

**Abstract:** The genus *Ocimum* means fragrant-lipped, characterized by the presence of the upper lobe of the calyx, which is large and decurrent. *Ocimum gratissimum* L. is conventionally known as Clove Basil due to its foliage which smells like cloves. The present study reports the extant distribution of *O. gratissimum* L. ssp. *gratissimum* var. *macrophyllum* Briq. across northeastern India. It is a new distribution record for the flora of Assam and northeastern India. A comprehensive description along with photographs, taxonomic notes, and diagnostic keys has been provided to aid identification.

**Keywords:** Assam, distribution, flora, keys, lipped, taxonomy.


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(Lamiaceae: Nepetoideae: Ocimeae) a new record from northeastern India

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**Author contributions:** ND and DN conceptualized and supervised the research work; MK did the field and laboratory works, and drafted the manuscript. ND and DN finalized the manuscript, and MK communicated to the Journal.

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INTRODUCTION

Commonly known as ‘Tulsi’ in Hindi and ‘Toolakhi’ in Assamese, ‘Basil’ (Empress of all herbs) descended from the Greek word ‘Basileus’ which means royal, and ‘Ocimum’ from ‘okimon’ which purports an aromatic herb. Ocimum L. is chiefly an ‘East Indian’ genus (Bentham 1832). The primary centre of origin is Africa, Tropical Asia, and Central and South America, while India is the secondary centre (Pushpangadan & Sobti 1982). According to APG IV, Ocimum gratissimum is a member of the tribe Ocimeae Dumort., subfamily Nepetoideae Burnett in the mint family Lamiaceae Martinov (Stevens 2001 onwards). The specific epithet ‘gratissimum’ explains an exaggerated expression of pleasantness due to the aroma of the species. The species have a more substantial degree of fragrance than other Ocimum L. species (Roxburgh 1832). O. gratissimum has two accepted sub-specific taxa, O. gratissimum ssp. gratissimum and O. gratissimum ssp. iringense Ayob. ex Paton. The latter subspecies is confined to Tanzania, while ssp. gratissimum is native to the tropical and sub-tropical old world. The variety macrophyllum was first acknowledged by Briquet (1894) affirming the distribution of var. macrophyllum in India Orientalis. According to Ryding (2000), var. macrophyllum is widespread in the tropics from India to western Africa. The var. macrophyllum got introduced from or to India and later disseminated through African cultivation. The variety was acknowledged by Paton (1992) while investigating Ocimum L. in Africa. He found a few forms of O. gratissimum in Uganda and Tanzania, corresponding to var. macrophyllum in having lax inflorescence, calyx, and leaf indumentum. The distinction of the varieties based on morphological characteristics conceals the facts acquired from genetic and secondary product variation. Such high degree variation is found in var. gratissimum against var. macrophyllum (Vieira et al. 2001). The var. macrophyllum is recognized by glabrous or pubescent leaves (hairs scattered over lower nerves) and hairy inflorescence (Albuquerque & Andrade 1998). While revising the tribe Ocimeae Dumort., Suddee et al. (2005) distinguished both varieties of O. gratissimum ssp. gratissimum (var. gratissimum and var. macrophyllum) and their distribution from India. The var. macrophyllum might have arisen from var. gratissimum in response to environmental constrain (Paton et al. 2009).

The Indian subcontinent is acknowledged by ssp. gratissimum. The var. macrophyllum is treated within ssp. gratissimum and reported earlier from different states of India, except Himachal Pradesh, Jammu & Kashmir, Uttarakhand, and northeastern India. In the present study, the variety macrophyllum is being reported for the first time from Assam.

MATERIALS AND METHODS

The specimens of the var. macrophyllum were collected from Jorhat district of Assam during our field survey conducted in 2019–22. Field photographs and GPS locations were recorded using a digital camera. The micro-morphological features were investigated on living specimens using a Labomed CZM4 stereo zoom binocular microscope. Further, photo plates were prepared using Adobe Photoshop 7.0. The variety was identified by consulting regional and national herbaria, such as ARUN, ASSAM, CAL, and GUBH, and through relevant literature (Floras, Journals, Revisions, and Synopsis). The microfilms of herbarium specimens from online databases BSI-IVH, G, JSTOR, KEW, LINN, MNHN, MO, and NY were also consulted for identification. The new distributional record of the variety was confirmed through research articles and literary works such as checklist, flora, and floristic records of northeastern India, along with physical verification of herbarium records held by ARUN, ASSAM, CAL, and GUBH. The morphological affirmations were correlated with lectotype G00018935 and photographs acquired from MNHN (Image 1). The common and vernacular names are given in English (E), Hindi (H), and Assamese (A).

TAXONOMIC TREATMENT

Ocimum gratissimum L. ssp. gratissimum var. macrophyllum Briq.


Type: Lectotype (LT): G00018935, Madagascar, Bourbon, Boivin L.H. LT present in Conservatoire et Jardin botaniques de la Ville de Genève (G) and photo of type in K!

Description: Perennial shrubs, 1.5–2 m tall; Stem erect, much branched, woody at the base, rounded quadrangular, glabrous; Leaves 6–12 × 4.5–7 cm in size, serrate, surface smooth, hairs restricted to veins beneath, apex acuminate, multicostate divergent reticulate venation; Petiole 1.5–4 cm long, slender; Inflorescence 15–22 cm long, lax, axis glabrescent, verticils 0.8–1.2 cm apart; Bracts 3–4 × 1.8–2.5 mm, green, ovate with broad base, caducous, apex acute, base cordate, sub sessile or...
sessile, margin ciliate, pubescent on both sides; Pedicels 3–3.5 mm long, pubescent, spreading, recurved; Calyx 2–3.2 × 2–3.5 mm, slightly downwards pointing against the inflorescence axis, green, slightly purplish at tips, posterior lip rounded, wider at tip, acute apex, decurrent on tube, anterior lip shorter than posterior, two hooked lateral curved teeth (uncinate lip) slightly lower than the two median teeth, median lobes of anterior lip pressed against posterior one in fruiting calyx, throat closed, tube with patent hairs or without; Corolla 4–5.5 × 2–3 mm, light pastel yellow, barely exceeding the calyx, lobes obscurely crenate, minute hairs at back, posterior lip oblong and comparatively shorter than anterior lip, lobes are equal in length, anterior lip boat shaped, tube straight, puberulous outside, glabrous inside; Stamens 4.5–5 mm, occasionally equal in length with anterior stamens, posterior pair having tufts of hairs at base (barbate filament base); Gynoecium 6.5–8 mm, two equal lobes, curled bifid stigma, ovary more or less globose; Nutlets 1.8–2.2 × 1.5–2 mm, ivory in colour, brown at maturity, sub globose, minutely tuberculate, producing mucilage when wet (Image 2).

**Flowering and Fruiting:** It was observed in July.

**Common names:** African Basil, Clove Basil, East Indian Basil, Russian Basil, Shrubby Basil, Tree Basil, Wild Basil, Tea Bush (E), Ban Tulsi, Jangli Tulsi, Vriadha Tulsi, Mali Tulsi, Ram Toolsee (H) and Ram toolakhi (A).

**Key to the Infra-specifics of Ocimum gratissimum L.**

1. Flower verticils 1–1.5 cm apart, not strongly reflexed towards the inflorescence axis; flowering and fruiting calyces recurved .................................................
2. Inflorescence 10–13 cm long, dense, axis softly pubescent; leaves pubescent on both sides; calyx horizontal or slightly upward pointing .................................................
3. Inflorescence 15–22 cm long, lax, axis glabrescent; hairs restricted to veins beneath; calyx downward pointing .................
4. Flower verticils 0.7–1.0 cm apart, strongly reflexed towards the inflorescence axis; flowering and fruiting calyces decurved .........................................................
Specimen examined


Taxonomic note

The variety epithet ‘*macrophyllum*’ is a Greek word which intent large-sized leaves of the specimen. Earlier, five varieties of *Ocimum gratissimum*, have been recognized, one by Hooker (1885) and the rest four by Briquet (1894, 1898). Hooker (1885) reduced *O. suave* Willd. to a variety of *O. gratissimum* var. *suavis*, and distinct the variety from *O. gratissimum* in leaf pubescence. Briquet (1894) established three varieties, viz., *macrophyllum*, *mascarenarum*, *hildebrandtii*, and later *subdentatum* in 1898. However, only a single variety (*macrophyllum*) is acknowledged, and the others are accepted as synonyms. Morton (1962) found insufficient evidence for establishing intermediates of *O. gratissimum*. He considered *O. suave* and *O. gratissimum* as different species based on chromosome number, 2n = 64 and 2n = 40, 48, respectively. Similar chromosome numbers (2n = 64) were obtained by Darlington & Wylie (1955) from the Indian material of *O. gratissimum*. Also, differences based on leaf epidermal characteristics were analyzed by Olowokudejo & Pereira-Shateolu (1988). Khosla (1995) found *O. suave* contrasting from *O. viride* Willd. and *O. gratissimum*. Based on taxonomic and genetic relationships, he further concluded their origin from a common ancestor. Currently, both *O. suave* and *O. viride* exists as a synonym of *O. gratissimum* ssp. *macrophyllum*. The var. *macrophyllum* is definite from var. *gratissimum* in having lax inflorescence and sparse indumentum. This incarceration is held up by referencing Indian material, where the discontinuity between the two varieties is also supported. The consulted herbarium specimens ARUN00012603, ARUN00012604, CAL 351776 pertaining to Assam and CAL 351777, ASSAM 57229 of Manipur and Tripura, respectively, are identified as *Ocimum gratissimum*. However, these specimens were found morphologically dissimilar from the variety described in the present study. Thus, it led to an establishment of new distribution record for the var. *macrophyllum* in northeastern India.

**DISCUSSION**

The species *O. gratissimum* popularly known as scent leaf, has potential bioactive compounds such as polyphenols and flavonoids. The var. *macrophyllum* is undoubtedly similar to clove basil, which may serve as an alternative to drugs. The variety can also make its appearance as a new medicinal plant. *O. gratissimum* L. ssp. *gratissimum* var. *macrophyllum* Briq. is a new distributional record for northeastern India and Assam. The investigations of var. *macrophyllum* are similar to the description given by Paton (1992) while revising the tribe *Ocimeae* in Africa. The present study has provided comprehensive data on the odoriferous specimen’s diagnosis, distribution, elucidation, and taxonomic status.
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