



## Taxonomic insights into medicinal plants pollen, using advanced microscopy techniques, from the Western Ghats, India

MOHAMMAD JAVED<sup>1,2</sup>, NAGENDRA PRASAD<sup>1,3</sup>, ANJUM FAROOQUI<sup>1</sup>,  
MOHAMMAD FIROZE QUAMAR <sup>1,3</sup> & MUNENDRA SINGH<sup>2</sup>

<sup>1</sup>Quaternary Palynology Laboratory, Birbal Sahni Institute of Palaeosciences (BSIP), Lucknow, India, <sup>2</sup>Department of Geology, University of Lucknow (LU), Lucknow, India, <sup>3</sup>Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, India

### Abstract

Pollen morphological study on 18 medicinal plants from the Western Ghats (India) was carried out using light microscopy (LM), confocal laser scanning microscopy (CLSM) and field emission scanning electron microscopy (FESEM) techniques. The principal aim was to obtain high-resolution three-dimensional images and ultra-structure of the pollen grains of the studied taxa. The palyno-morphological characters, such as polar axis, equatorial diameter, *P/E* ratio, pollen shape, aperture type and number, exine thickness and surface ornamentation will be useful in the identification and taxonomic classification of the studied medicinal plants. Statistical analysis reveals grouping of the taxa in three different clusters and also isolated presence of taxa on the principal component analysis (PCA) biplot, irrespective of their families, showing similarities and/or variations among the studied taxa, belonging to the same and/or different families. The present study has taxonomic significance, providing high taxonomic resolution (identification of the taxa up to species level), and further aid in the identification and delimitation of the 18 studied plants.

**Keywords:** *pollen morphology, medicinally important plants, LM, CLSM and FESEM, PCA, systematics*

Humans have relied on medicinal plants since prehistoric times to treat a wide range of ailments and diseases. The Botanical Survey of India (BSI) reports that India is home to over 8000 species of medicinal plants, many of which are currently threatened with extinction. To aid in their preservation, palyno-morphological studies offer a valuable foundation for taxonomic classification and identification of these plants at a high taxonomic resolution (up to species level). The unique ultrastructural and morphological features of pollen grains make them particularly useful in plant systematics and taxonomy. Studies based on pollen provide essential insights for taxonomic classification, phylogenetic identification, and resolving taxonomic confusion and issues

within plant species of the same genera (Clark et al. 1980; Quamar et al. 2017, 2022a, 2022b; Bahadur et al. 2018; Khan et al. 2018; Garg et al. 2023). Taxonomists rely on distinctive pollen morphological characteristics, such as shape, size, aperture type and number, and exine sculpturing to determine the taxonomic status of plants at various levels, including family, subfamily, tribe, genus, species, and variety (Ragho 2020). In the present study, palyno-morphological studies of 18 plants (15 genera and 18 species), belonging to families Lamiaceae, Oleaceae, Apocynaceae, Plantaginaceae, Rosaceae, Apiaceae, Poaceae, Asteraceae and Acanthaceae, using light microscopy (LM), confocal laser scanning microscopy (CLSM) and field emission scanning electron microscopy (FESEM), were carried out. The

Correspondence: Mohammad Firoze Quamar, Birbal Sahni Institute of Palaeosciences (BSIP), Lucknow 226007, India. E-mail: [mohdfiroze\\_quamar@bsip.res.in](mailto:mohdfiroze_quamar@bsip.res.in); [quamar\\_bot@yahoo.co.in](mailto:quamar_bot@yahoo.co.in)

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