa, 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^{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, sepaloïd, cordate at the base, complete, hermaphrodite, actinomorphic, pentamerous, hypogenous. Calyx: 5 sepals, moderate to medium green, frequently with rubicund margins, conspicuously hidden by a pair of copious bracts, broadly oval-obovoid 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 ditheous, basifixed, introrse, longitudinally dehiscent, sagittate. Gynoecium: usually tetracarpellary formed by false septation, syncarpous, superior, monolocus,

one ovule in each locule, axile placentation, single style, whitish, stigma in a pair, bilobed. Fruit and Seed: a capsule, oval, bi-tetra seeds per capsule; seeds light phaeoic to carbonaceous, tri-angled (two platylateral and one orbicular side) or asymmetric in shape, about 4-6 mm long (Plate: 1 A and B).

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 commonly found associated with other climbers like *Mikania micrantha*, *Pergularia daemia*, *Oxystelma esculenta* etc.

Cymbalaria muralis G.Gaertn., B.Mey. and Scherb. Oekon. Fl. Wetterau 2: 397. 1800. [PLANTAGINACEAE]

Synonyms: *Antirrhinum acutangulum* Ten. Fl. Napol. 2: 47. 1820. *Antirrhinum cimbalaria* Neck. Delic. Gallo-Belg. 267. 1773. *Antirrhinum cymbalaria* L. Sp. Pl. 2. 612 1753. *Antirrhinum quinquelobum* Stokes Bot. Mat. Med. 3: 385 1812. *Cymbalaria flabellifer* A.Chev. Bull. Soc. Bot. France 83: 650. 1937. *Elatine cymbalaria* Moench Methodus 525. 1794. *Linaria cymbalaria* (L.) Mill. Gard. Dict. ed. 8. 17. 1768.

Vernacular name(s): Kalukki, Khanjanika (O); Coliseum-ivy, Pennywort, Oxford-ivy, Ivy-leafed 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-ennea 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 1.4-3×0.4-1 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, bilabiate 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 exerted from the throat of the corolla, basally adnate to corolla, anthers ditheous, staminode absent, filaments incurved, abaxial 2-5 mm, adaxial 3-6 mm, pollen sacs oblongiform, glabrous. Gynoecium: bicarpellary, syncarpous, superior, bilocular, numerous anatropous ovules in each locule, axile placentation, 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, ellipsoid-globose, nigrescent, differ in size, seed of upper locule are parvulus asymmetric surface permits seeds to stick together, forming clumps, ca. 1mm long and about 0.5-1mm wide (Plate: 1 C and D).

Flowering and Fruiting: May-October

Distribution: Native in South Alps, West Yugoslavia, widespread in South West Asia, Europe, Mexico, Central and South America, Africa, Atlantic and Pacific Islands, Australia.

Ecology: Introduced but now found in rock crevices.

Specimen examined: Tayaput, Koraput, on shady rocks and walls, N 18° 89' 377" and E 83° 25' 367", 17. 8. 2015, RM 3035 (Herbarium, Utkal University, Vani Vihar, Bhubaneswar).

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

Note: Three subspecies are recognized; only subsp. *muralis* occurs in India. It is distributed very frequently throughout the world. Subspecies *visianii* (Kümm. ex Jáv.) D.A. Webb and subsp. *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]

Synonym: *Fumaria parviflora* auct. non Lam.: Burkill, List. Fl. Pl. Baluch. (reprint ed.). 7. 1956. *Fumaria parviflora* ssp. *vaillantii* (Lois.) Hook.f. and Thoms., Fl.

Ind. 1:238. 1955. *Fumaria vaillantii* var. *indica* Hausskn. Flora. 56: 443. 1873.

Vernacular name(s): Dhumagandha (O), Parpatakha (San), Pit papra (H), Indian Fumitory (E).

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, exstipulate, 3-10×1-2.5 cm broad, stalk elongated to sub-sessile, heavily dissected, two-three pinnatisect or decomposed, with (two) three-five pairs of lateral pinnae and a terminal one; pinnae long-petioluled to subsessile; 1-4 cm long, 0.4-2.5(3) cm broad, very frequently ternately lobed, each lobe entire, individual lobe deeply, finely lobuled into linear ultimate segments called lobules up to 4 (-9) mm long, 1-1.5 mm broad, platyform to sparsely channeled. Inflorescence: racemose-raceme, lowly peduncled 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, dimerous, hypogynous, 4-7 mm long, generally candid or pale roseus or purple. Calyx: sepals 2, polysepalous, leucoish, membranous, pusillus, less than 1 mm long, 0.7 mm broad, occasionally obsolete or inevident, laciniatedentate, caducous, valvate, acute. Corolla: petals 4, arranged in two whorls of two each, upper petal with teeny-weeny sub-orbicular, moderately oblong and obscurely down campylar spur, ca. 1.7 mm long (or may be approximately ½ of the lamina of upper petal), inner whorl petals are smaller and placed antero-posteriorly. Androecium: stamens in two groups, each group contains ½+1+ ½ stamens, filament of the stamen opposite to the spurred petal has a yellow-green nectar, basified, extrorse. Gynoecium: bicarpellary, syncarpous, superior, unilocular, many ovules, parietal placentation, style short, nematiform, stigma lobed. Fruit and seeds: a nut, ca. 1.5-2 mm in diam., sub-orbicular with generally rotund apex when mature, moderately apiculate at juvenescence, sparsely or obscurely keeled, keel conspicuous in scarcely juvenile fruits, occasionally rugose when withered and with two obscure apical pits, one seeded; seed 1.5-2 mm in diam, phaeoic (Plate: 1 E and F).

Flowering and Fruiting: March-June.

Distribution: Afghanistan, Bhutan, Nepal, India, Pakistan, Central and West Asia.

Ecology: Agricultural field, wasteland related to agricultural purpose.

Specimen examined: Rourkela, Nuagaon, on agricultural land, N 22° 17' 257" and E 84° 78' 178" 17.5.2017, RM 3014 (Herbarium, Utkal University, Vani Vihar, Bhubaneswar).

Associated species: Plant is generally found among *Richardia scabra*, *Blumea lacera*, *Amberboa ramosa*, *Sonchus asper* and *Trichodesma zeylanica*.

Note: This species shows very close resemblance with *Fumaria parviflora* Lam. but leaf segments are almost platy; also very much similar to *Fumaria vaillantii* Lois., from which it differs by its long bracts. This species was previously reported in Haines flora (1922-1924) from Bihar but not from Odisha.

Gloxinia perennis (L.)Druce, Rep. Bot. Exch. Club Soc. Brit. Isles 3: 418.1913. [GESNERIACEAE]

Synonym: *Escheria gloxiniaeflora* Regel; Flora 32: 179. 1849. *Escheria gloxinifolia* Regel; Flora 33: 179. 1850. *Eucolum crassifolium* Salisb. Prodr. Stirp. Chap. Allerton 98 1796. *Gloxinia bicolor* Poepp. ex Hanst. Fl. Bras. 8(1): 419 1864. *Gloxinia heterophylla* Poepp., Nov. Gen. Sp. Pl. 3(1-2): 9. 1840. *Gloxinia pallidiflora* Hook., Bot. Mag. 72: [1], t. 4213. 1846. *Gloxinia suaveolens* Decne., Rev. Hort. [Paris], sér. 3, 2(24): 463. 1848. *Gloxinia trichantha* Miq., Linnaea 22(4): 473-474.1849. *Martynia perennis* L. Sp. Pl. 2: 618. 1753. *Salisia maculata* (L'Hér.) Regel; Bot. Zeitung (Berlin) 9: 894 1851. *Salisia suaveolens* (Decne) Regel. Bot. Zeitung (Berlin) 9(51): 894. 1851.

Vernacular name(s): Chitraghantaa (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, hermaphrodite, 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, porraceous, 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

cm long, tube broadly campanulate, 2-3.5 cm long, base broad, ventrally gibbous, ca. 1 cm wide, middle broadly ventricose, throat slightly contracted, 2-3.2 cm wide, outside pilose, inside glandular on upper surface, limb to 4 cm wide, lobes subequal, upper and lateral lobes spreading, basal lobes incurved, all broadly sub orbicular, 1.0-1.2 x 1.0-1.8 cm, margin upper and lateral lobes entire, basal lobe toothed. Androecium: stamens 4, didynamous, epipetalous, anthers laterally coherent, ditheous, parallel, divergent, introrse. Gynoecium: unilocular; syncarpous, ovary inferior, parietal placentation, ovules numerous, anatropous, style 1, 1.2-1.5 cm long, glandular, sparsely pilose, stigmas 1, stomatomorphic (mouth shaped), bilobed, pale, ovary apex broadly ovoid, 0.3-0.5 x 0.3-0.4 cm, apex pubescent, epigynous. Fruit: an ovoid to elliptical dry rostrate capsule, bivalved, mature capsule prasinus to phaeoic, angustiformly conic, loculicidally dehiscent without splitting the hypanthium, 1-1.8 x 0.4-0.7 cm. Seeds: numerous, perpusillus, rhombic to ellipsoid (Plate: 2 A and B).

Flowering: August-November and **Fruiting:** November-February

Distribution: Native to Central and South America (Andes), Costa Rica, Colombia, Brazil, Peru, Bolivia and West Indies.

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, Utkal University, Vani Vihar, Bhubaneswar).

Associated species: Plant is found among the common grasses like *Bothriochloa pertusa*, *Cynodon dactylon*, *Ischane globosa*, *Chloris barbata* etc.

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

Synonym: *Adyseton balimifolium* Link Enum. Hort. Berol. Alt. 2: 157 1822. *Adyseton maritimum* (L.) Link Enum. Hort. Berol. Alt. 2: 157 1822. *Adyseton orbiculare* Bubani Fl. Pyren. 3: 207 1901. *Alyssum balimifolium* L. Sp. Pl. 650 1753. *Alyssum maritimum* (L.) Lam. Encycl. 1: 98 1783. *Alyssum minimum* L. Sp. Pl. 651. 1753. *Alyssum odoratum* Voss Vilm. Blumengärtn. ed. 3 1: 77. 1894. *Anodonteia balimifolia* (DC.) Sweet, Hort. Brit. 467 1826. *Clypeola balimifolia* Link Handbuch 2: 295 1831. *Clypeola maritima* L. Sp. Pl. 652 1753. *Crucifera koniga* E.H.L. Krause Deutschl. Fl. ed. 2, 6: 70. 1902. *Draba maritima* (L.) Lam. Fl. Franç. 2.46.1779. *Glyce maritima* (L.) Lindl. Syn. Brit. Fl. 26 1829. *Koniga balimifolia* Rchb. Fl. Germ. Excurs. 2: 669 1832. *Koniga maritima* (L.) R.Br. Narr. Travels Africa 214 1826. *Koniga strigulosa* Nyman Syll. Fl. Eur. 200. 1855.

Lepidium fragrans Willd. Bot. Mag. (Römer and Usteri) 4: 11 tes St. 36. 1790. *Lobularia balimifolia* Steud. Nomencl. Bot. ed. 2, 2: 64 1841. *Lobularia strigulosa* Willk. Prodr. Fl. Hispan. 3: 837. 1880. *Lunaria balimifolia* All. Fl. Pedem. 1: 245 1785. *Octadenia maritima* (L.) Fisch. and C.A. Mey. Index Seminum (LE) 3: 41 1837.

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

Description: Habit: perennial herbs, occasionally suffruticose, (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 x (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, psilic, (3.5)5-8(-12) mm, pilose. Flower: ebracteate, ebracteolate, complete, hermaphrodite, actinomorphic, tetramerous, hypogynous. Calyx: 4 sepals, polysepalous, in 2 whorls of 2 each; sepals prasinus or purpureus, oblong, 1.4-1.9(3) x 0.4-1 mm, hispid, acute. Corolla: 4 petals, polypetalous, cruciform, petals leucoish or deep purpureus, obovate or lowly orbicular, 2-3.5 x 1.4-2.7(-3.5) mm, suddenly narrowed to claw, claw one mm. Androecium: stamens 6, scarcely tetradynamous, spreading or sub-erect, filaments dilated at base, anthers ovate, obtuse at apex, filaments white or purple, 1.2-2 mm, anthers ovate, 0.3-0.5 mm, ditheous, introrse, longitudinally dehiscent, nectar glands eight, four lateral vestigial, four median cylindrical. Gynoecium: bicarpellary, syncarpous, superior, unilocular but becoming bilocular due to development of false septum 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) x (1.3-)1.7-2(-3.5) mm, latisepate, shortly stipitate, valves papyrus, with a distinct mid-vein, replum orbicular; septum complete, membraniform, translucent, cylindrical. Seeds: uniseriate, light to rubro-phaeoic, one per ovary, lenticular, ovate or suborbicular, (1-)1.3-1.5(-2) x (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, Utkal University, Vani Vihar, Bhubaneswar).

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

Tacca leontopetaloides (L.) Kuntze, Revis. Gen. Pl. 2: 704. 1891. [DIOSCOREACEAE]

Synonym: *Chaitaea tacca* Sol. ex Seem. Fl. Vit. 102 1866. *Leontice leontopetaloides* L. Sp. Pl. 313 1753. *Tacca abyssinica* Hochst. ex Baker Fl. Trop. Afr. 7: 413 1898. *Tacca artocarpifolia* Seem. Fl. Vit. 101 1866. *Tacca brownii* var. *paeoniifolia* Limpr. Pflanzenr. IV, 42: 30. 1928. *Tacca brownii* Seem. Fl. Vit. 100 1866. *Tacca dubia* Schult. and Schult.f. Syst. Veg. 7: 167 1829. *Tacca gaogao* Blanco Fl. Filip. 262 1837. *Tacca guineensis* G. Don ex Loudon Hort. Brit. 2: 167 167 1830. *Tacca hawaiiensis* H. Limpr. Pflanzenr. IV, 42: 30. 1928. *Tacca involucreta* Schumacher and Thonn. Beskr. Guin. Pl. 177 1827. *Tacca maculata* Zipp. ex Span. Linnaea 15: 480 1841. *Tacca madagascariensis* Bojer Hortus Maurit. 350 1837. *Tacca oceanica* Seem. J. Bot. 4: 261 1866. *Tacca phallifera* Schult. and Schult.f.

Syst. Veg. 7: 167. 1829. *Tacca pinnatifida* J.R. Forst. and G. Forst. Char. Gen. Pl. 35 1775. *Tacca pinnatifolia* Gaertn. Fruct. Sem. Pl. 1: 43 1788. *Tacca quanzenensis* Welw. Apont. 591 1859. *Tacca umbrarum* Jum. and H. Perrier Ann. Inst. Bot.-Géol. Colon. Marseille II, 8: 386 1910. *Tacca viridis* Hemsl. Hooker's Icon. Pl. 26: t. 2515. 1897.

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 scabrelous, 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

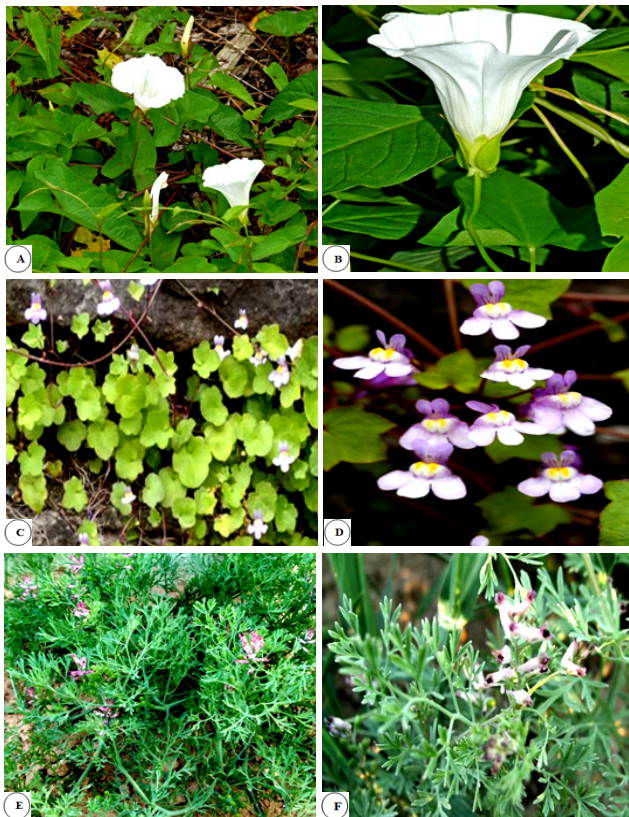


Plate 1: 1A: *Calystegia sepium* with flowers; 1B: Prominent calyx and long pedicel of *C. sepium*; 1C: Rounded leaf and flowers of *Cymbalaria muralis* 1D: Individual flowers of *C. muralis*; 1E: *Fumaria indica* with its associates; 1F: A single flowering twig of *F. indica*



Plate 2: 2A: *Gloxinia perrenis* with its associated species; 2B: A single flowering twig of *G. perrenis*; 2C: Flowering bunch of *Lobularia maritime*; 2D: A single inflorescence of *L. maritime*; 2E: Individual plant of *Tacca leontopetaloides*; 2F: Fruiting branch and fruits of *T. leontopetaloides*.

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: tintinabulate, 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 biloculed, introrse. Gynoecium: ovary inferior, 2-6×2-5 mm, uniloculed, placentas 3, parietal, ovules many, anatropous, style pusillus, 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 leucoish, 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 *Cynodon dactylon*, *Eleusine 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.

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