

POLLEN MORPHOLOGY OF *ACHILLEA* (COMPOSITAE-ANTHEMOIDEAE) SPECIES FROM PAKISTAN

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ABSTRACT

Pollen morphology of the genus Achillea (Compositae) has been examined from Pakistan by light microscope. Pollen grains are generally circular to elliptical in equatorial view, and semi-angular in polar view. Aperture is trizonocolporate. Spines are pointed with dome-shaped broad base and number of spine rows between colpi are 4–6. Collumella is tectate and sexine is much thicker than nexine.

Key words: Pollen Morphology, *Achillea*, compositae, Pakistan.

INTRODUCTION

The knowledge of pollen morphology and taxonomy can be used as an instrument of multiple scientific research in systematic botany, paleobotany, paleoecology, pollen analysis, aeropalynology, criminology, allergy, stratigraphic correlation of oil-bearing rocks and coal fields, drugs in the field of medicopalynology and improvement of honey in the field of mellittopalynology and copropalynology. However, at international level there has been an explosion of information published on many aspects of pollen and spores. Reviews of pollen (Heslop-Harrison, 1969, Stanley and Linsken, 1974; Reitsma, 1970; Mascarenhas, 1975), evolutionary and chemical aspects of pollen and spore wall (Ferguson and Muller, 1976) and palynology in general (Mantel, 1970) have provided excellent insight into taxonomy. Although several palynological works have been previously published in Pakistan (Zahur, *et al.* 78; Meo *et al.*, 1988 a b, 1989, 1999; Nasreen and Khan 1998; Dawar *et al.*, (2002), yet the field of palynology is deficient in Pakistan.

The pollen grains of Compositae are mainly helianthoid, spherical or slightly flattened, tricolporate and echinate with variation in size and colpus number (Wodehouse 1935). It is a eurypalynous family (Erdtman, 1952) and possess zonocolporate pollen (Sachdeva and Malik, 1996). Wodehouse (1926, 1935) published some aspects of pollen morphology in Compositae. Various workers viz. Tombe *et al.* (1974), Feuer and Tombe (1977), Pinar and Donenz (2000), Clark *et al.* (1980), Vincent and Norris (1989), Ciller (1991) Nakajima and Monteiro (1995) and Kaya *et al.* (1996) published pollen morphology of the family Compositae in their respective flora. *Achillea millefolium* is a famous medicinal plant and its local name is 'Biranjasai'. It is diaphoretic, stimulant, tonic emmenagogue and useful in cold, obstructed perspiration and commencement of fever (Baquar, 1989).

MATERIALS AND METHODS

Pollen samples of *Achillea* were obtained from Quaid-i-Azam University Herbarium (ISL), Islamabad. The pollen grains were prepared for light microscopy by the standard methods described by Erdtman (1966). Florets were treated in acetic acid for five minutes. The measurements were based on twenty values from each species. Polar axis

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(P), Equatorial diameter (E), P/E ratio, Exine thickness, shape in polar view, shape in equatorial view, spine length, number of spine rows between colpi and aperture type were examined.

The descriptive terms used are after Erdtman (1952, 1954), Kremp (1965), Walker and Doyle (1975). A list of specimens investigated is given in the Appendix I.

RESULTS AND DISCUSSION

Table 1 summarizes the light microscopic measurements of pollen grains from the species examined. Light microscopic micrographs of *Achillea* species are presented in Fig. 1.

Size: The size of the pollen grain (Polar axis, equatorial diameter excluding spines) of *Achillea* species ranges from 22.3–23.7 μ to 23.2–24.6 μ . There is a little variation in the size of the pollen grains. *Achillea millefolium* and *A. santolina* have almost similar sized pollen and P/E ratio is also similar.

Symmetry and Shape: The pollen grains are radially symmetrical, isopolar, tri-zonocolporate, spheroidal. Pollen shape is circular to elliptical in equatorial view and semi-angular in polar view.

Class: Pollen Class is Trizonocolporate.

Aperture: The pollen grain is tricolporate. The ora are elliptic or circular. Aperture type is Lacunate in *A. millefolium* and broadly nonlacunate in *A. santolina*. Apertural membrane is spinate. Colpi are short and pores are broad in *Achillea*.

Spine: The spines are pointed and are dome shaped broad based. The spine length ranges from 3.3 μ to 3.9 μ . The number of spine rows between colpi varies from 4 to 6 among the two species. This feature can be determined easily in the polar view by light microscope.

Exine: The exine thickness varies from 5.7 μ to 6.0 μ among the two species. Columellae are tectate. Pollen sculpturing is echinate. Sexine is much thicker than nexine.

DISCUSSION

Palynological characters are helpful in supporting taxonomic suggestion (Clark et al., 1980). The columellae is tectate in *Achillea santolina*. Spine base is dome shaped. Colpi pore is wide and colpi length is short. Sculpturing is echinate. Equatorial view is prolate while polar view is oblate, spheroidal. Colpi pore is short in *A. millefolium*.

P/E ratio is 1.06 in both species. The number of spine rows between colpi varied from 5 – 6 in *A. millefolium* and 4–5 in *A. santolina*. Spine length is 3.3 μ in *A. millefolium* and 3.9 μ in *A. santolina* indicating a wide range of variation, hence distinguishing the two species. Hall (1928) and Clark et al. (1980) studied the Astereae and distinguished some genera on the basis of pollen features. Malik et al. (1963) studied pollen morphology of some Pakistani medicinal plants which include *A. millefolium*. However, *Achillea millefolium* and *A. santolina* can be distinguished on the basis of exine thickness, spines with dome shaped base and pointed end, spine length and number of spine rows between colpi. These characters can be used as additional characters to solve taxonomic problems and classification of this genus within the tribe Anthemoideae. Similarly Pinar and Donmez (2000) noted that spine cavities of pollen exine can be regarded as diagnostic characters in the genera of Compositae.

In conclusion, the polar and equatorial size of *Achillea millefolium* and *A.santolina* L. is almost similar (Table I) and both the species are trizonocolporate. However, number of spine rows between colpi are 5-6 with lacunate pollen in *A.millefolium* and 4-5 with broadly non-lacunate pollen in *A.santolina*.

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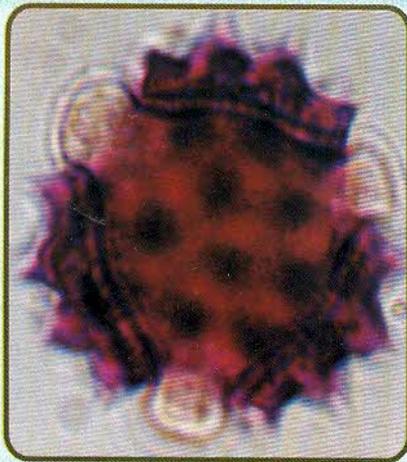
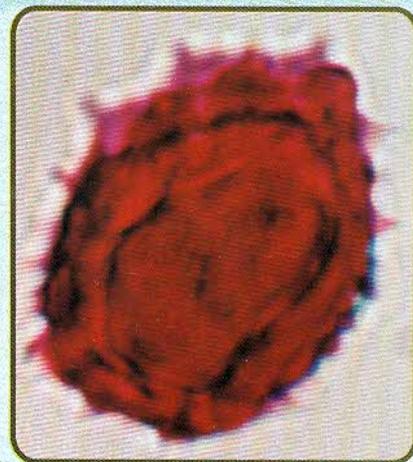
Table-1. Summary of Pollen measurements, shape and sculpturing features in *Achillea* (Anthemoideae) species

(All measurements are in microns)

Taxon	Equatorial View μ	Polar View μ	P/E ratio μ	Exine thickness μ	No. of Spine rows between colpi	Spine length μ	Shape in Equatorial view	Shape in Polar view	Class	Aperture type	Sculpturing
<i>Achillea millefolium</i> L.	23.2 (20-26)	24.6 (20-27)	1.06	5.7 (5-6.5)	5-6	3.3 (2.5-4)	Circular to elliptical	Semi-angular	Trizonocolporate	Lacunate	Echinate
<i>Achillea santolina</i> L.	22.3 (20-24)	23.7 (20-26.5)	1.06	6 (5-6.5)	4-5	3.9 (2.5-5)	Circular to elliptic	Semi-angular	Trizonocolporate	Broadly Non-lacunate	Echinate

Appendix-I. Source of Pollen Material used in this study

Taxon	Locality	District	Collected by	Voucher number	Date of Collection
<i>Achillea millefolium</i> L.	Barian	Rawalpindi	Anjum Amin, Muqarrab Shah, <i>et al.</i>	533	23/6/1975
	Dariya Gali	Rawalpindi	Iqbal Dar, M. Arif & Sarfraz Khan.	677	23/6/1975
	Kai Munja	Muzzafarabad	Jan Mohammad.	3225	3/9/1976
<i>Achillea santolina</i> L.	Nushki	Nushki	Manzoor Hussain & M. Arif.	837	22/4/1978
	Baghban	Khuzdar	Muqarrab Shah & Nisar.	38	14/4/1979
	Zaidi	Khuzdar	Muqarrab Shah & Nisar.	114	15/5/1979

*Achillea millefolium L. (Polar view)**Achillea millefolium L. (Equatorial view)**Achillea santolina L. (Polar view)**Achillea santolina L. (Equatorial view)*

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