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Floristic diversity of the genus *Impatiens* L. (Balsaminaceae) in Kashmir Himalaya

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ABSTRACT

Impatiens L., commonly known as balsams, is one of the largest genera among flowering plants. It is regarded to be taxonomically a difficult genus due its large number of species (ca. 1000) and their polymorphism. It exhibits tremendous diversity in morphology, habitat, and ecological preferences. The genus shows abundance and great diversity in the Kashmir Himalaya, occurring mostly in riparian habitats and other moist situations. A critical revision of this genus is required to understand the recognizable characters so as to help identifying its constituent taxa easily and accurately. In this paper, an attempt has been made to arrive at a comprehensive taxonomic treatment of *Impatiens* in Kashmir Himalaya. A taxonomic account of 10 species of *Impatiens* in the Kashmir Himalaya has been provided. Updated nomenclature, with basionym and synonym(s) (if any), description, altitudinal range, and distribution pattern of all the taxa in the study area is given.

Keywords:Impatiens, Taxonomy, Species Richness, Kashmir Himalaya

I INTRODUCTION

The family Balsaminaceae comprises two genera; *Hydrocera* Blume and *Impatiens* L., which are commonly known as balsams, jewel weed, snap weed or touch-me-not (Willis 1973). The genus *Impatiens* is supposed to be one of the largest genera among the flowering plants (Sreekala et al. 2007), comprising more than 1000 species (Grey-Wilson 1980; Clifton 2000; Pieter et al. 2006). It is essentially sub-cosmopolitan genus and mainly distributed in montane areas in the Old World tropics and subtropics (Grey-Wilson 1980; Yuan et al. 2004), but several species occur in temperate Eurasia and North America (Pieter et al. 2006). Native species are absent from the South America and Australia.

Impatiens is phytogeographically a unique genus, which has its greatest development in the Indian region and is found chiefly in moist sub-temperate areas. In India, the concentration of *Impatiens* species is remarkably local and occurs in three major centers of diversity including the Himalaya in the north, Western Ghats in the south

and parts of northeastern states. The genus contains over 206 species in India (Vivekananthan et al. 1997; Vishwanathan & Manikandan 2003; Bhasker 2006).

Balsams are beautiful plants bearing curious and variously coloured flowers with peculiar floral structures. Though the ideal climatic conditions prevailing in this region provide suitable habitat for the balsams, their populations are rapidly declining due to various biotic and abiotic factors. Majority of wild Balsams have great Horticultural potential due to their diversified forms, shapes and spectacular colours. Despite being very important in horticultural, the species delimitation in *Impatiens* is taxonomically confusing. Over the last one century, varying number of *Impatiens* species (ranging from10 to 15) has been reported from the Kashmir Himalaya by different workers, which makes its taxonomic resolution difficult. In view of this confusing situation, the present study has been undertaken to work out the taxonomy of *Impatiens* in this Himalayan region.

II STUDY AREA

The Jammu and Kashmir State, being located in the northwestern extremity of India, represents a mosaic of biogeographic zones, such as Western Himalaya, Northwestern Himalaya and Trans Himalaya (Figure 1). The State with an area of about 2, 22, 236 km2 contributes the largestpercentage area (41.65 %) of Indian Himalayan Region (Nandy et al. 2006). As result of the prevalence of wide range of physiographic and bioclimatic conditions, the State supports a rich and diverse flora, including *Impatiens*. The genus shows abundance and great diversity in the Kashmir Himalaya, occurring mostly in riparian habitats and other moist situations. Despite being one of the most interesting floristic elements, *Impatiens*has been little investigated taxonomically in the region.

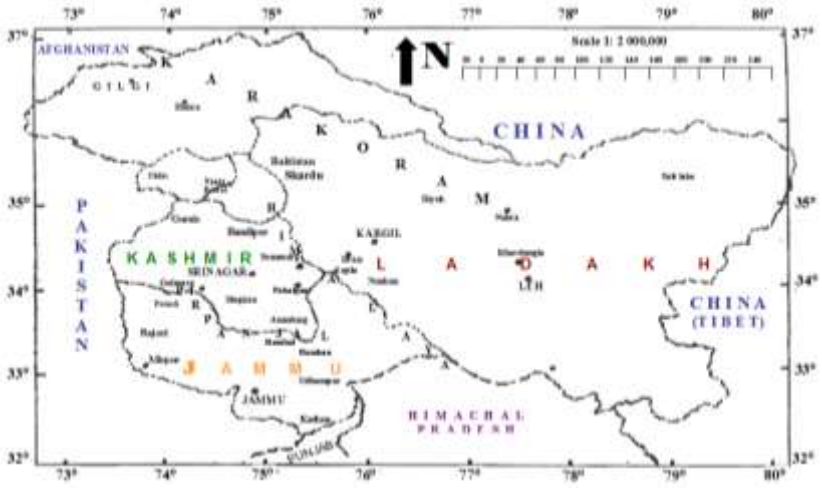

Figure 1. Location map of Jammu and Kashmir State, showing three provinces of Jammu, Kashmir, Ladakh.

III MATERIALS AND METHODS

The present work is mainly based on the collection of *Impatiens* specimens from different areas of Kashmir Himalaya, supplemented with the perusal of relevant systematic literature, and previous herbarium specimens housed at Kashmir University Herbarium (KASH). During this work the study area was thoroughly surveyed, ensuring collection of the required material in the flowering as well as fruiting condition. The collected plants were dried and preserved using the usual taxonomic methods. Recent nomenclature changes were incorporated by using the specialized online web resources. Altitudinal range for all the species has been worked out; and it refers to the minima and maxima of altitude within all the recorded localities of each species in the region.

IV RESULTS

At the present stage of investigation, the genus *Impatiens* is represented by 10 species in the Kashmir Himalaya. Each species has been provided with currently valid scientific name, followed by full author citation, basionym and synonyms (if any), brief taxonomic description, flowering period, geographic distribution including local distribution and altitudinal range in meters (above mean sea level).

1. ***Impatiens balsamina*** Linn., Sp. Pl. 938. 1753. (Garden Balsam or Touch-me-not)

Balsamina angustifolia Blume; *Impatiens eriocarpa* Launert.

Diagonastic characters: Leaves lanceolate, serrate; flowers white, orange, pink-red or purple, 25-30 mm long, axillary, solitary or 2(-3); capsule broadly elliptic to fusiform, densely tomentose, pendulous.

Distribution: Cultivated as an ornamental in tropical and sub-tropical regions of, Pakistan, Sri Lanka, Malaya, China, and India: cultivated throughout.

Collection sites: Kashmir Universitygarden, Shalimar garden, Khilanmarg, Rajouri, Gulmarg.

Elevation Range: 1550-1800 m

Flowering: June-September

2. Impatiens brachycentra Kar. & Kir. in Bull. Soc. Nat. Hist. Mosc. 1:179. 1842. (Spurless Balsam)

Diagonastic characters: Leaves elliptic-ovate to ovate, serrate to subcrenate, base glandular stipitate; Flowers white, sometimes tinged yellow, almost spurless.

Distribution: Central Asia, China, Pakistan and Afghanistan; India: W. Himalayas, Jammu & Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh.

Collection sites: Dachigam, Gulmarg, Pampore, Ganderbal, Khaag (Budgam), sonamarg, Padam (Zanaskar), Sarbal, Preng, Banihal, Baramulla.

Elevation Range: 1650-4000 m

Flowering: June-September

3. *Impatiens sulcata* Wall. in Roxb. Fl. Ind. Carey ed. 2:458. 1824. (Grooved Balsam)

Impatiens gigantea Edgew.; *Impatiens sulcata* var. *minor* Hook. f.

Diagonastic characters: Leaves opposite-verticillate, elliptic-ovate, crenate-subcrenate; Flowers pink; Lateral sepals oblique cordate, Lower sepal saccate, abruptly ending in a spur; Capsule narrowly clavate, c. 30 mm long, nodding

Distribution: Temperate Himalayas, Nepal, Tibet, Bhutan, Pakistan, India: Kashmir, Himachal Pradesh, Uttar Pradesh, W. Bengal, Sikkim, and Arunachal Pradesh.

Collection sites: Gulmarg and Boniyar.

Elevation Range: 2000-4000 m

Flowering: July-September

4. *Impatiens balfourii* *Hook. f.,* Bot. Mag. 129: t. 7878. 1903. & in Rec. Bot. Surv. Ind. 1,4:9.1904.(Balfour's Balsam, Kashmir Balsam)

Diagonastic characters: Leaves elliptic-ovate to lanceolate, alternate, serrate-crenate, base glandular-stipitate; Flowers white, pink and yellow, spurred lower sepal conical, tapering into a slender straight spur, 10-15 mm long; capsule broadly linear, 20-24 mm long, erect.

Distribution: Pakistan, India: Jammu & Kashmir and Uttar Pradesh.

Collection sites: Sonamarg and Boniyar.

Elevation Range: 1900-3000 m

Flowering: July-August

5. ***Impatiens edgeworthii*** Hook. f., Fl. Brit. Ind. 1:476. 1874. & in Rec. Bot. Surv. Ind. 4:9.1904. (Edgeworth's Balsam)

Impatiens chrysantha Hook. f.

Diagonastic characters: Leaves elliptic-ovate, acuminate, crenate to crenate-dentate, glandular towards the base; Flowers yellow, streaked red in the throat, Lateral sepals green, subcordate to broadly ovate, apiculate; lower sepal infundibuliform, gradually narrowed into a recurved spur.

Distribution: NW. Himalayas; Nepal, India: Kashmir, Himachal Pradesh and Uttarpradesh.

Collection sites: Dachigam, Gulmarg, Boniyar, Baramulla, Uri, Sonamarg, Kangan and Dawar (Gurez).

Elevation Range: 1800-3000 m

Flowering: July-September

6. *Impatiens thomsonii* Hook. f. in J. Linn. Soc. Bot. 4:128. 1860. (Thomson's Balsam)

Diagonastic characters: Leaves elliptic-lanceolate or elliptic-ovate, acuminate, serrulate to crenate-dentate; Flowers pink, white and yellow, spotted brown within, Lateral sepals subcordate, lower sepal conical gradually tapering into a curved yellow, 2-5 mm long, spur; Capsule narrow, clavate, nodding.

Distribution: Temperate Himalayas from Hazara and Kashmir to Kumoan and eastward to Sikkim.

Collection sites: Padam (Zanaskar), Ramban, Uri, Baramulla, Gulmarg, Naranag and Gangabal.

Elevation Range: 1700-4000 m

Flowering: July-September**8.**

7. ***Impatiens scabrida*** DC., Prodr. 1:687. 1824. (Rugged Yellow Balsam, Himalayan Jewel Orchid)

Impatiens cristata Wall.

Diagonastic characters: Leaves elliptic-ovate to oblong-ovate, acuminate to subacuminate, crenate to crenate-dentate; flowers lemon yellow, spotted brown within; lateral sepals pubescent, ovate-suborbiculate, sometimes mottled brown-black; lower sepal saccate or conical, spur 8-20 mm long, curved. capsule erect, puberulous.

Distribution: Nepal, Bhutan, Pakistan, India: Kashmir, Himachal Pradesh, Uttar Pradesh, W. Bengal, Sikkim, and Arunachal Pradesh.

Collection sites: Najwan, Beehama and Naranag.

Elevation Range: 2000-3000 m

Flowering: July-August

8. ***Impatiens glandulifera*** Royle, Ill. Pl. Himal. Mount. 151. t. 28, f. 2. 1834. (Royle's Balsam)

Balsamina roylei (Walp.) Ser.; *Impatiens roylei* Walpers

Diagonastic characters: Leaves opposite-verticillate, elliptic-ovate, serrate, base glandular stipitate; Flowers pink-red or red-purple; Lateral sepals oblique cordate, Lower sepal saccate, abruptly ending in a spur 5-6 mm long; Capsule broadly clavate, nodding

Distribution: Temperate Himalayas from Hazara and Kashmir to Kumoan and eastward to Sikkim.

Collection sites: Gumri (Ladakh), Aharbal, Budwan & Dawar (Gurez), Naranag, Sonamarg, Kellar, Dras, Ferozpura and Gulmarg.

Elevation Range: 1600-4000 m

Flowering: July-August

9. ***Impatiens bicolor*** Royle, Illustr. Bot. Himal. 151. t. 28. 1834. (Amphora Balsam)

Impatiens amphorata var. *umbrosa* Hook. f.; *Impatiens roylei* K1.

Diagonastic characters: Leaves elliptic to elliptic-ovate, crenate-dentate; Flowers pink and yellow, Lower sepal broad conical, ending in a spur less than 1 cm.

Distribution: NW. Himalayas, Nepal and Pakistan, India: Kashmir, Himachal Pradesh, Punjab and Kumaon.

Collection sites: Dawar & Budwan (Gurez), Jammu

Elevation Range: 1700-3000 m

Flowering: July-August

10.*Impatiens flemingii* Hook. f. in Rec. Bot. Surv. Ind. 4:9. 1904.

Diagonastic characters: Leaves elliptic-ovate to lanceolate, alternate, serrate-crenate, acuminate, base glandular-stipitate, finely pubescent on both surfaces; flowers white or pink with yellow throat; lateral sepals ovate, slightly curved on one side, lower sepal conical, spured 8-15 mm long; capsule linear, acute, upto 12 mm long.

Distribution: Pakistan, India: Kashmir to Hazara.

Collection sites: Najwan and Beehama.

Elevation Range: 1600-3200 m

Flowering: July-August

V DISCUSSION AND CONCLUSIONS

Over the last one century, varying number of *Impatiens* species (ranging from10 to 15) has been reported from the Kashmir Himalaya by different workers (Coventry 1923; Blatter 1928; Stewart 1972; Polunin & Stainton 1984)), which makes its taxonomic resolution difficult.Based on the present study, the genus Impatiens is represented by 10 species. *Impatiens amphorata*Edgew. and*I. amplexicaule* Edgew. that were previously reported (Blatter 1928) were not found at present stage of investigation. Also the specific names like I. roylei Walp. and I. gigantea Edgew were treated as accepted scientific names in herbarium as well as literatue (KASH; Blatter 1928; Stewart 1972), however, both are synonyms of *I. glandulifera*Royle and *I. sulcata*Wall., respectively. The Kashmir Himalaya Balsams are mostly confined to higher alpines. Based on our field observations over the last one decade, it seems that habitat loss due to increasing anthropogenic activities in the alpines might be the main cause of their rarity in this Himalayan region.

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Figure 2. a-b. *I. balsamina*; c-d. *I. brachycentra*; e-f. *I. sulcata*; g-h. *I. balfourii*; i-j. *I. edgeworthii*; k-l. *I. thomsonii*.