Sonerila gigantea (Melastomataceae) – A new species from Western Ghats, India.

ABSTRACT

The *Sonerila gigantea* is a new acaulescent species found in Mallalli Falls, Kodagu District, Karnataka, India, part of the Western Ghats. This species has distinguishable characteristics from the genus *Sonerila* worldwide. S*onerila* ~~-~~ *gigantea* ~~compared with~~ *Sonerila wallichii* Benn. & *Sonerila grandis* Ridl. The species shown differ in several characteristics described in a table form with taxonomic keys and even explained micro morphology characters like p~~P~~ollen and s~~S~~eed. Thi~~se present~~ report deliberates on the new species *Sonerila gigantea* from the Western Ghats, India.

Keywords: Acaulescent, Giant habit, Kodagu, Stemless Sonerila, White patches.

1. INTRODUCTION:

The Melastomataceae Juss. is one of the Neotropical widely distributed familie~~s~~y in the world, which comprises 169 accepted genera (Kew Royal Botanical Garden, POWO, 2024) and currently has about 5,858 species (Ulloa *et al*., 2022), The leaf character shows acrodromous venation, making it easy to identify as Melastomataceae (Hicky 1973). The tribe Sonerilae (Melastomataceae) occurs in Southeast Asia and Madagascar, with few species from Neotropical regions (Renner 1993). The genus *Sonerila* Roxb., a complex genus in Melastomataceae, explained in the Old World, is represented by 180 taxa (Cellinese, 1997). In India, the genus Sonerila~~Genus *Sonerila* in India~~ reported about 50 species and one variety (about 86%) out of 43 species endemic to the Western Ghats (Resmi *et al*., 2021). In Karnataka, 15 *Sonerila* species have been reported, including ~~the~~ *Sonerila talbotii* Giri & Nayar, *Sonerila raghaviana* Ratheesh, Sunil, Nandakumar & Shaju, and *Sonerila bababudangiriensis* Karadakatti & Kakkalameli, which are endemic to the state (Saldanha 1984; Giri & Nayar 1986; Ratheesh *et al*., 2014; Sanjappa & Sringeswara 2019; Ravikumar *et al*., 2021; Karadakatti & Kakkalameli 2024; Karadakatti & Kakkalameli 2025). The present studies express the macro- and micromorphology ~~morphology (Macro & Micro)~~ and the diversity of the rare new species ~~of rare plant new species~~ *Sonerila gigantea* from Kodagu District, Karnataka, a~~the~~ region with~~initself from the~~ Western Ghats. The reported species is compared with~~Reporting species compared with~~ *Sonerila wallichii* Benn. and~~&~~ *Sonerila grandis* Ridl (Ridley 1946). The other micromorphology, like seed and pollen parameters, is discussed using SEM (Fig. 4) (Patel *et al*., 1984; Girish & Nayar 1986; Bhattacharya *et al*., 2006).

2. MATERIALS AND METHODS:

The characteristics ~~are~~ were explained using taxonomic shreds of evidence, herbarium specimens and web-based specimens (Ridley 1946). The collected pollens were stored with 70–% alcohol to follow the further procedure. The species were analyz~~s~~ed using a Scanning Electron Microscope to describe the micro-morphological characteristics like p~~P~~ollen and s~~S~~eed parameters (Patel *et al*., 1984; Girish & Nayar 1986; Bhattacharya *et al*., 2006). The coordinates were marked using Garmin – GPS Etrex 10 and later graphed using QGIS 3.28.2 software to create a delimited data map showing species location (Fig. 1).

2.1. Study area: The *Sonerila gigantea* was collected from Near Kallahalli Tea Estate, Mallalli Falls Road, Kodagu, Karnataka, India (12°40'20.0" N 75°46'22.9" E) elevation of about 1050 m. Well-grown on hill slopes and adapted to shady and wet soil (Fig. 1).

Comentado [LMdCV1]: Who is the author?

Comentado [LMdCV2]: Option 1: *S. gigantea* it has been compared with *Sonerila wallichii* Benn. and *Sonerila grandis* Ridl.

Option 2: *S. gigantea* is compared with *Sonerila wallichii* Benn. and *Sonerila grandis* Ridl.

Comentado [LMdCV3]: **Sonerileae** Triana?

Formatado: Fonte: Itálico

3. RESULT AND DISCUSSION:

Taxonomic treatment:

Sonerila gigantea Karadakatti & Kakkalameli sp nov.,

The species can be easily distinguished by its habit, leaf size and texture of the lamina, inflorescence, flower, fruit, pPollen shape and size and even ~~the~~ seed texture. *S. gigantea* resembles *S. grandis* Ridl. and *S. wallichii* Benn. from Karnataka, the key characteristics of the above-mentioned.

Typus: INDIA, Karnataka, Kallahalli Tea Estate, Mallalli Falls Road, Kodagu District, 12°40'20.0" N 75°46'22.9" E. 1050 m. 19.09.2024, Prashant Karadakatti & Siddappa B Kakkalameli. M009, (*holo* UASB5782).

Figs. 2 & 3.

Herb, pPerennial, erect, c. 32 cm tall. Acaulescent tuber, ~~measures about~~ 1.5 – 2 cm diameter, spherical, brown. Roots-branched flesh white to pale green from the lower to the upper. Leaves ~~are~~ 10 – 18 cm ~~wide,~~x 15 – 30 cm ~~height~~ with petiole, 6~~-~~ nerved, veins pinnate, three pairs from the base, 1 – 2 pairs from midrib above; lamina dark green, dorsal side white spotted patches associated with small spines or papillae scattered, ~~measured about~~ 0.5 – 1 mm long, pale green at ventral side, glabrous, sparsely gland-dotted, toothed margins, serrate, leaf base orbicular with equal base and cordate; pPetioles 10 – 25 cm long, claret tinge at the base to pale green at the tip, glabrous, sub-scapose. Inflorescence~~,~~ 2 – 4, bostryx cyme, 2 – 5 cm long, 20 – 40 flowered, unbranched; peduncle 20 – 32 cm long, claret tinge to pale green, glabrous, angular; bracts and bracteoles not prominent. Flowers trimerous, 1.5 – 2 cm; pedicel sub-angular, 1 – 1.5 cm longer, pale green, gland-tipped trichomes; hHypanthium campanulate, 1.5 – 2 cm long, ~~three~~3-lobed, pale green base, gland-tipped trichomes; pPetals ~~three~~3, 0.5 – 1.2 cm long, polypetalous, oblongate, stellate and acute apex, pink adaxial, abaxial vanishes, dark pink midrib; sSepals parrot green, 1 – 3 mm long, polysepalous, gland-tipped trichomes; Stamens 3, alternate to petals, filaments measured about 4 – 7 mm long, pale pink, glabrous; aAnthers ~~3three~~, yellow, beaked at apex, glabrous, 3 – 6 mm long, ~~anther~~ lobes dorsifixed, cordate at base, dDeeply beaked; oOvary inferior, style filiform 6 – 8 mm long, dark pink, glabrous, many carpels.~~;~~ Fruits capsule, ~~pale green,~~ 1 – 1.5 cm long, pale green, gland-tipped trichomes, sometimes glabrous; Seeds numerous, obovoid ~~and~~, pusticulate.

Flowering and Fruiting: August to November.

Habitat: Hill slopes, ~~water stream~~streams, misty ~~places~~areas, associated with *Sonerila wallichii* Benn, *Commelina indehiscens* E. Barnes, and *Adiantum* sp. L.

Distribution: Coorg, Karnataka, India 1050 MSL elevation from 3444 ft (Present Record).

Etymology: The specific epithet refers to the plant being a giant or ~~big~~ large individual (gigantic/gigantea) compared to the existing *Sonerila* species in the world, except the species reported from the ~~country~~ Indonesia ~~is~~ , *Sonerila grandis* Ridl., hitherto the plant described with the word using the ~~biggest~~ largest habit.~~-~~ However, it shows a lot of variation~~s~~ in morphology, with the present report on *Sonerila gigantea*. The plant is located on Mallalli Falls Road, Coorg District, Karnataka, India.

Specimen examined: INDIA, Karnataka, Kallahalli Tea Estate, Mallalli Falls Road, Kodagu District, 12°40'20.0"N 75°46'22.9"E. 1050 m. 19.09.2024, Prashant Karadakatti & Siddappa B Kakkalameli. UASB5782

Conservation Status: The surveyed regions from Kodagu District, Karnataka, India, reveal that *Sonerila gigantea* exists in only one mentioned ~~regions~~region, which is on the way Mallalli Falls, Near Kallahalli Tea Estate. Fewer populations are found near the water stream on road cuts (sSlopes). The species was~~ere~~ found within a 50 m range. Being rRarely found, hence, this species may be ~~categorised~~categorized under Data Deficient (DD) due to the lack of knowledge ~~on~~ about its distribution (IUCN Standards and Petition Committee 2024).

Comentado [LMdCV4]: It may be noted in which season this species tends to flower and fruit. This information may not be precise for individuals in other regions of the world.

Comentado [LMdCV5]: I don't know if it's needed again, only if there were paratypes.

Note: As per Ridley 1946, *Sonerila grandis* Ridl. from Indonesia & *Sonerila repens* Stapf & King. Malaysia has since had the biggest population in the world. The evidence ~~says~~ indicates that the individual ~~is about~~grow to nearly 20 cm maximum, and the present reporting *Sonerila gigantea* from India is about 30 cm and somehow exceeds (Table 1).

3.1. Micro Morphology:

3.1.1. Pollen Morphology

In the p~~P~~ollen NPC classification by Erdtman (1969), all parameters included Number, Position and Characters (NPC). *Sonerila gigantea* pollen grains usually have a t~~T~~riangular- -obtuse, convex shape at the polar view, the equatorial view shows a non-angular, elliptic, truncate, obtuse and an a heterocolpate aperture~~aperture Heterocolpate~~. Approximately 16 – 18 × 13 – 15 µm, small fibrous structures on the pollen surface are striate-reticulate. (Fig. 4).

3.1.2. Seed Morphology

~~The~~ *Sonerila gigantea* seeds are numerous, ellipsoid, 490 – 525 × 175 – 215 µm, brown to dark brown, raphe remains out with dorsal surface tubercle, well-differentiated smaller and larger tubercles, from micropyle to dorsal shows small pusticles with larger tubercles, large tubercles ~~measure about~~ 24 × 26 µm in upper view, 10 – 24 × 6 – 12 µm in side view, small tubercles ~~measures about~~ 2 – 4 × 2 – 4 µm. less exposed testa cells, margins undulated with each other, ~~about~~ 30 – 35 × 20 – 30 µm (Fig. 4).

3.2. Dichotomous Key Characters of Sonerila in Karnataka:

1a.	With stem	**2**
1b.	Without stem	**6**
2a	Well adapted to the rocks	***S. konkanensis***
2b	Well adapted to the soil	**3**
3a	Inflorescence one in each individual	***S. bababudangiriensis***
3b	Inflorescence more than one in each individual	**4**
4a	Unequal leaf base with dense pubescent	***S. cannanorensis***
4b	Unequal leaf base with less pubescent	**5**
5a	Habit less branched	***S. talbotii***
5b	Habit more branched	***S. versicolor* var. *axillaris***
6a	Tuberous	**7**
6b	Non tuberous	***S. wallichii***
7a	Habit within 25 cm	**8**
7b	Habitat more than 25 cm	***S. gigantea***
8a	Inflorescence unbranched	**9**
8b	Inflorescence branched	***S. veldkempiana***
9a	More than two inflorescences in each individual	**10**
9b	Only two inflorescences in each individual	***S. gadgiliana***
10a	Leaf with less papillae	**11**
10b	Leaf with dense papillae	***S. raghaviana***

Comentado [LMdCV6]: Maybe: According to Ridley (1946), *Sonerila grandis* Ridl. from Indonesia and *Sonerila repens* Stapf & King from Malaysia have had the largest populations in the world since then.

Comentado [LMdCV7]: I think it would be better to complement it with another characteristic, these details about trichomes can be confusing.

Comentado [LMdCV8]: Specify what is more and less branched; 'more' and 'less' are ambiguous terms, use numbers instead.

Comentado [LMdCV9]: If the size and shape of these papillae are available, make this step of the key more complete.

11a	Flowers more than 6 in each inflorescence	***S. scapigera***
11b	Flowers up to 6 in each inflorescence	***S. rotundifolia***

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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Table 01. Comparison of the morphological characteristics of *Sonerila gigantea~~n~~*, *Sonerila wallichii*, and ~~&~~ *Sonerila grandis*.

Parts	***Sonerila gigantea~~n~~*** Karadakatti & Kakkalameli.	***Sonerila wallichii*** Benn.	***Sonerila grandis*** Ridl.
Habit	Herb measured 32 cm	Herb measured 15 – 18 cm	Herb measured 19 cm
Root / Tuber	Small tuber 1.5 – 2 cm diameter, brown in color.	Non–Tuberous	Non-tuberous.
Leaf	Lamina 10 – 18 cm wide, 15 – 30 cm height, 6-nerved, glabrous petiole, dark green dorsal side with claret tinge spines or papillae scattered measured about 1 – 3 mm, claret at ventral side, glabrous, densely gland-dotted, toothed margins, serrate, leaf base slightly orbicular with equal base and cordate.	Parrot green 4–10 cm wide, 3–14 cm long, 4–6 nerved, four pairs from the base, 4–12 pairs from the midrib, sparsely gland-tipped trichomes.	Green 5.5 – 14 cm wide, 13 – 18 cm long, 7-nerved, transverse nerves up to 30, glabrous petiole 5 – 9 cm long. Short bristles on the dorsal side, glabrous at the ventral, denticulate, serrate margins, ovate acuminate, acute with rounded cordate base.
Inflorescence	2 – 4 inflorescence from each, unbranched, bostryx cyme, small gland-dotted trichomes, 2 – 5 cm long, 20 – 40 flowered	~~Two to three~~2-3 inflorescences from each individual, unbranched, scorpioid cyme, 2–5 from each habit, and 5–18 flowers.	2 - 3 inflorescence from each individual, branched, axillary cyme, glabrous, 5 – 9 from each habit and 20 – 22 flowers.
Flower	1.5 – 1.8 cm, trimerous, pink.	1.5–2 cm, trimerous, rarely tetramerous, moderate pink.	8 mm, trimerous, moderate pink.
Peduncle	Angular, 20 – 30 cm long claret tinge to pale green & glabrous.	Quadrangular, 5–18 cm long pale green to white at tip with glandtipped	Angular, 7.5 cm long, glabrous.

Comentado [LMdCV10]: Sort the columns in alphabetical order: first *Sonerila gigantea*, then *Sonerila grandis*, and finally *Sonerila wallichii*, as presented in the abstract.

		trichomes.	
Petals	Three, pale pink 0.5 – 1.2 cm	Moderate pink to dark pink; 4–10 mm ovate-oblong & acuminate glandular hairs on abaxial midrib.	Three, pink, 4 mm.
Fruit	Long capsule, angular, glabrous at pedicel, 1.5 × 0.6 cm.	Capsule short, angular, gland-tipped trichomes, 0.5 × 0.7 cm.	Long capsule, obconical, angular, glabrous, densely minute punctate 5 × 4 mm.

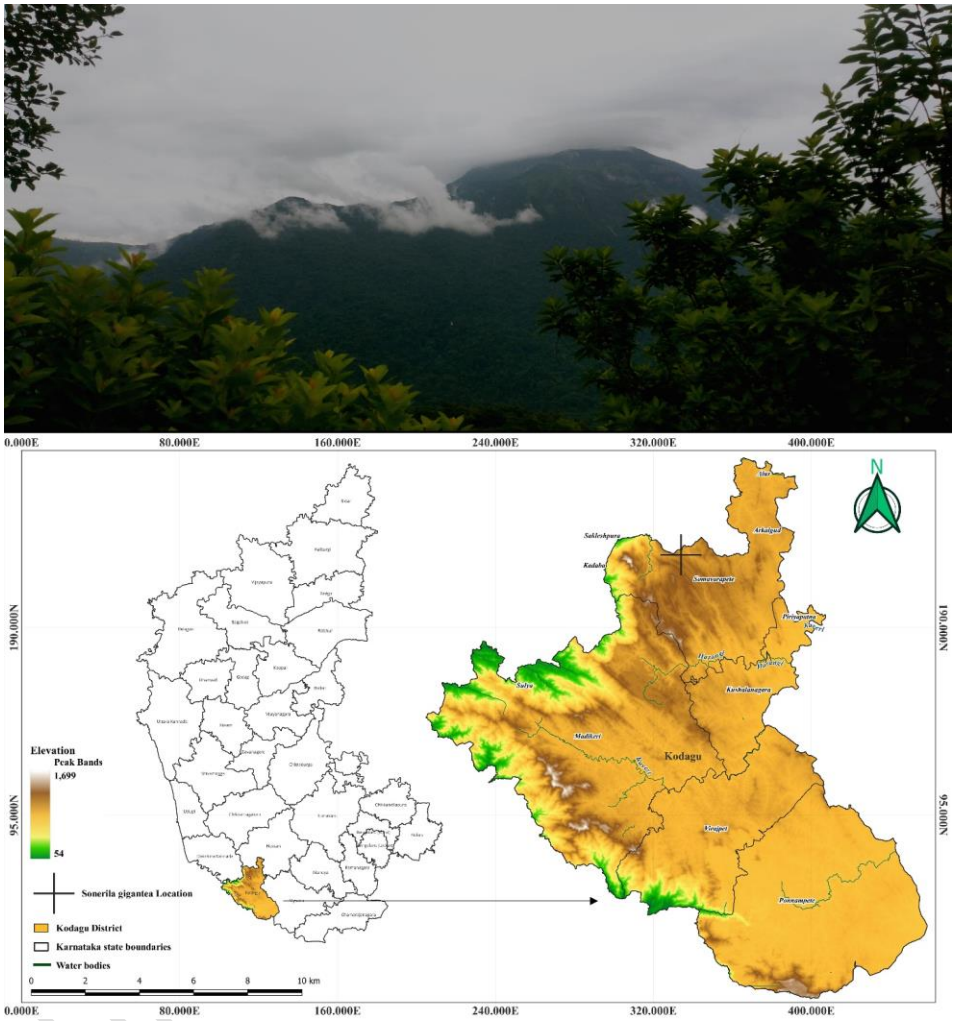

Figure 1. *Sonerila gigantea* Upper image landscape of species origin, Lower image species location Map. (Drawn using the software QGIS 3.28.2 version).

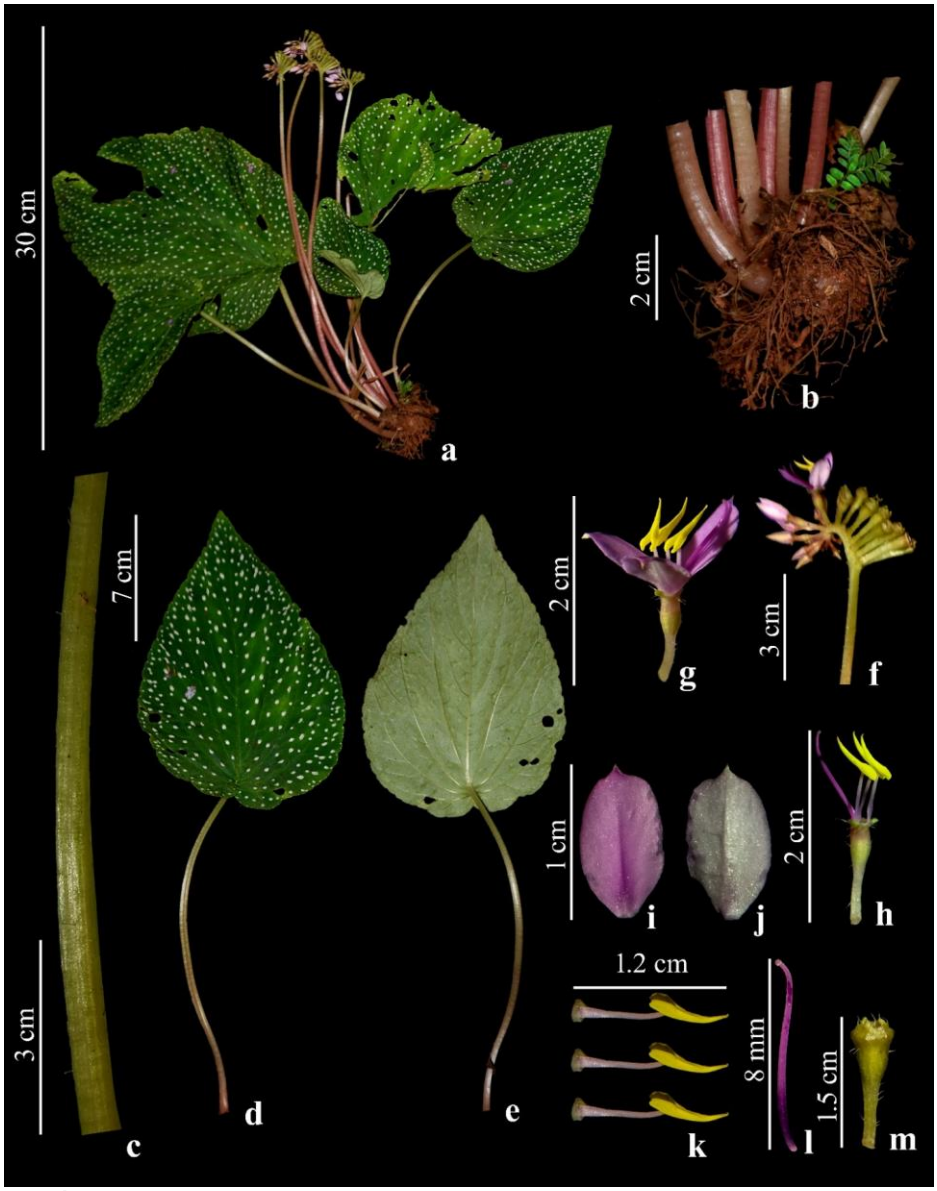

Figure 2. ***Sonerila gigantea***. **a.** Habit, **b.** Tuber, **c.** Petiole, **d.** Leaf dorsal, **e.** Leaf ventral, **f.** Inflorescence, **g.** Flower, **h.** Hypanthium, **i.** Petal dorsal, **j.** Petal ventral, **k.** Anthers, **l.** Gynaoecium, **m.** Fruit.

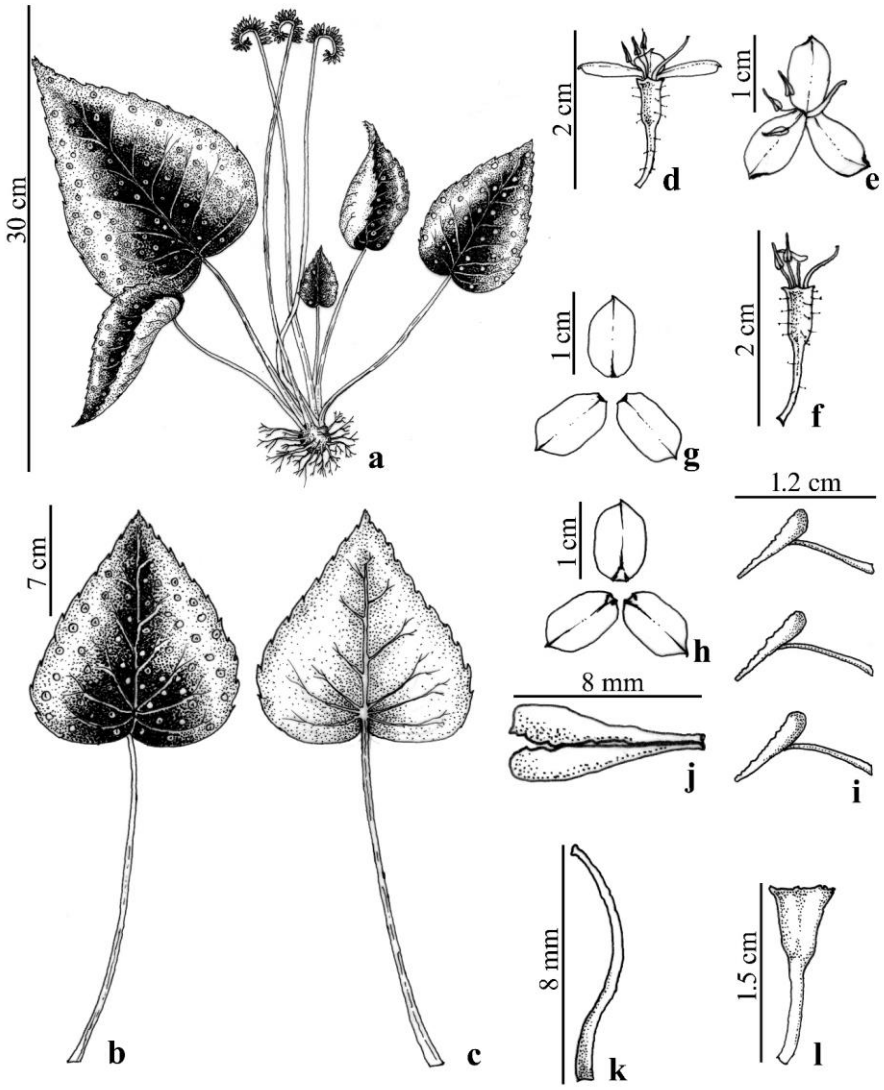

Figure 3. ***Sonerila gigantea***. **a.** Habit, **b.** Leaf dorsal, **c.** Leaf ventral, **d.** Flower side view, **e.** Flower front view, **f.** Hypanthium, **g.** Petal abaxial, **h.** Petal adaxial, **i.** Anthers, **j.** Anther lobe, **k.** Gynoecium, **l.** Fruit.

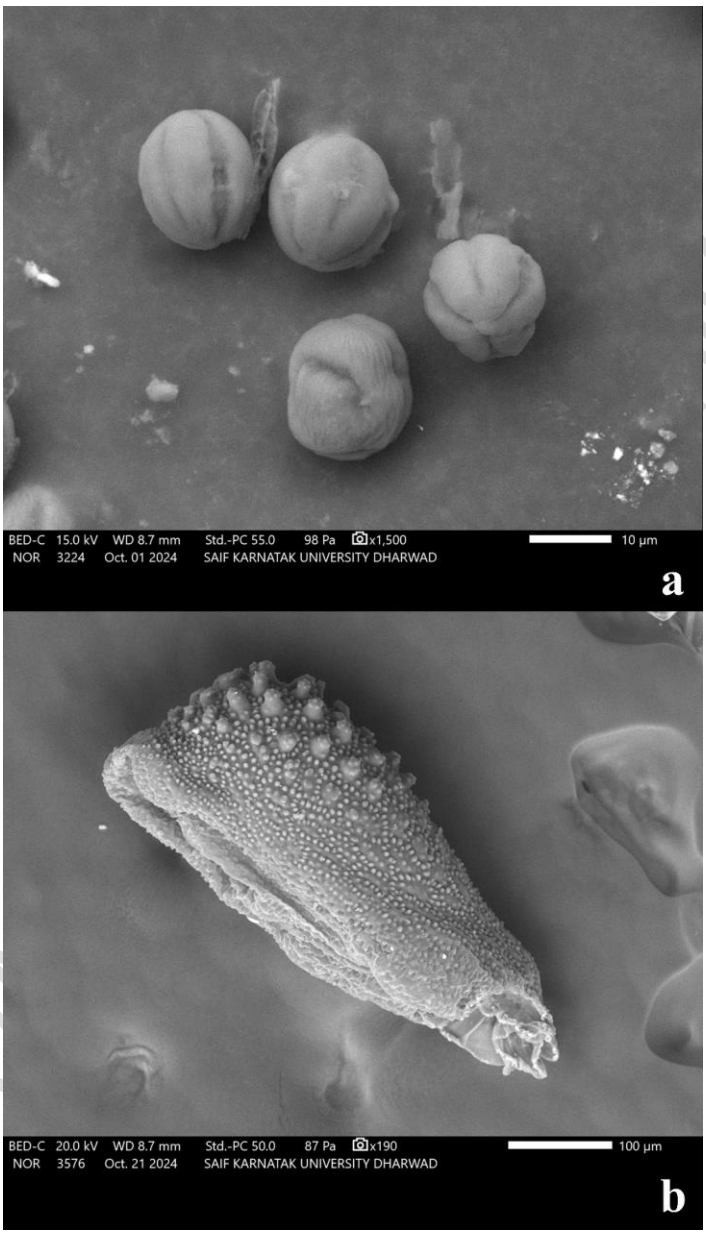

Figure 4. ***Sonerila gigantea*** ~~n~~***.*** Scanning Electron Microscope Images **a.** Pollen grains, ~~&~~ **b.** Seed.