

***Exacum tenue* (Blume) Klack. (Gentianaceae): a new record for the flora of Eastern Himalaya**

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Abstract

Exacum tenue (Blume) Klack. (Gentianaceae), a small achlorophyllous mycoheterotrophic herb, is reported here for the first time from the Arunachal Pradesh, Eastern Himalaya. A detailed taxonomic description along with photographs and an identification key to the closely related species are provided for scientific validation.

Key words: *Exacum tenue*, Extended distribution, Himalayas, Talle Valley Wildlife Sanctuary, Arunachal Pradesh

INTRODUCTION

The genus *Exacum* L. of Gentianaceae consists of five known achlorophyllous, mycoheterotrophic species, found in the Himalayas, Southeast Asia to New Guinea (Averyanov *et al.* 2014). Formerly, these species were recognized in the distinct genus *Cotylanthera* Blume (Lace 1914; Smith *et al.* 1921; Hara 1975). Based on recent molecular studies (Yuan *et al.* 2003, 2005) and morphological analysis, all the species of the genus *Cotylanthera* were assigned to genus *Exacum* L. (Klackenberg 2006). In India, the achlorophyllous mycoheterotrophic herbs of this genus is represented by three species (*E. paucisquamum*, *E. nanum* and *E. tenue*), of which two (*E. paucisquamum* and *E. nanum*) were reported earlier from the Eastern Himalaya (Clarke 1883; Averyanov *et al.* 2014). *Exacum tenue* is known to occur in the Philippines, Indonesia, India and New Guinea. In India, the species is known to occur only in the state of Odisha (Biswal *et al.* 2011).

During a recent botanical survey in the Talle Valley Wildlife Sanctuary (27°32.977' North latitude and 093°54.395' East longitude) Arunachal Pradesh, the authors collected some unidentified saprophytic plant species of Gentianaceae. On careful examination of the specimens using taxonomic literature (Averyanov *et al.* 2014; Biswal *et al.* 2011; Klackenberg 2006; Tiwari *et al.* 2015; Yuan *et al.* 2003), online e-flora illustrations (Flora of China) and expert scrutiny, the species was identified as *Exacum tenue* (Blume) Klack. Standard taxonomic methods were used for collection, processing, and preparation of the herbarium specimens (Jain & Rao 1977; Bridson & Forman 1998). The specimens were deposited at ASSAM Herbarium. The species has not been reported earlier from the Himalayan region and represents a new addition to Himalayan flora.

Exacum tenue (Blume) Klack. in Bot. Jahrb. Syst. 126(4): 478. 2006. *Cotylanthera tenuis* Blume Bijdr.: 708. 1825. *Eophylon lobbii* Gray in J. Linn. Soc., Bot. 2: 23. 1869. *E. tenellum* Gray in J. Linn. Soc., Bot. 2:23. 1869. *Cotylanthera tenella* (Gray) Gilg in Engler & Prantl Nat. Pflanzenfam. 4(2):64. 1895. [PLATE – I]

A mycoheterotrophic, achlorophyllous herb, minute, erect, white coloured, 10–12 cm tall. Roots numerous, horizontal, fleshy, emerging from short underground rhizome, 1–2.5 cm long. Stem erect, branched, slender, glabrous, fleshy, terete, 0.5–1.2 mm in diameter; nodes 4–10, internodes 1–2.8 cm long. Leaves opposite, decussate, minute, exstipulate, sessile, scale-like, 3–10 pairs, membranous, obtuse to acute, *c.* 3 mm long. Inflorescence terminal cymes. Flower solitary terminal, 8–10 mm long, 4-merous, light bluish purple. Calyx tubular, tube 4–5 mm long, fleshy white, 4-lobed, campanulate; lobes ovate, acute at apex. Corolla 4-lobed, lobes oblong, 4–9 mm long, bluish purple, connate at base, obtuse at apex, glabrous.

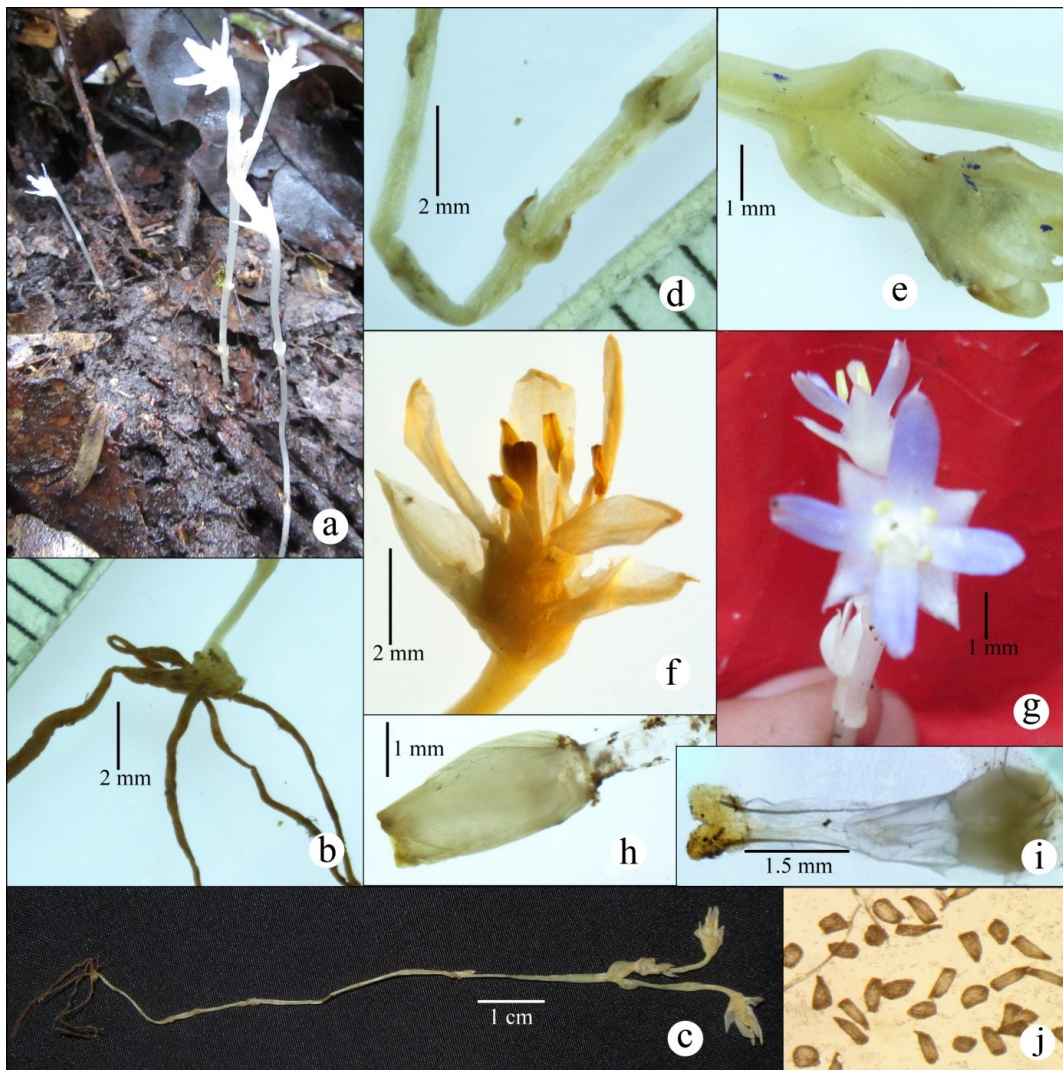


PLATE - I. *Exacum tenue* (Blume) Klack.: **a.** plant habit; **b.** roots; **c.** dried plant; **d.** stem with opposite leaves; **e.** emerging branch; **f** & **g.** flowers; **h.** stamen; **i.** gynoecium; **j.** seeds.

Stamens 4, alternate with the corolla segments, *c.* 3.5 mm long; filament white, *c.* 1.5 mm long; anther narrowly oblong to oblong, yellow, basifixed, *c.* 2 mm long, cordate at the base, obtuse at the apex, poricidal. Ovary superior, subglobose, 2-chambered, style 5 mm long, stigma lobed. Seed yellowish-brown, numerous, minute, scrobiculate and in varied shape.

Flowering & Fruiting: August – September

Habitat: Grows in decomposed leaf litter on the forest floor in the shady evergreen forest of *Quercus sp.*, *Rhododendron sp.*, *Magnolia sp.*, *Acer sp.*, etc.

Specimens examined: INDIA, **Arunachal Pradesh**, Lower Subansiri District, Talle Valley Wildlife Sanctuary, 27° 32.977' N and 93° 54.395' E, 2003 m, 13.08.2017, *Licha Jeri & N.A. Bhat*, 92633 (ASSAM).

Distribution: India (Arunachal Pradesh, Odisha); Philippines (Luzon, Panay, Negros, Mindanao); Indonesia (Java, Sumatra, Kalimantan, Sulawesi) and New Guinea.

Note: Presently, this species is extremely rare and was found from only one locality (Â 5 individuals) in the Wildlife Sanctuary. Due to its minute, colorless and almost leafless appearances, the plant is often overlooked and little is known about it. Therefore, following the IUCN Criteria (IUCN 2012), *Exacum tenue* can be temporarily assessed here as 'Data Deficient (DD)' until sufficient information is available to carry out an assessment. Based on the present study, the Himalayan region now consists of three achlorophyllous mycoheterotrophic species of genus *Exacum* L. namely *E. tenue* (Blume) Klack, *E. nanum* Klack. and *E. paucisquamum* (C.B. Clarke) Klack. These three species share similar floral characters but can easily be distinguished from each other using some specific characters (Table 1).

Table 1. Comparison of key delimiting characters between *E. tenue*, *E. paucisquamum* and *E. nanum*, found in the Himalayan region

Characters	<i>Exacum tenue</i>	<i>Exacum paucisquama</i>	<i>Exacum nanum</i>
Stem	Branched, 10–12 cm tall	Unbranched, <i>c.</i> 7 cm tall	Unbranched, 4.5–8.5 cm tall
Leaves	Scale leaves 3 mm long, obtuse-acute, acute apex	Scale leaves 3.5– 4.5 mm long, ovate-lanceolate, acute apex	Scale leaves 2 mm long, deltoid, acuminate apex
Flower	Two or solitary terminal, 8–10 mm long	Solitary terminal, 10–15 mm long	Solitary terminal, 3–7 mm long
Calyx tube	4–5 mm; lobes acute at apex	5–6 mm; lobes obtuse at apex	1.2–3 mm; lobes obtuse at apex
Filament	Shorter than anther, <i>c.</i> 1.5 mm long	Equal to the anther, 2–3 mm long	Slightly longer than the anther, 1.25–2.5 mm long
Anthers shape	narrowly oblong	Sagittate	Oblong

Key to the Himalayan species of *Exacum* L.

1. Stem simple2
1. Stem branched; flowers 8–10 mm long; anthers narrowly oblong to oblong .. *E. tenue*
2. Flower 3–7 mm long; filaments longer than anther; anthers oblong *E. nanum*
2. Flower 10–15 mm long; filaments equal to anther; anthers sagittate ... *E. paucisquama*

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