

Pollen Flora of Pakistan - XXVI. *Balsaminaceae*

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Received: 22.07.1999

Accepted: 28.09.2000

Abstract: The pollen morphology of 8 species belonging to a single genus, i.e., *Impatiens* L., of the family *Balsaminaceae*, was studied by light microscope and scanning microscope. It is stenopalynous in nature. Pollen grains oblate to sub-oblate, rectangular, tetra-colpate, colpi very short (brevicolpate). Tectum reticulate. Palynology of the family confirms its monotypic status.

Key Words: Pollen morphology, *Balsaminaceae*, Pakistan, Flora

Introduction

Balsaminaceae is a family represented by 2 genera and over 900 species. It is distributed in Europe, N. America, Africa and Asia (Willis, 1973; Mabberley, 1987). It is represented in Pakistan by a single genus, i.e., *Impatiens* L., and 12 species (Nasir, 1980).

Takhtajan (1969) treated this family under the order Geraniales. However, Dahlgren (1989) separated the family *Balsaminaceae* from the order *Geraniales* and placed it in the monotypic order *Balsaminales*.

Narayana (1963) studied the embryology of the family *Balsaminaceae*. Bhaskar & Raiz (1973) examined the exine structure of the family *Balsaminaceae*. Wood (1975) studied the pollen morphology of the family *Balsaminaceae* from the southeastern United States. Durdana & Nair (1988) described the pollen of the family *Balsaminaceae* while studying the pollen of the order *Geraniales*. Qaiser & Perveen (1979) also examined the pollen of the family *Balsaminaceae* during a palynological survey of the Flora of Pakistan.

The pollen morphology of the family *Balsaminaceae* was also examined by Erdtman (1952), Radulescu (1967), Tara & Namboodri (1974), Bhaskar et al. (1975), Narayana & Sayeedudin (1959) and Moore & Webb (1978).

Materials and Methods

Pollen samples were obtained from Karachi University Herbarium (KUH) or collected from the field. The list of

voucher specimens is deposited in KUH. The pollen grains were prepared for light (LM) and scanning microscopy (SEM) by the standard methods described by Erdtman (1952). For light microscopy, the pollen grains were mounted in unstained glycerine jelly and observations were made with a Nikon Type-2 microscope (E40, 0.65) and oil immersion (E100, 1.25), using a 10x eye piece. For SEM studies, pollen grains were suspended in a drop of water and directly transferred with a fine pipette to a metallic stub using double-sided adhesive tape and coated with gold in a sputtering chamber (Ion-sputter JFC-1100). Coating was restricted to 150A. The S.E.M. examination was carried out on a Jeol microscope, JSM-T200. The measurements were based on 15-20 readings from each specimen. Polar axis, equatorial diameter, colpi length and exine thickness were measured (Table).

The terminology used is in accordance with Erdtman (1952); Kremp (1965), Faegri & Iversen (1964) and Walker & Doyle (1976).

Observations and Results

General pollen characters of the family *Balsaminaceae*

Pollen grains sub-isopolar, oblate rarely sub-oblate, rectangular. Length (18.5-) 23.6 ± 0.917 (-25.13) μm , Breadth (28.7-) 35.4 ± 1.18 (-39.49) μm , P/E ratio: 0.66, colpi very short, c. 0.359 μm in length. Tetracolpate, zonoaperturate, colpus short, narrow, not sunken. Colpal membrane scabrate, \pm rectangular in polar view and elliptic in equatorial view. Sexine thinner than nexine. Exine (0.35-) 0.96 ± 0.26 (-1.79) μm thick.

Table General pollen characters of the species studied from *Balsaminaceae*

| Name of taxa | Polar length (P) in μm | Equatorial diameter (E) in μm | Colpus length in μm | Exine thickness μm | Tectum μm |
|--|--------------------------------------|---|-----------------------------------|----------------------------------|-------------------------|
| <i>Impatiens brachycentra</i> Kar. Kir. | 18.5(23.71 \pm 0.91) 25.13 | 28.11(36.38 \pm 1.18) 39.49 | 0.35 | 0.35(0.95 \pm 0.28) 1.79 | 1.66-3.80 |
| <i>Impatiens edgeworthii</i> Hook.f. | 22.3(25.71 \pm 0.58) 28.71 | 32.3(37.7 \pm 0.58) 42.71 | 3.23(4.16 \pm 0.90) 6.82 | 0.35(0.42 \pm 0.38) 0.718 | 1.19-2.36 |
| <i>Impatiens bicolor</i> Royle | 19.5(23.39 \pm 0.47) 25.13 | 36.2(38.7 \pm 0.38) 39.49 | 3.59(4.75 \pm 1.05) 7.89 | c.0.72 | 1.66-2.85 |
| <i>Impatiens flemingii</i> Hook.f. | 18.6(25.05 \pm 0.47) 25 | 28.7(29.8 \pm 0.52) 33.0 | 3.59(6.18 \pm 0.25) 7.53 | 0.35(0.57 \pm 0.12) 0.72 | 1.19-3.30 |
| <i>Impatiens glandulifera</i> Royle | 16.5(18.39 \pm 0.39) 21.54 | 25.13(38.7 \pm 0.38) 30.5 | 1.79(2.98 \pm 1.31) 4.30 | 0.35(0.78 \pm 0.18) 1.79 | 0.71-2.85 |
| <i>Impatiens sulcata</i> Wall. | 19.7(22.7 \pm 0.82) 25.18 | 32.31(34.14 \pm 0.37) 36.0 | 3.23(3.59 \pm 0.35) 3.94 | 0.35(0.39 \pm 0.02) 0.72 | 0.90-2.72 |
| <i>Impatiens thomsonii</i> Hook.f. | 21.5(26.51 \pm 0.72) 31.30 | 34.11(35.9 \pm 0.38) 39.1 | c. 3.59 | 0.35(0.94 \pm 0.37) 0.72 | 1-2.85 |
| <i>Impatiens lemmanii</i> Hook.f. | 16.05(18.05 \pm 0.18) 23.33 | 19.9(29.8 \pm 0.77) 39.49 | 1.79(3.21 \pm 0.14) 3.59 | 0.35(0.62 \pm 0.10) 3.59 | 0.69-1.60 |

Tectum coarsely reticulate, with granulated luminae, variable in size and shape, 1.66- 3.80 μm in diameter.

Species included: *Impatiens edgeworthii* Hook.f., *I. bicolor* Royle, *I. brachycentra* Kar. & Kir., *I. flemingii* Hook.f., *I. glandulifera* Royle, *I. sulcata* Wall., *I. thomsonii* Hook.f., *I. lemmanii* Hook.f.

Conclusion

The pollen morphology of the family *Balsaminaceae*, as evident from the species investigated, is uniform in terms of pollen characters, being 4-colpate, rectangular, colpi short with reticulate tectum. It is difficult to delimit the species on the basis of pollen characters, namely, size, colpi length, exine thickness and exine ornamentation (see

Table). However, the family shows little variation in pollen shape such as, *Impatiens flemingii* Hook. f. has sub-oblate shape pollen, whereas the remaining species like *Impatiens edgeworthii* Hook. f., *I. bicolor* Royle, *I. brachycentra* Kar. & Kir., *I. glandulifera* Royle, *I. sulcata* Wall., *I. thomsonii* Hook. f., and *I. lemmanii* Hook. f., have oblate pollen. Durdana & Nair (1988) also reported a similar type of grain in other species of the family *Balsaminaceae*. The present palynological data strongly support Dahlgren's treatment, who kept this family in the monotypic order *Balsaminales*. The pollen of *Geraniaceae* is different from that of *Balsaminaceae*. In the *Geraniaceae*, a large distinct tricolporate with densely baculate-gammate or striate-rugulate tectum is found (Qaiser & Perveen, 1979; Perveen & Qaiser 1999).

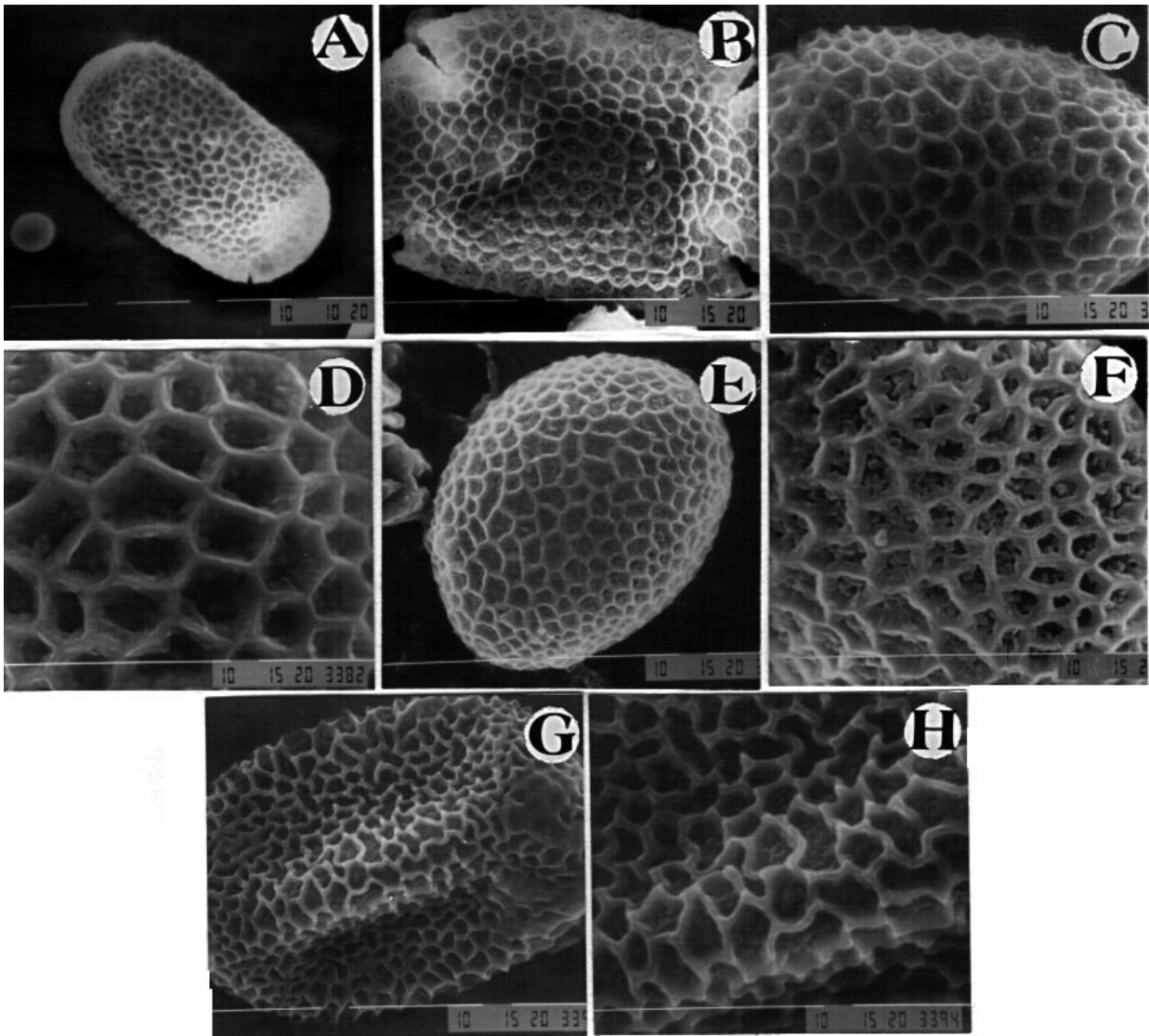


Figure Scanning Electron micrographs of pollen grains. *Impatiens brachycentra*: A, pollen grain. *Impatiens bicolor*: B, Exine pattern. *Impatiens flemingii*: C, pollen grain; D, Exine pattern. *Impatiens glandulifera*: E, pollen grain; F, Exine pattern. *Impatiens thomsonii*: G, Pollen grain; H, Exine pattern.
F Scale bar = A-H = 10 μ m.

Acknowledgements

We are grateful to the National Scientific Research Developmental Board (NSRDB), University Grants Commission Pakistan, for providing financial support.

We are also grateful to the Director of the Biological Research Centre for providing scanning electron microscope facilities.

References

- Bhaskar V & Razi BA (1973). A new kind of exine sculpturing in *Impatiens* L. (*Balsaminaceae*) from south India. *Curr Sci* 42: 510-512.
- Bhaskar V, Razi BA & Yoganarasimhan SN (1975). A "Pollen variety" of *Impatiens acaulis* Am. (*Balsaminaceae*). *Curr Sci* 44: 622-623.

- Dahlgren G (1989). The last Dahlgrenogram-system of classification of dicotyledons. In: Kit-Tan (ed.) *The Davis and Hedge Festschrift*. Edinburgh: Edinburgh University Press.
- Durdana Y & Nair PKK (1988). *Pollen morphology of Indian Geraniales*. Vol. XI-XVI. New Delhi.
- Erdtman G (1952). *Pollen Morphology and Plant Taxonomy. Angiosperms*. Chronica Botanica Co., Waltham, Massachusetts.
- Faegri K & Iversen J (1964). *Textbook of Pollen Analysis*. Munksgaard, Copenhagen.
- Kremp GOW (1965). *Encyclopedia of Pollen Morphology*. Univ. Arizona Press, Tucson.
- Mabberley DI (1987). *The Plant Book*. Camb. Univ. Press, Cambridge.
- Moore PD & Webb JA (1978). *An Illustrated Guide to Pollen Analysis*. Hodder and Stoughton, London.
- Narayana L (1963). Contributions to the embryology of *Balsaminaceae*. 1. *J Ind Bot Soc* 42: 516-517.
- Narsyana LL & Sayeeduddin M (1959). A study of the gametophytes in *Impatiens leschenaultii* Wall. *J Ind Bot Soc* 38: 391-397.
- Nasir YJ (1980). *Balsaminaceae*. In: Nasir E & Ali SI (eds.) *Flora of Pakistan*, 133: 17.
- Perveen A & Qaiser M (1999). Pollen Flora of Pakistan-XV. *Geraniaceae*. *Turk J Bot* 23: 263-269.
- Qaiser M & Perveen A (1979). A Palynological Survey of Flora of Pakistan. In: Öztürk M, Secmen O & Gork G (eds.) *Proceedings of Int. Symp. on Plant Life of S. West Asia and Central Asia*, pp. 795-835.
- Radulescu D (1967). Recherches morphopalynologiques sur les familles des *Anacardiaceae* et *Balsaminaceae*. (Enroumain). *Lucr Gard Bot Bucuresti* 169-185.
- Takhtajan A (1969). *Flowering plants (Origin and dispersal)*. Edinburgh: Oliver & Boyd.
- Tara CP & Namboodri AN (1974). Aberrant microsporogenesis and sterility in *Impatiens sultani* (*Balsaminaceae*). *Amer J Bot* 61: 585-591.
- Walker JW & Doyle JA (1976). The basis of Angiosperm phylogeny: Palynology. *Ann Mo Bot Gard* 62: 666-723.
- Willis JC (1973). *A Dictionary of the flowering Plants & Ferns*. VII ed. University press, Cambridge.
- Wood CE Jr (1975). The *Balsaminaceae* in the Southeastern United States. *J Am Arb* 56: 413-426.