

The Stratigraphic, Palaeobiogeographic and Phylogenetic Significance of *Aquilapollenites*

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How to cite this paper: Mishra, S., Kadukothanahalli Nagaraju, S.P., Bansal, M. and Prasad, V. (2019) The Stratigraphic, Palaeobiogeographic and Phylogenetic Significance of *Aquilapollenites*. *Open Journal of Geology*, 9, 597-600.

<https://doi.org/10.4236/ojg.2019.910051>

Received: August 15, 2019

Accepted: September 20, 2019

Published: September 23, 2019

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Abstract

Angiosperm evolved and diversified during Cretaceous. During this course of evolution and radiation, various pollen of uncertain origin had evolved. *Aquilapollenites* represents the early stock of angiosperms attaining its acme with respect to diversity and dominance during Campanian and Maastrichtian age. It was globally present (except Antarctica) however more dominant in northern hemisphere (Canada, North America, Sakhalin Oblast and China). In India, the *Aquilapollenites* sp. is present in Maastrichtian aged deposits. The pollen affinity has been associated with Loranthaceae and Santalaceae plant families. Here, a comparative description of all the *Aquilapollenites* sp. comprising a wide range of morphological diversity has been discussed. The wider morphological diversity and ecological adaptability of *Aquilapollenites* sp. infer that it is globally significant and warrants a more detailed study.

Keywords

Triprojectate Pollens, Late Cretaceous, Maastrichtian, Paleocene

1. Introduction

Aquilapollenites sp. [1] was amended with the advancement in the field of microscopy [2] [3]. *Aquilapollenites* sp. belongs to a group of Triprojectacites [4]. This group includes angiosperm pollen with three equatorial projections and a polar projection on each side. *Aquilapollenites* sp. attained its maximum abundance and diversity during Campanian and Maastrichtian [5]. It is believed to evolve during the Turonian [6]; there are several pre-Turonian records from northern and southern hemisphere. Records of this pollen extend up to Eocene

but most are reworked [7].

There is a total of 180 species of *Aquilapollenites* sp. out of which only twelve occur in Indian sub-continent, restricted to Maastrichtian aged deposits [8]. The pollen is morphologically very diverse and consists of a wide variety of features. The pollen affinity has been discussed in detail by Jarzen [9] and assigned to Loranthaceae and Santalaceae plant family with uncertainty. Here we present the comparative description of morphological variation in the *Aquilapollenites* sp. along with its stratigraphic, palaeobiogeographic and phylogenetic significance.

2. Comparative Morphological Description of *Aquilapollenites* sp.

Aquilapollenites sp. bears a unique morphology with three equatorial protrusion and one polar protrusion on each side. It constitutes heteropolar, subisopolar to isopolar pollen forms. The size of the polar protrusion varies considerably. Pollen which either have one very small polar projection (less than half of the developed polar projections) or bear only one polar projection have been transferred to the genus *Mancicorpus* [3]. The number of equatorial projections is 3 - 4, oriented either equatorially or meridional. The shape of equatorial protrusion ranges from cylindrical, auriculate to conical. There is a wide difference between the ratio of polar and equatorial protrusion. In few species both protrusions are well developed while in others either of the two is well-developed. In Indian *Aquilapollenites* sp. forms, polar protrusion is well developed while equatorial protrusions are very small peg like structure [8]. The apertures are 3 to 4 in number and situated either equatorially or meridionally. The most common aperture type of *Aquilapollenites* sp. is colpi, rarely demicolpi (common in Indian species) and only one species of tricolporate pollen (*A. amicus*).

There is a wide variety of morphological diversity in the exine ornamentation, suprategal elements and their distribution. Pollen mostly bear reticulate and striatoreticulate ornamentation. However, psilate, punctate, foveolate, retipilate, infrareticulate and granulate also occur in some species. The suprategal elements mostly consist of acuminate spines with few species having pila, scale or crystal shaped spines. Most of the Indian *Aquilapollenites* sp. bear striatoreticulate ornamentation and are devoid of suprategal elements. In few species, dimorphism is very common in *Aquilapollenites* sp. showing different ornamentation on equatorial, polar and central region of the pollen. Sometimes spines only occur at the borders of the colpi extending from one end to the other forming a "Dragon Comb" like structure [10].

3. Stratigraphic, Palaeobiogeographic and Phylogenetic Significance of *Aquilapollenites* sp.

Aquilapollenites sp. represents the early stock of angiosperm. It originated during the Early Cretaceous when the world was represented by one phytogeographical province [11]. The increased tectonic activity during the late Creta-

ceous resulted in the formation of new continental assembly and changing global precipitation pattern and climate [12]. The angiosperms diversified during this time gave rise to nine phytogeographical provinces [13]. The *Aquilapollenites* phytogeographical province was majorly restricted to northern hemisphere due to its higher abundance and diversity in this region. However, *Aquilapollenites* sp. was globally present in the late Cretaceous palynoassemblages except Antarctica. Its affinity has been related to parasitic plants of Loranthaceae and Santalaceae families with uncertainty [9]. Thus, *Aquilapollenites* sp. holds an interesting history of angiosperm diversification and adaptation which warrants more detailed study. The vast array of data regarding *Aquilapollenites* sp. needs to be compiled and analyzed using phylogenetic approach to identify its affinity, contribution in angiosperm evolution and palaeobiogeographic distribution.

Acknowledgements

I (S.M.) gratefully acknowledge Dr. Vandana Prasad, Director, BSIP, Lucknow for permitting us to publish. I am also thankful to Prof. Gang Li and the organizing committee of UNESCO/IUGS/IGCP 679 2019 for their help and travel support.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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