Pilea hyalina (Urticaceae), a new record for Asia from Peninsular India

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Abstract: Pilea hyalina Fenzl (Urticaceae), a species indigenous to the Neotropics is reported here as a new record for Asia based on collections from four South Indian states (Karnataka, Kerala, Maharashtra and Tamil Nadu). This species had previously been known to occur only in Central and South America, but has recently been reported from Hawaii and Belgium, outside its area of nativity. A detailed description along with an illustration and photographic images are provided. The number of species of Pilea in Peninsular India is seven, according to the present report.

Keywords: India, New record, Pilea pumila, Pilea wightii.

Introduction

Pilea Lindl. (Urticaceae) is one of the most species-rich genera in the Eudicot Rosids and the largest genus in its family (Monro, 2006) comprising 600–715 species (Adams, 1970; Burger, 1977; Monro, 2004). It is widely distributed in the tropics, subtropics and warm temperate regions worldwide. Southeast Asia is considered as the center of morphological and phylogenetic diversity, while the Greater Antilles and the Andean countries as the centers of species diversity (Monro, 2006). Literature survey revealed a total of c. 35 species of Pilea in India (Hooker, 1888; Clarke, 1889; Tuyama, 1966; Chen & Monro, 2003; Chen et al., 2007; Sojan et al., 2017), with a greater diversity in the Northeastern states. In the Western Ghats, only six species (Pilea angulata (Blume) Blume, P. kingii C.E.C.Fisch., P. melastomoides (Poir.) Wedd., P. microphylla (L.) Liebh., P. victoriae V.Suresh & Sojan and P. wightii Wedd.) are reported (Fischer, 1928; Nayar et al., 2014; Sojan et al., 2017). The genus Pilea comprises succulent herbs, epiphytes and shrubs, growing in shallow substrates in moist and shaded habitats. It can easily be delimited from other genera of the tribe Elatostemateae Gaudich. by a combination of characters such as opposite leaves with linear cystoliths, single ligulate, intrapetiolar stipules in each leaf axil (sometimes reduced or absent), non-capitate cymose or paniculate inflorescence and 3–5-parted perigonium.

As a part of an ongoing taxonomic revision of the family Urticaceae in Peninsular India, the first author undertook extensive floristic explorations in different areas in Peninsular India during 2016–2019. Luxuriant growth of several populations of a pellucid and succulent stemmed species of Pilea was found growing in different parts of Peninsular India. A thorough morphological analysis of the collected specimens showed striking differences with Indian and Asian species reported so far. Extensive examination of the relevant literature and herbarium specimens housed in major herbaria (BSI, CALI, JCB, K, MH, P & TBGRI) helped us to infer that the taxon has been collected by many authors (Saladanha, 1984; Sasidharan, 1998; Jomy Augustine, 2000) previously but misidentified either as P. kingii C.E.C.Fisch. or P. wightii Wedd. The
newly collected species can be distinguished by a combination of characters such as sparsely hairy leaves with blunt serrations, 2–4 axillary cymes, peduncles shorter than the petioles, 2-tepaled male flowers and muricate, brown achenes against glabrous leaves with sharp serrations, 2–4 axillary cymes, peduncles longer than the petioles, 4-tepaled male flowers and smooth, pale white to pale yellow or green achenes in *P. wightii*. On the other hand, *P. kingii* differs in having large, unequal pairs of ovate-lanceolate leaves with acuminate or cuspidate apex, prominent stipules and 4-tepaled staminate flowers.

Information about this taxon has never been recorded in any of the publications from India or Asia. Hence a detailed search was conducted on literature pertaining to Neotropical *Pilea* (Miquel, 1853; Killip, 1937; Standley & Steyermark, 1952; Burger, 1977; Boufford, 1997; Monro, 2001) which enabled us to identify the specimen as *P. hyalina* Fenzl which is native to Central America, Lesser Antilles, Mexico and South America (Acevedo-Rodríguez & Strong, 2012). This species is difficult to distinguish from the closely similar *P. pumila*, a species extending its distribution from North America to East Asia (Boufford, 1997; Chen & Monro, 2003). The identity was further confirmed by Alex K. Monro, Kew (Pers. Comm. dated 02.05.2019 & 04.10.2019). Therefore, the present study constitutes a new species record of *Pilea* for Asia. A comparison of morphological characters of closely similar species of *Pilea* is provided in Table 1 to facilitate precise identification.

**Materials and Methods**

The description of the species is based on live specimens collected from different parts of Peninsular India and collections maintained in Calicut University Botanic Garden (CUBG). A detailed comparative morphological study was carried out with specimens of closely resembling species and by referring to herbarium specimens housed at various herbaria (BISH, BR, BSI, C, CALI, F, HAL, JCB, K, MH, P, S & TBGRI). Field photographs were taken with a Sony α65 DSLR Camera and morphological observations were made using a Leica M80 stereo microscope attached to a digital camera.

**Taxonomic treatment**


Annual, succulent, terrestrial herbs, *c.* 40 cm tall, monoecious, non-stinging. Roots fibrous, shallow and adventitious off the lower part of stem in contact to soil. Stems erect or decumbent, pellucid, simple or with suppressed, short axillary branches, *c.* 8 cm long; internodes 4-angled to wavy at base,
Fig. 1. *Pilea hyalina* Fenzl: a. Habit; b. Flowering twig; c. Leaf base and petiole; d. Node showing hairs; e. bract; f. Stipule; g. & h. Staminate inflorescence; i. & j. Pistillate inflorescence; k. Male bud; l. Male flower; m. Female flowers; n. Achenes (a, m & n from K.K. Jeomol 151110; b–f, i & j from S. Resmi & K.P. Krishnapriya 156063; g, h, k & l from Dani Francis 157913, photos by K.K. Jeomol).
Fig. 2. *Pilea hyalina* Fenzl: **a.** Habit; **b.** Portion of lamina enlarged showing hyaline hairs and petiole; **c.** Portion of lamina enlarged showing cystoliths; **d.** bracts; **e.** Stipule; **f.** Staminate inflorescence; **g.** Male bud; **h.** Male flower; **i.** Pistillate inflorescence; **j.** & **k.** Female flowers; **l.** Achenes (a–e & i from S. Resmi & K.P. Krishnapriya 156063; f–h from Dani Francis 157913; j–l from K.K. Jeomol 151110, drawn by K.K. Jeomol).
Table 1. Comparison of morphological characters of closely similar species of *Pilea*

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>P. hyalina</em> Fenzl</th>
<th><em>P. pumila</em> (L.) A.Gray</th>
<th><em>P. wightii</em> Wedd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stems</td>
<td>Quadrangular</td>
<td>Quadrangular</td>
<td>Terete</td>
</tr>
<tr>
<td>Petioles</td>
<td>Unequal in pairs, 2–3.5 cm long</td>
<td>Sub-equal in pairs, 0.4–4.5 cm long</td>
<td>Unequal in pairs, 3–6 cm long</td>
</tr>
<tr>
<td>Glabrous except near leaf base on abaxial surface</td>
<td>Sparsely puberulent on adaxial surface</td>
<td>Glabrous on both sides</td>
<td></td>
</tr>
<tr>
<td>Stipules</td>
<td>Inconspicuous, free, triangular, c. 0.5 mm long, deciduous,</td>
<td>Conspicuous, free, ovate-oblong, 2–3 mm long, deciduous</td>
<td>Conspicuous, connate, triangular, 2–2.5 mm long, persistent</td>
</tr>
<tr>
<td>Leaves</td>
<td>Elliptic or elliptic-ovate or ovate, sub-equal, bluntly serrate, apex acute</td>
<td>Elliptic or rhombic or ovate, sub-equal, rounded or acutely serrate, apex shortly acuminate, caudate or acute</td>
<td>Cordate-ovate, unequal, deeply serrate, apex acuminate</td>
</tr>
<tr>
<td>Leaf surfaces</td>
<td>Hyaline-strigillose above, glabrous below</td>
<td>Sparsely pilose on both surfaces</td>
<td>Glabrous</td>
</tr>
<tr>
<td>Inflorescences</td>
<td>2–4 per node</td>
<td>1 or 2 per node</td>
<td>Solitary</td>
</tr>
<tr>
<td>Peduncles</td>
<td>Shorter than petioles</td>
<td>Shorter than petioles</td>
<td>Longer than petioles</td>
</tr>
<tr>
<td>Male tepals &amp; stamens</td>
<td>2–3, never 4 (in protologue)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Female tepals</td>
<td>3, unequal, dorsal oblong-cucullate, lateral triangular</td>
<td>3, nearly equal, linear-lanceolate</td>
<td>3, unequal, dorsal oblong, lateral triangular</td>
</tr>
<tr>
<td>Achenes</td>
<td>0.2–0.5 × 0.2–0.4 mm, mucicar, yellow-brown or pale brown at maturity with dark brown tubercles, lateral surface without a raised marginal ring</td>
<td>1.3–1.7 × 0.6–1.1 mm, smooth or with coral warts not verrucate, pale yellow to brown, occasionally with small black or purple coral warts markings, lateral surface with a raised marginal ring</td>
<td>1–1.2 × 0.6–0.7 mm, smooth, pale yellow or green, lateral surface without a raised marginal ring</td>
</tr>
</tbody>
</table>

* 5 cm long, 2–5 mm thick at base, glabrous or with a few short blunt hairs near node; translucent green. Stipules 2, intrapetiolar, free, triangular, c. 0.5 × 0.5 mm, obscure, glabrous, translucent. Leaves opposite-decussate, equal or subequally paired; petioles 2–3.5 cm long, longer than inflorescences, adaxially canaliculate, glabrous except near leaf base, hairs c. 0.4 mm long, translucent; laminae equal or subequal, elliptic or elliptic-ovate or ovate, 2.5–8 × 2–7 cm, basifixed, base cuneate-obtuse, margins bluntly serrate except near base, 3–10 serrations on each sides, apex acute, membranous, sparsely hyaline-strigillose above, glabrous below, lustrous green above, pale green below; venation trinerved, basal lateral veins not curved, evanescent towards apex, lateral nerves 5–7 pairs; cystolith linear, inconspicuous on both surfaces. Inflorescences unisexual, monochasial cymes, male and female crowded in the same leaf-axils, short pedunculated. Staminate inflorescences 0–2 per axils, 0.5–3 cm long, 10–15-flowered, smaller than and at the base of pistillate cymes, the male flowers usually develops and falls-off early, sub-sessile or pedunculate; peduncles 0.5–1.5 mm long, persistent, glabrous, translucent; bracts triangular, c. 0.4 × 0.4 mm, glabrous, translucent, with linear cystoliths. Male buds ovoid from top-view, obovate and compressed from lateral-view, c. 1 mm long, 0.3–0.6 mm in diam., glabrous; pedicels c. 0.5 mm long, glabrous, translucent; tepals 2, c. 0.5 mm long, corniculate,
Pilea hyalina, a new record for Asia

cymbiform, connate about halfway to base, sub-apical appendage c. 0.1 mm, translucent to greenish; stamens 2; filaments inflexed in bud, translucent; anthers white. Pistillate inflorescences 2–4 per axils, 2–15 mm long, 30–120-flowered; peduncles 1–4 mm long; bracts triangular, c. 0.4 × 0.4 mm, glabrous, translucent, with linear cystoliths. Female flowers c. 0.7 mm long, curved downwards; pedicels c. 0.4 mm long, shorter than ovary, green, lateral tepals triangular, c. 0.2 mm long, glabrous, transversal; staminodes 3, scaly, c. 0.5 mm long, shorter than ovary, translucent; ovary ovoid, 0.4–0.5 mm long, stipitate, tubercled, white; stamina pellucidae. Achenes ovoid to widely ellipsoid, 0.2–0.5 × 0.2–0.4 mm, biconvex, length : width ratio 1 : 1, slightly curved at apex, muricate, yellow-brown or pale brown with dark brown dots.

Flowering & fruiting: Flowering and fruiting from August to February.

Habitat: On moist, shady mossy rocks, moist vertical earth cuttings, tea plantations and along water courses.

Distribution: Belgium, Central America, Hawaii, Lesser Antilles, Mexico, South America and India.

Specimens examined: INDIA, Karnataka, Kodagu district, Abbi falls [Abbey falls], 28.12.1978, Cecil J. Saldanha, P. Prakash & S.B. Manohar KFP5577 (JCB digital image); Bhagamandala, ±898 m, 26.10.2016, K.K. Jeomol 151114 (CALI); Cheryandane, on the way to Cheлавara waterfalls, ±979 m, 25.10.2016, K.K. Jeomol 151110 (CALI); Madikeri [Mercara], Kushalnagar, 30.10.1981, Cecil J. Saldanha, B. Gurudev Singh & Shiva Prakash KFP13966 (JCB digital image). Kerala, Idukki district, Munnar, Lockhart tea plantation, ±1499 m, 05.09.2019, K.K. Jeomol 169250 (CALI); Painavu, 06.08.2017, K.K. Jeomol 151183 (CALI); Periyar Tiger Reserve, Mlappara, 110 m, 20.11.1998, Jomy Augustine 17911 (CALI); Kozhikode district, Muthappampuzha, Thenpara, ±576 m, 27.08.2018, Dani Francis 157913 (CALI); Thamarasserry Ghat, 7th–9th hairpin, 03.02.2017, K.K. Jeomol 156071 (CALI); Malappuram district, Calicut University Botanical Garden (cultivated, originally from Sulthan Bathery, Wayanad), 15.11.2019, K.K. Jeomol 169295 (CALI); Wayanad district, Edakkal caves, ±1100 m, 18.10.2017, K.K. Jeomol 156035 (CALI); Kurumbalakotta, 01.09.2018, K.K. Jeomol 157920 (CALI); Pookode, 750 m, 10.10.1997, M.K. Shyja 52685 (CALI); Ibid., ±783 m, 18.10.2017, K.K. Jeomol 156027 (CALI); St. Mary’s College Campus, Sulthan Bathery, ±925 m, 16.09.2017, K.M. Manudev 156002 (CALI); Thalimala to Chembra peak, 02.11.2017, S. Resmi & K.P. Krishnapriya 156063 (CALI); Thirunelli [Tirunalli], on the way to Brahmagiri, ±850 m, 18.08.1980, V.S. Ramachandran 68220 (MH). Maharashtra, Sindhudurg district, Chaukul, 05.09.2017, K.K. Jeomol 154240 (CALI); Thillari Nagar, 20.09.2018, K.K. Jeomol 157968 (CALI). Tamil Nadu, Nilgiris district, Coonoor, 25.01.2017, K. Shinoj & Manu Philip 151166 (CALI); Ooty, ±2210 m, 26.10.2017, S. Resmi 156052 (CALI); Pambar estate, 900 m, 18.08.1964, J.L. Ellis 20476 (MH).

Notes: Pilea hyalina is distinct by its short peduncled inflorescence, invariably 2-tepaled male flower, unequal 3-partite female tepals, sub-oblique, ovoid and muricate, brown achenes. In the Neotropics, the species is considered as a weed and is known outside its native place recently as an invasive species in Belgium and Hawaii, through accidental introduction (Verloove, 2006; Lau & Frohlich, 2012). Pacific Island Ecosystem at Risk (PIER) by the Institute of Pacific Islands Forestry has listed P. hyalina as a high risk, nursery weed (US forest service, continuously updated).

The course of the introduction of this species to India is still uncertain. Availability of herbarium specimens 40 years old and considering its occurrence in different areas in Peninsular India, it can be suggested that the species could have been introduced long before as propagules along with other exotic ornamental plants and flourished in humid conditions and got naturalized here. This can be corroborated by the introduction and
naturalization of the congener *P. microphylla* (L.) Liebm. Though not extensively distributed as the latter, the species is propagated by viable seeds.

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