Journal of Bioresources 11 (1): 07–10, January – March 2024

JOURNAL OF BIORESOURCES

journal webpage: https://jbr.rgu.ac.in

ISSN: 2394-4315 (Print)
ISSN: 2582-2276 (Online)

RESEARCH ARTICLE

Extended distribution record of two threatened species of *Impatiens* (Balsaminaceae) from Arunachal Pradesh, India

Krishna Chowlu[1] and Souravjyoti Borah[2]*

[1]Botanical Survey of India, Arunachal Pradesh Regional center, Itanagar, Arunachal Pradesh, India- 791 111.

[2]Department of Botany, Gauhati University, Assam, India-781014.

*Corresponding author e-mail: souravjyotiborah@gmail.com
Article No.: SBJBR74; Received: 01.11.2023; Revised: 15.02. 2024; Accepted: 26.02.2024; Published: 31.03.2024
Doi: https://doi.org/10.5281/zenodo.10989611

Abstract

Two threatened species of *Impatiens* namely *I. sikkimensis* and *I. tuberculata* were recorded here as a new record for the flora of Arunachal Pradesh, India. Both the species were earlier known only from Sikkim in India. Detail description from live material and coloured illustrations for easy identification are provided.

Keywords: Balsam; *Impatiens*; New record; Threatened species; Arunachal Pradesh

1. Introduction

Impatiens belonging to the family Balsaminaceae is one of the largest genera of Angiosperm having more than 1000 species (Mabberley, 2008; Bhaskar, 2012; Yu, 2012; Gogoi et al., 2018, 2021), distributed in the tropical and subtropical regions of the Old World as well as in the northern temperate regions (Fischer, 2004; Mabberley, 2008). The genus is known to have five distinctive diversity hotspots i.e. Tropical Africa, Sino-Himalayan region, Southern part of India, Madagascar and South-East Asia (Toppin, 1920; Grey-Wilson, 1980; Bhaskar and Razi, 1981; Chen, 2001; Gogoi et al., 2018). The habitat requirement of the *Impatiens* species is very much specific and prefer to grow in cool, moist, mountainous habitats and is the reason why most of the species were endemic to particular locality.

During a recent plant expedition tour to Tawang and other adjoining areas of Arunachal Pradesh in August 2023, many species of *Impatiens* were collected. After critical examination of the specimen and thorough scrutiny of literature (Lamarck, 1778; Hooker, 1905; Grey-Wilson, 1991; Chakrabarty, 2009; Govaerts and Chakrabarty, 2011; Gogoi et al., 2018, 2018a, 2021; Borah et al., 2019; Wangchuk et al., 2020) two of the specimens were identified as *Impatiens sikkimensis* Govaerts & Chakrab. and *Impatiens tuberculata* Hook.f. & Thomson.

The present discovery of *I. sikkimensis* is very important from the conservation point of view as the species is endemic to Sikkim (Grey-Wilson, 1991; Chakrabarty, 2009; Gogoi et al., 2018a) and is endangered due to restricted distribution with decreasing population (Gogoi et al., 2021). Recently this species was discovered from Zhemgang district of Bhutan by Wangchuk et al. (2020). The other species *I. tuberculata* is recorded only from Sikkim in India other than Bhutan and China, and also considered as endangered and no recent collection was observed from India (Gogoi et al., 2018, 2021).

Hence, it is reported here as new addition to flora of Arunachal Pradesh, India and this information shall be important for planning conservation strategies of both these two threatened species. A detail description along with coloured photographic illustration are provided for easy identification of the species in the field.

2. Materials and methods

Extensive field survey was conducted to different parts of Tawang district in the month of August, 2023 to collect different species of *Impatiens*. The species collected were dissected, photographed, descriptions were prepared and finally put up on herbarium sheets following the method of Jain and Rao (1976). The voucher specimens were deposited in herbarium of Arunachal Pradesh Regional Centre of Botanical Survey of India (ARUN). The specimens were identified consulting the relevant literatures as mentioned above.

3. Result

3.1. Taxonomic Treatment

Impatiens sikkimensis Govaerts & Chakrab., Rheedea 21: 173 (2011); *I. lutea* Hook.f., Rec. Bot. Surv. India 4: 18 (1905), nom. illeg.; Grey-Wilson in Grierson & Long, Fl. Bhutan 2: 96. 1991; Vivek. & al. in Hajra & al, Fl. India 4: 176. 1997. *I. humilis* Hook.f., Hooker's Icon. Pl. 30: t. 2964 (1911). (Figure 1)

Annual herb, 20–60 cm tall, sparsely branched, hairy on upper parts. Leaves evenly distributed on the stem, alternate; petiole 0.5–1.4 cm; blade sparsely hairy, elliptic to ovate, 2.5–10 × 1–4 cm, apex acuminate, base cuneate, margin crenate, setose between the teeth, extrafloral nectaries absent. Inflorescence 1–3 flowers fascicle, axillary, peduncle 1–2 cm long. Flowers yellow with red spots on middle; bract ovate, to 0.4 cm long, hairy, apex acuminate; pedicel 1.5–2 cm long, hairy. Lateral sepals 2, widely ovate, green, dorsally hairy, 0.7–0.9 × 0.8–1 cm, apex cuspidate. Lower sepal yellow, navicular, gradually tapering in to a spur; mouth to about 1 cm long, beaked; spur yellow to yellowish green, to 1.5 cm long, coiled or curved. Dorsal petal yellow, widely ovate, 0.9–1.1 × 1–1.3 cm, beak absent. Lateral united petals yellow with greenish splash at the base and red blotch on throat, bilobed, upper (basal) lobe unevenly ovate, 0.7–0.8 × 0.9–1.1 cm, not clawed, apex obtuse to emarginate; lower (distal) lobe unevenly dolabriform, 0.5–0.6 × 1.2–1.4 cm, apex notched, auricle absent. Stamens 5, encircled the ovary, to 0.4 cm long, filaments greenish. Capsule linear, green, 3–4 cm long. Seeds oblong.

Figure 1. ***Impatiens sikkimensis*** Govaerts & Chakrab. A. Flowering twig B. Lateral view of the flower C. Front view of the flower D. Lateral sepals (ventral) E. Lateral sepals (dorsal) F. Lower sepal G. Lateral united petals H. Dorsal petal (ventral) I. Dorsal petal (dorsal).

Fl. & Fr.: July to September.

Specimen examined: Arunachal Pradesh, Tawang, Jung, 2905 m, 27°44'45.7 N & 92°48'06.9"E, K. Chowlu, 41998.

Habitat: Moist areas along hill slopes.

Distribution: Widely growing along the hill slopes, huge population of about 200 individuals in Jung, Tawang district were observed.

Impatiens tuberculata Hook.f. & Thomson, J. Proc. Linn. Soc., Bot. 4: 155 (1859); *Impatiens aganantha* Hook.f. in Rec. Bot. Surv. India 4: 16 (1905). (Figure 2)

Annual herb 15–30 cm tall, stem green, greenish purple, purple in colour, ridged. Leaves are confined more to the apical part of the stem, alternate, apical leaves are sessile, petiole to 1.3 cm long; blade glabrous, ovate to lanceolate, 1–1.6 × 1.5–4 cm, apex acuminate, base cuneate, margin crenate, setose between the teeth, pointed towards upper side, extrafloral nectaries absent. Inflorescence raceme, axillary and terminal, 7–8 cm long, peduncle 3–3.5 cm long, 6–10 flowered. Flower white with purplish colouration at middle. Bract caducous, ovate-lanceolate, to 2 mm long; pedicel 0.7–1.5 cm long. Lateral sepals 2, obliquely ovate, 0.2–2 × 1–3 mm, apex purplish. Lower sepal navicular, mouth 4.5–5 mm long, spur very short, to 1 mm long. Dorsal petal white, ovate, to 0.3 × 0.4 cm, cuculate, apex pointed. Lateral united petals white with purplish blotch at middle, upper (basal) lobe obovate to orbicular, 2–3 × 3–4 mm; lower (distal) lobe dolabriform, 3–4 × 6–7 mm, apex acute. Androecium 5, to 2.5 mm long, Capsule clavate with tuberculate surface, 1-1.4 cm long.

Figure 2. ***Impatiens tuberculata*** Hook.f. & Thomson A. Habitat B. Inflorescence C. Front view of the flower D. Lateral view of the flower E. Lateral Sepals F. Lower sepal G. Lateral united petals H. Dorsal petal I. Androecium.

Fl. & Fr.: July to September.

Specimen examined: Arunachal Pradesh, Tawang, on the way to Bumla pass, 4496m, 27°43'15.54" N & 91°53'31.37" E, K. Chowlu 41981.

Habitat: Growing on the moist rock crevices along hill slopes.

Distribution: It was observed only at one location in Tawang district.

4. Conclusion

The present study documents the extended geographical distribution of *Impatiens sikkimensis* and *I. tuberculata* from Tawang district of Arunachal Pradesh. Both the species were earlier reported only from the state of Sikkim in India. Though quite good population of *I. sikkimensis* were observed but *I. tuberculata* was recorded only from single location.

Acknowledgement
The authors are thankful to Dr. A.A. Mao, Director, Botanical Survey of India, Kolkata, for logistic support. The authors are also thankful to Dr. Rajib Gogoi, Scientist, Botanical Survey of India, Sikkim Himalayan Regional Centre for help in the identification of the species. The author SB is thankful to the Head, Department of Botany, Gauhati University for logistic and support.

Author's contributions
Collection of the sample and photography was performed by KC. The identification of species and draft was prepared by SB. Both the authors (KC & SB) checked and finalised the manuscript.

Conflict of interests
Authors have no conflict of interests.

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