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A new species of *Pyrenaria* (Theaceae-Theoideae) from Northeast India

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Abstract

A new species of the genus *Pyrenaria* (Theaceae) from Cherrapunjee-Mawsynram Hills in the Meghalaya State, north-eastern India, *P. cherrapunjeana* Mir, is described and illustrated. It is morphologically similar to *P. diospyricarpa* Kurz var. *camelliiflora* (Kurz) S.X.Yang, *P. khasiana* R.N.Paul and *P. menglaensis* G.D.Tao. Notes on distribution, habitat and conservation status of the new species are provided, along with a key to the Indian species of *Pyrenaria*.

Introduction

Pyrenaria Blume belongs to the subfamily Theoideae (or Camellioideae) of the family Theaceae. The genus contains about 30 taxa (Yang 2005, Li *et al.* 2011, Tropicos 2016), is distributed in tropical South-East Asia from north-eastern India and northern Myanmar through south-western China and Indo-China Peninsula to the Malaysian region (Yang *et al.* 2000, Li *et al.* 2011). In India, it is represented by three species viz. *P. barringtoniifolia* Seem., *P. diospyricarpa* Kurz and *P. khasiana* R.N.Paul (Chauhan & Paul 1993).

During floristic exploration in Cherrapunjee and Mawsynram areas in Khasi Hills of Meghalaya, north-eastern India, we encountered a few individuals belonging to the family Theaceae that appeared to be an undescribed species of *Pyrenaria,* which we describe here.

Materials and methods

Field explorations were carried out in Cherrapunjee and Mawsynram areas in Khasi Hills of Meghalaya, north-eastern India from December 2013 to March 2016. The collection, pressing and preparation of herbarium specimens were in accordance to the conventional herbarium techniques (Jain and Rao 1977). Flowers were preserved in FAA solution. Taxonomic measurements and descriptions of each plant part are based on living material. Microscopic details were observed using Olympus stereo-zoom microscope SZ-2-ILST and photographed with Nikon COOLPIXP520. Voucher specimens are lodged at the herbarium of Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM), Central National Herbarium, Calcutta (CAL)

and Herbarium housed at North-Eastern Hill University, Shillong (NEHU). Other specimens of different taxa of *Pyrenaria* housed in ASSAM were also thoroughly studied.

Taxonomic treatment

Pyrenaria cherrapunjeana Mir, sp. nov.

Type: INDIA. Meghalaya: East Khasi Hills district, Cherrapunjee, Mawmluh, alt. 1315 m, 25°16.051'N, 91°43.302'E, *A.H. Mir 17*, 18 April 2015 (holo: ASSAM!; iso: CAL!).

Trees, up to 12 m high. Young branchlets light purplish-brown, glabrous to sparsely acicular hairy. *Leaves* simple, alternate; petiole light purplish-brown, 1.0–1.2 cm long, sparsely acicular hairy; leaf blade elliptic-oblanceolate, 7.0–16.5 × 3.8–5.8 cm, papery, dark green and glabrous above, pale green with sparsely acicular hairs along midvein beneath, midvein adaxially depressed and abaxially elevated, secondary veins 10–12 on each side of the midvein, adaxially depressed, abaxially raised, margin serrate, base attenuate, apex long acuminate. *Flowers* axillary, solitary, c. 2 cm across, fragrant. *Pedicel* 2.5–3.5 × 2.0–3.0 mm, pubescent; bracteoles 2, ovate, 2–3 × 3 mm, leathery, non-foliaceous, silky villous outside, glabrous inside, apex acute. *Sepals* persistent, 5, imbricate, ovate-orbicular, unequal, 4–6 × 6–7 mm, non-foliaceous, silky villous adaxially, glabrous abaxially, apex obtuse-rounded. *Petals* 5 or 6, creamy white, obovate to widely obovate-rhomboid, 1.0–1.5 × 0.7–1.6 cm, silky villous adaxial, glabrous abaxially, basally united, margins undulate, apex rounded. *Stamens* numerous, basally connate; filaments glabrous, lanceolate, 1 cm long, outer whorl basally adnate to petals; anther dorsifixed, bilobed. *Ovary* subglobose, c. 3.5 mm in diam., silky vellutinous, 5-loculed; styles 5, distinct, free, 3–4 mm long, basally vellutinous, apically glabrous. *Fruits* drupaceous, indehiscent, subglobose, 1.0–1.5 × 1.1–1.7 cm, 5-loculed, densely vellutinous, apex crowned with 5 stigmatic protuberances, with persistent calyx at base. **Figures 1 and 2**.

Other specimens examined: INDIA. Meghalaya: East Khasi Hills district, Cherrapunjee, Sohrarim, alt. 1590 m, 25°22.480'N, 91°44.951'E, *A.H. Mir 18*, 5 Mar 2016 (ASSAM!); Mawsynram, Mawrapat, alt. 1146 m, 25°15.721'N, 91°32.085'E, *A.H. Mir 19*, 10 Mar 2016 (NEHU).

Phenology: Flowering from December to March and fruiting from March to June.

Etymology: The new species is named after the place of occurrence, Cherrapunjee subdivision in East Khasi Hills district of Meghalaya, India.

Habitat: *Pyrenaria cherrapunjeana* grows in dense subtropical broad-leaved forests of Cherrapunjee-Mawsynram area at alt. 1300-1600 m. The area receives heavy rainfall and is one of the wettest places on earth. During 1940-2005, the mean annual rainfall in Cherrapunjee and Mawsynram was 11,150 and 11,510 mm respectively (Khaladkar *et al.* 2009). The area includes Sylhet Traps of Jurassic age consisting of metamorphic and igneous rocks: gneisses, schists and granites. The soil texture varies from sandy loam to clay loam. The soil is highly leached, nutrient poor, and acidic (Prokap 2004). The forests are of short stature with tree height rarely exceeding 15 m (Upadhaya 2015). Common tree species include *Castanopsis tribuloides* (Sm.) A.DC., *Engelhardtia spicata* Lechen ex Blume, *Elaeocarpus prunifolius* Wall. ex Müll. Berol., *Schima wallichii* Choisy, *Syzygium tetragonum* (Wight) Wall. ex Walp., and *Quercus kamroopii* D.Don. These species together form the canopy and sub-canopy layer of the forest. Common small trees and shrubs include *Ardisia* spp., *Camellia kissii* Wall., *Nostolachma khasiana* (Korth.) Deb & Lahiri, *Erythroxylum kunthianum* Kurz, *Microtropis discolour* (Wall.) Arn., *Morinda* spp., *Psychotria* spp., and *Sarcandra glabra* (Thunb.) Nakai.

Distribution: India: Meghalaya, Khasi Hills (Cherrapunjee, Mawsynram). Endemic.

Affinities: *Pyrenaria cherrapunjeana* is superficially similar to *P. diospyricarpa* Kurz (China, Myanmar, Thailand and Vietnam), *P. khasiana* R.N.Paul (China, India) and *P. menglaensis* G.D.Tao (China) in having pedicellate flowers, drupaceous, indehiscent fruits with five stigmatic protuberances at the apex, clearly differentiated sepals and petals, 5-loculed ovary, and distinct styles. The morphological differences between these four taxa are shown in Table 1.

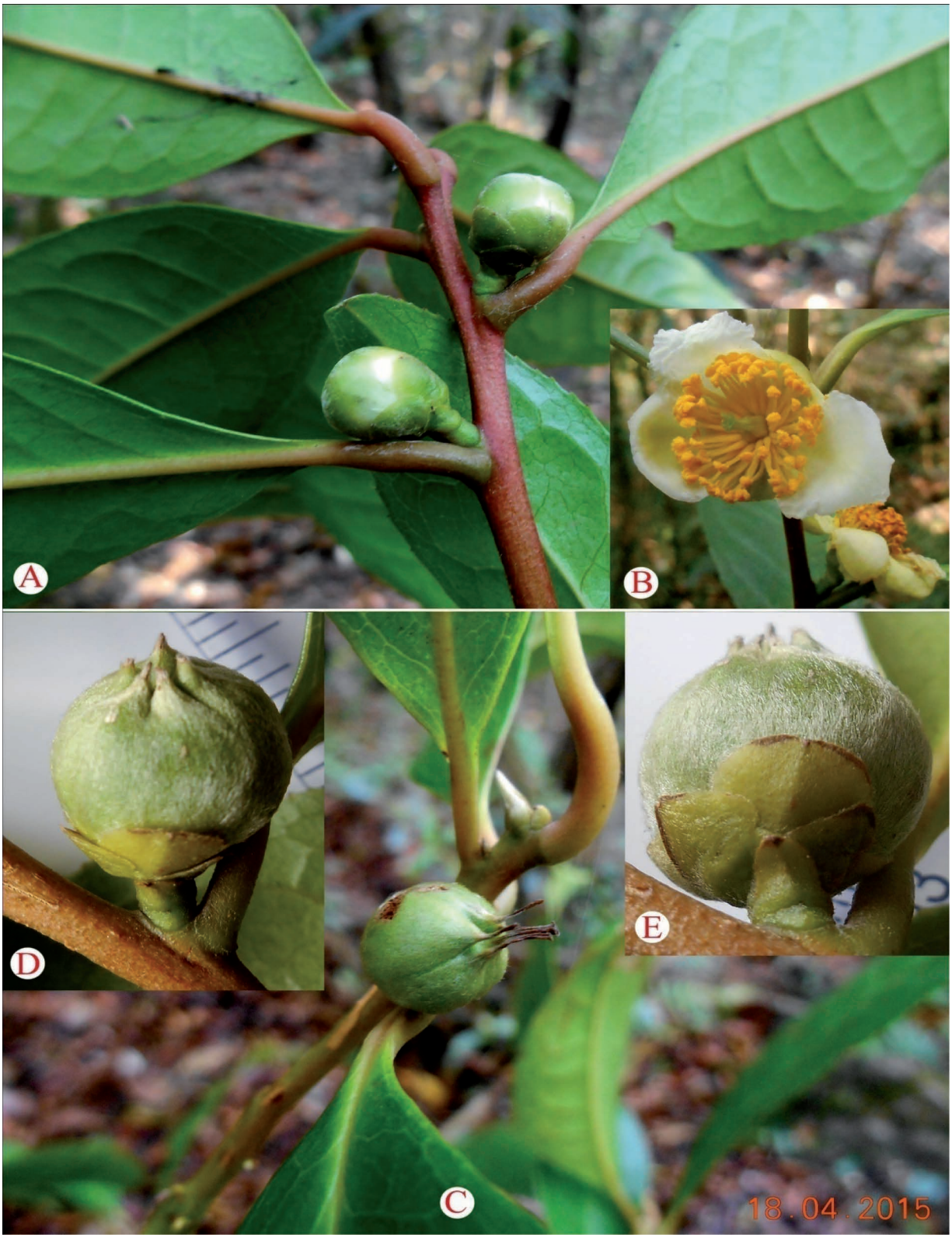

Figure 1. ***Pyrenaria cherrapunjeana*** Mir**: A.** twig with flower-buds, **B.** flower, **C.** twig with fruit, **D and E.** fruits.

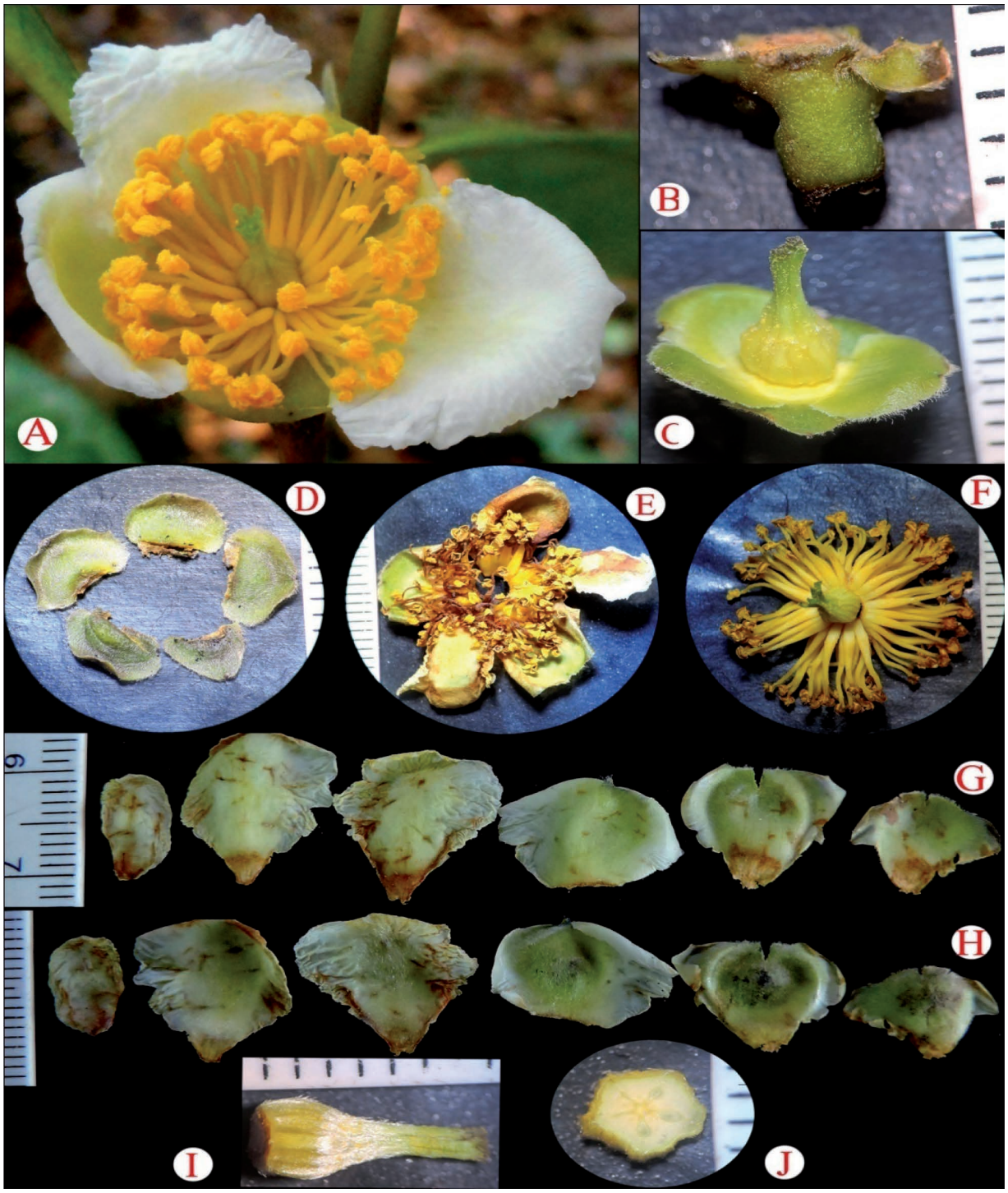

Figure 2. ***Pyrenaria cherrapunjeana*** Mir**: A.** flower, **B.** pedicel with bracteoles, **C.** sepals with gynoecium, **D.** sepals (adaxial view), **E.** petals with stamens, **F.** stamens with gynoecium, **G.** petals (abaxial view), **H.** petals (adaxial view), **I.** gynoecium, **J.** T.S. of ovary.

Table 1. Morphological comparison between *P. cherrapunjeana, P. diospyricarpa, P. menglaensis* and *P. khasiana*

Characters	*P. cherrapunjeana*	*P. diospyricarpa*	*P. menglaensis*	*P. khasiana*
Young branchlets	Glabrous to hairy	Sparingly pubescent	Densely villous	Sparingly pubescent
Leaf blade	Elliptic-oblanceolate, 7.0–16.5 × 3.8–5.8 cm, papery	Oblong to obovate-oblong, 8–16 × 3–6 cm, papery	Ovate to oblong-ovate, 15–33 × 7–14 cm, leathery	Broadly oblanceolate to oblong-lanceolate, 7–20 × 3–8 cm, leathery
Flower(s)	Solitary	Solitary	Solitary or a cluster of 3	Solitary
Pedicel	Sparsely pubescent, 0.25–0.35 cm long	Silky villous, to 0.25 cm long	Sericeous, 0.5 cm long	Glabrous, 0.4–0.6 cm long
Bracteoles	Non-foliaceous, 0.2–0.3 cm long	Foliaceous, 1.0–2.5 cm long	Non-foliaceous, 0.5–1.0 cm long	Foliaceous, 0.8–1.0 cm long
Sepals	5, non-foliaceous, 0.4–0.6 cm long	5 or 6, foliaceous, 0.5–1.5 cm long	5 or 6, non-foliaceous, 1.0–2.0 cm long	5, foliaceous, 0.6–1.5 cm long
Petals	5 or 6, 1.0–1.5 cm long	5, 0.7–1.0 cm long	5–9, 2.5–3.5 cm long	6, 1.0–2.1 cm long
Fruit	Subglobose, 1.1–1.7 cm diam.	obovoid, 2.5–3.0 cm diam.	Globose, 5.0–8.0 cm diam.	Oblate to subglobose, 2.3–3.2 cm diam.

Conservation Status: All collections of *P. cherrapunjeana* have been made from Mawmluh and Sohrarim in the Cherrapunjee area, and from Mawrapat of the Mawsynram area of Khasi Hills in Meghalaya. The geographical range of the species is very narrow with an extent of occurrence estimated to be less than 100 km^2 and an area of occupancy < 1 km^2. The known population from all plots includes only eight mature and two immature individuals. The restricted distribution of this species makes it prone to stochastic events which may reduce the population or eliminate it. The species occurres in highly fragmented forests amidst grassland. In addition, the habitat of the species is threatened by a number of anthropogenic factors including limestone mining, fire, agricultural expansion, extraction of timber and non-timber forest products, as well as encroachment of forest land for human settlement. The species is in urgent need of conservation management. This species requires an accurate survey to determine the geographical range to gain a better understanding of the population size. On the basis of IUCN (2016) classification criteria the species is classified as Critically Endangered (CR) as it fulfils the criteria under categories CR: A4, B1, D.

Specimens of other species examined: ***Pyrenaria barringtoniifolia*** Seem., INDIA: Assam: Darrang, Charduar, *G. Mann 722*, Mar 1877 (ASSAM!); Lakhimpur, Joypore reserve, *G.K. Deka 13348*, 4 Apr 1936 (ASSAM!); Lakhimpur, Jaikai reserve, *G.K. Deka 18030*, 6 Feb 1939 (ASSAM!); Meghalaya: Khasi & Jaintia Hills, Umsaw reserve, *S.R. Sarma 11057*, 10 Jun 1935 (ASSAM!). ***Pyrenaria diospyricarpa*** Kurz, INDIA: Assam: Sibsagar, Jamuguri Road, *U. Kanjilal 1907*, 14 Nov 1912 (ASSAM!); Lakhimpur, DighalTarang, *U. Kanjilal 8951*, 22 Jan 1931 (ASSAM!). ***Pyrenaria khasiana*** R.N.Paul, INDIA: Khasi Hills and Brahmaputra plains, *S. Kurz 161A* (CAL!). ***Pyrenaria menglaensis*** G.D. Tao, CHINA: Yunnan: Mengla Xian, Meng-xing, 720 m, *G.D. Tao 15933*, Oct 1981 (CVH-image, HITBC057633).

Key to Indian species of *Pyrenaria*

1a. Fruits with 5 stigmatic protuberances at apex; calyx persistent **2**

1b. Fruits without 5 stigmatic protuberances at apex; calyx not persistent ..... ***P. barringtoniifolia***

2a. Branchlets sparsely pubescent to glabrous; bracteoles smaller than sepals **3**

2b. Branchlets densely pubescent; bracteoles larger than sepals ..... ***P. diospyricarpa***

3a. Leaf blade leathery, broadly oblanceolate to oblong-lanceolate with cuneate to decurrent base and acute to acuminate apex; pedicel glabrous; sepals foliaceous ..... ***P. khasiana***

3b. Leaf blade papery, elliptic-oblanceolate with attenuate base and long acuminate apex; pedicel pubescent; sepals non-foliaceous ..... ***P. cherrapunjeana***

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