



***Ocimum basilicum* var. *pilosum* (Willd.) Benth.: A new distributional record of wild sweet basil from Odisha**

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ABSTRACT

The genus *Ocimum* Linn. (Lamiaceae), commonly called as basil, is highly valued for its medicinal properties in indigenous as well as modern pharmacological system. It is also used in perfumes, cosmetics and food industries and associated with diverse Indian cultural traditions. The members are widely distributed in tropical and subtropical regions of Asia, Africa and South America. During the investigation for germplasm collection in parts of Odisha, the natural occurrence of *Ocimum basilicum* var. *pilosum*, a wild sweet basil, was explored first time from undomesticated habitats of the state. On elucidative review, its natural occurrence in Odisha is found to be a new taxonomic record for the flora of Central and Eastern India. The present communication deals with information on its taxonomic description, phenology, germplasm collection and photographs to facilitate easy identification and rational use.

Key words: Eastern and central India, new record, Odisha, sweet basil

INTRODUCTION

Ocimum Linn. belonging to the tribe *Ocimeae* of family *Lamiaceae*, is a large and diversified genus of annual, biennial, or perennial herbs and sub-shrubs of high economic importance due to the presence of essential oils. It is used in traditional medicines including antiseptics, perfumes, cosmetics, cleaning products, food industries and associated with several Indian cultural traditions. The plant is highly valued for its therapeutic properties in traditional as well as modern pharmacological system. The genus *Ocimum* has complex taxonomy attributed to the occurrence of large number of subspecies, varieties, and cultivars on account of high degree of polymorphism and biochemical variability in essential oils which offer diverse medicinal potential (Paton et al., 1992; Pandey et al., 2014; Misra and Das, 2016). *Ocimum* oil exhibited several biological properties like insecticidal, nematocidal,

fungistatic, anti-bacterial including antioxidant, anti-aging, anti-inflammatory, anti-carcinogenic and cardio-vascular agents (Zhang et al., 2009). The genus comprises approximately 30 to 160 species (Charles and Simon, 1990; Pushpagandan and Bradu, 1995; Mabberley, 1997; Gill et al., 2012), mainly distributed in the tropical and warm temperate regions of the world such as Africa, Asia, South America (Sobti and Pushpagandan, 1982; Vieira and Simon, 2000). However, out of 327 scientific plant names of species rank, *Ocimum* has 66 accepted species names and the rest were placed as synonyms and unassessed (Anonymous, 2014). India is represented by 9 species (including three exotics) mainly confined to tropical and peninsular regions (Anonymous, 1966).

Ocimum basilicum L., the common basil or sweet basil, an annual aromatic culinary herb, native to Southeast Asia, is cultivated throughout the greater part of India and has significant economic value

(Anonymous, 1966). The morphology of the species is very variable and its botanical nomenclature is complicated. It shows high polymorphism and classified into 2 to 6 varieties based on growth habit, stem or leaf colour, leaf shape, degree of hairiness on branch, petiole, leaves, and peduncle etc. (Drury, 1866; Gamble, 1925; Matthew, 1982; Rawat et al., 2016). *O. basilicum* var. *pilosum*, one of such varieties, a potential medicinal herb with sharp pungent aromatic odour, mainly distributed in tropical and subtropical regions of Asia: China and India (Drury, 1866; Hooker, 1885; Wu and Li, 1977; Zhang et al., 2009) was reported in wild condition from peninsular region of India (Gamble, 1925; Matthew, 1982; Mohanan and Henry, 1994; Pullaiah et al., 2011). In the present report, the natural occurrence of *O. basilicum* var. *pilosum*, a high valued medicinal and aromatic species, from Odisha forms new plant record for Eastern and Central India.

MATERIALS AND METHODS

During exploration for germplasm collection of medicinal and aromatic plants in parts of Odisha, the first author noticed the occurrence of one peculiar wild species of *Ocimum* at different locations in Sundargarh and Dhenkanal districts of Odisha (Fig. 1. A-C). A total number of nine germplasm accessions of this species were collected from northern plateau and central table land phyto-geographical zones of Odisha. The seed germplasm was collected on-spot from exploration sites bearing respective accession number and conserved in the National Gene Bank, NBPGR, New Delhi for long term storage (Table 1). Further, the seeds were multiplied, and live plants were maintained and characterized in experimental plots of NBPGR Base Centre, Cuttack (Fig. 1.D). The plant voucher specimens bearing both vegetative and flowering parts were deposited in the herbarium of NBPGR base centre, Cuttack, Odisha along with one set at the National Herbarium of Cultivated Plants, NBPGR, New Delhi. The live plants and herbarium specimens were meticulously studied and cross-checked with the plant descriptions and references cited in the Indian literature and abroad. Further, the morphological features of the plant were examined using the trinocular lens and dissection microscope and the distinctive characters were described. The photographs

of the vegetative, flowering or fruiting and the seeds along with the associated species in the natural habitat were taken for reference and future use.

RESULTS AND DISCUSSION

After thorough examination of the vegetative and floral characters of live plants coupled with study on herbarium specimens and perusal of literature (Drury, 1866; Gamble, 1925; Matthew, 1982), the species was identified as *Ocimum basilicum* var. *pilosum* (Willd.) Benth., a species reported in wild state so far only from Kerala, Tamil Nadu, and Andhra Pradesh (Matthew, 1982; Henry et al., 1987; Mohanan and Henry, 1994; Pullaiah et al., 2011; Sasidharan, 2011). It was observed that the plants were found growing luxuriantly in wild habitats and its occurrence has been recorded at nine locations of Sundargarh and Dhenkanal districts, part of central table land and northern plateau zones of Odisha. On verification of major published Indian literature, it was found that it has not been reported till date in wild condition from Central and Eastern India including Odisha (Haines, 1922; Mooney, 1950; Saxena and Brahman, 1995; Mudgal et al., 1997; Singh and Karthikeyan, 2000; Singh et al., 2001). Therefore, the present collection counts an addition of species to the flora of Odisha and forms a new distributional record for Eastern and central India. A detailed taxonomic description on morphology of different parts of the plant species along with field photographs (Fig. 1. E-H), ecology and ethno-botanical uses are provided for easy identification and sustainable utilization.

Taxonomic description

Ocimum basilicum L. var. *pilosum* (Willd.) Benth.

Ocimum basilicum Linn. var. *pilosum* (Willd.) Benth., Labiat. Gen. Spec. 5:1832; *Ocimum basilicum* var. *pilosum* (Willdenow) Benth., Prodr. Systematis Naturalis Regni Vegetabilis 12:33. 1848. Drury, Handb. Ind. Fl. II: 516. 1866; Fl. Brit. Ind. 4: 608. 1885; Gamble, Fl. Pres. Madras 777 (1111). 1924; Matthew, Fl. Tamil Nadu Carnatic 2: 1269. 1982; Pullaiah, Fl. Eastern Ghats 4:569. 2011.



Fig. 1. *Ocimum basilicum* var. *pilosum*. A - C. Wild occurrence on foot hill at Kudpani village, Kuarmunda; Dengurpani village, Gurundia; Gilkuda village, Subdega block; Sundargarh, Odisha. D. Maintained in experimental plot, NBPGR Regional Station, Cuttack. E. Leaves. F. Inflorescence. G. Flowers. H. Seeds

Table 1. Specimen examined and seed germplasm collected and conserved (*Ocimum basilicum* var. *pilosum*)

Site	Collection No.	IC No.	Date of collection	Source	Site of collection					
					Village	Block	District	State	Latitude	Longitude
1	RCM/GD/144	599357	20.03.13	Wasteland	Gaudakatani	Hindol	Dhenkanal	Odisha	20° 47'	85° 22'
2	RCM/SS/41	641756	05.03.2021	Disturbed wild	Badasahi	Gurundia	Sundargarh	Odisha	21° 52'	84° 47'
3	RCM/SS/56	641765	06.03.2021	Disturbed wild	Kudpani	Kuarmunda	Sundargarh	Odisha	22° 24'	84° 41'
4	RCM/BV/PK/07	649107	08.12.2022	Natural wild	Ramaeuda	Lahunipada	Sundargarh	Odisha	21° 50'	85° 00'
5	RCM/BV/PK/10	649109	08.12.2022	Natural wild	Basubahal	Lahunipada	Sundargarh	Odisha	21° 52'	85° 00'
6	RCM/BV/PK/41	649120	09.12.2022	Natural wild	Dhengurpani	Gurundia	Sundargarh	Odisha	21° 57'	84° 34'
7	RCM/BV/PK/62	649131	11.12.2022	Natural wild	Kustuna	Kutra	Sundargarh	Odisha	22° 09'	84° 12'
8	RCM/BV/PK/114	649152	15.12.2022	Natural wild	Gilkuda	Subdega	Sundargarh	Odisha	22° 10'	84° 07'
9	RCM/BV/PK/117	-	15.12.2022	Natural wild	Katangidihi	Subdega	Sundargarh	Odisha	22° 12'	84° 07'

Annual erect under-shrub up to 1.2 m high; stem much branched, base globous; branches 4-angled, woody, purplish-green, hairy, tender parts pilose, apex purple, nodes with a tuft of hairs around. Leaves oblong to elliptic-lanceolate, lamina glabrescent above, glandular, sparsely hairy on midrib and sometimes on veins below, 3.5-5.0 × 1.5-2.0 cm; petiole densely pilose, ca 1 cm; base acute to decurrent, attenuate; margin sparingly serrate, apex gradually acute. Racemes elongated, 15-25 cm long, 3-chotomous, purple, slender, densely hairy; verticillasters densely pilose, many flowered; bracts 2, petiolulate, oblanceolate, 5-10 mm, green, base attenuate, margin ciliate, apex acute; pedicel ca 3 mm in flower. Calyx campanulate, 2-lipped, ca 4 × 3 mm, densely pubescent outside, pilose at throat; tube 3-4 mm long in flower, lobes 5 (4+1), imbricate, densely ciliate; middle tooth of upper lip widest, spreading, ca 3 mm, sub-orbicular, deep purple, concave, mucronate, pilose, often with a tuft of long hairs at the base; lower lip 4-toothed with central pair of teeth longer than upper lip, up to 5 mm long; lateral lobes lanceolate, ca 4 mm long, tooth

apex spinescent, ciliate; fruiting calyx persistent, not markedly enlarged in fruit, brown when dry. Corolla tubular, purplish, limb 2-lipped, up to 7 mm long; lobes 5 (4+1), unequal, obliquely campanulate at throat; upper lip spreading, 5 mm long, sub-equally 4-lobed; lower lip longer, ca 7 mm long, declinate, margin entire; limb puberulent outside; tube ca 3 mm, throat dilated. Stamens 4, free, in 2-pairs, white, declinate, with lower lip of corolla; posterior filaments hairyw at base. Nutlets ovoid-lanceolate, dark grey to black, ca 2 × 2 mm, glandular, with a white basal areola, mucilaginous when wet.

Flowering and fruiting: October - December

Distribution

The species grows in tropical and subtropical regions of Africa and southern Asia including India and China (Wu and Li, 1977). In India, it was recorded earlier in southern peninsula: Kerala, Tamil Nadu, and Andhra Pradesh (Drury, 1866; Gamble, 1925; Matthew, 1982; Henry et al., 1987; Mohanan and Henry, 1994; Pullaiah et al., 2011; Sasidharan, 2011).

Habitat

The plants were found growing rare in wild state in dryer areas in disturbed habitats adjoining to foothills in scrublands in association with herbs, shrubs and grasses. The dominant associates are *Cassia occidentalis*, *Triumfetta pentandra*, *Corchorus aestuans*, *Xanthium strumarium*, *Urena sinuata* and *Fioria vitifolia* etc. A total of 9 germplasm accessions were recorded from different locations of northern plateau and central tableland zones of Odisha. The species is hardy, prefers direct sunlight and propagated well through seeds.

Specimens examined and germplasm collected and conserved

Nine germplasm accessions of *Ocimum basilicum* var. *pilosum*, locally called as *Jungli Tulsi* or *Bana Dahana*, were assembled from partly disturbed wild habitats of Lahunipada, Gurundia, Kutra, Kuarmunda and Subdega blocks of Sundargarh and Hindol block Dhenkanal district of Odisha and brief passport information on respective accession numbers and their germplasm conservation in National Gene Bank, ICAR-NBPGR, New Delhi were provided in Table 1.

Taxonomic notes

The taxon resembles *Ocimum africanum* Lour. (syn. *O. citriodorum* Vis.), reported from parts of Odisha state, in many respects having young shoots or apical nodes, petioles and verticillasters pilose with spreading hairs, oblong to elliptic-lanceolate leaves and acute to decurrent leaf base (Misra et al., 2022). However, this taxon is different from *Ocimum africanum* and can be distinguished from it in possessing taller habit (up to 1.2 m), purplish-green branches, non-lemon scented, very aromatic and fragrant shoot and leaves and purplish corolla.

Ethno-botanical uses

Munda and Oraon tribes of Gurundia and Subdega blocks of Sundargarh district, Odisha use the juice of fresh leaves along with ginger for treatment of common cold, cough and malaria and intermittent fever. The leaves along with honey are given to children to boost immunity. The leaves

either crushed or cut into pieces and put in a glass of hot water and its steam is inhaled for curing migraine, headache and sore throat. The leaves are also consumed in morning to prevent stress in old age patient.

Biochemical analysis of essential oil

The essential oil extracted from leaves of *O. basilicum* var. *pilosum* (IC- 641756 and IC- 641765) exhibited several active compounds out of which the predominant chemotypes (%) were represented by methyl chavicol-rich (78.06 and 71.75) and linalool-rich (17.86 and 24.65) types. Earlier study on chemotypic characterisation of this taxonomic variety also reported methyl chavicol-rich chemotypes (79.66-90.71%) germplasm (Raina and Gupta, 2018). Methyl chavicol commonly known as estragol, a phenyl propanoid compound, is widely used in perfumes and flavour industry. However, the essential oil analysis of this taxon collected from Tengzhou country, Shandong Province (East China), by Zhang et al. (2009), reported linalool (29.68%), as the major active compound, which may be due to their distribution in divergent eco-climatic zones and edaphic condition.

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