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Palynological studies on some members of the family Asteraceae of Ranchi District, Jharkhand

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Abstract- Palynological studies of thirty-four species of Asteraceae available in Ranchi District were studied and it was found that pollens are radially symmetrical, isopolar, echinate, nonlacunate and trizonocolporate. The size of the pollen varied from 19.5 μm to 37.3 μm and the size of the spine varied from 1.5 μm to 6.8 μm . Only the *Xanthium indicum* Koen. species was recorded without spines.

Key words: Asteraceae, pollen grains, Ranchi, Jharkhand

INTRODUCTION

Palynology is the science of pollen morphology. The knowledge of palynology can be used as an instrument of multiple scientific researches for the following subjects: systematic botany, paleobotany, paleo-ecology, pollen analysis, areopalynology, criminology, pollen allergy, stratigraphic correlations of oil-bearing rocks and coal fields, drugs and their importance in honey production. It is also used to trace the origin of variety of ancient cereal crops and their history of cultivation. The pollen morphology can provide useful taxonomic features if the surface morphology is sufficiently distinctive to allow reliable identification of different taxa of the family. Pollen morphology has been used as the basis of phylogenetic studies in a number of angiospermic groups.

The family Asteraeae is one of the largest, with 27773 species belonging to 1765 genera (TPL)¹. The Ranchi

District of Jharkahand is rich in this flora. The members of the Asteraceae of Ranchi District were collected and studied from 2010 to 2013. Till the end of 2013, 93 species from 61 genera were collected and identified by the authors. Thirty-four members were selected for palynological studies in 2021.

MATERIAL & METHODS

The specimens were collected, examined and deposited in the herbarium of the Department of Botany at Shyama Prasad Mukherjee University, Ranchi. Thirty-four species were selected for palynological studies. The work of Erdtman²⁻⁴, Wodhouse⁵ and Wagner *et al.*⁶ was followed to collect and prepare pollen slides of the members. It was preferred to use fresh specimens for the collection of pollen, preferably those flowering buds just about to open. Flowers were washed twice or three times with alcohol to remove any extra pollen from other plants. The slides were photographed and stored digitally on a computer. The

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observations were documented and the results were analyzed.

RESULTS & DISCUSSION

Three main characters chosen to identify the plant species, genera or families were the number and position of the furrow or Colpi; the number and position and complexities of the aperture; and the form, ornamentation, or sculpture of the outer wall of the pollen grain exine. The data so obtained were compared with the earlier studies done.⁷⁻⁹

The pollen morphology of the family was recorded as follows:

1. The size of pollen grains varied from 19.5µm to 37.3µm (polar axis). The maximum range was observed in the species *Calendula officinalis* (37.3µm) and the minimum in *Ageratum houstonianum* Mill. (19.5µm). The maximum equatorial diameter of 36.5µm was observed in *Sonchus asper* (L.) Hill and the minimum 17.2µm in *Eclipta prostrata* (L.) L.

2. The pollen grains were radially symmetrical and isopolar. The P/E ratio varied from 0.91 to 1.31. The lowest value was observed in *Sonchus asper* (L.) Hill., while the highest value was observed in *Blanvillea acmella* (L.) Philipson. Pollen grains of eleven species: *Dahlia imperialis* Ortgies, *Launea asplendifolia* (Willd.) Hook, *Galinsoga quadriradiata* Ruiz and Pav., *Emilia prenanthoides*, *Tagetes minuta* L., *Wedelia biflora* (L.) DC., *Tagetes patula* L., *Sonchus brachyotus* DC., *Tagetes erecta* L., *Wedelia chinensis* (Osbeck.) Merr. and *Tithonia*

rotundifolia (Mill.) S. F. Blake were almost spherical or spheroidal in shape as they had a P/E ratio between 0.98 and 1.02. The pollen grains of nine species were more elongated along the polar axis than the equatorial axis. They were *Ageratum conyzoides* L., *Ageratum houstonianum* Mill., *Blanvillea acmella* (L.) Philipson, *Blumea sinuata* (Lour.) Merr., *Cosmos bipinnatus* Cav., *Eclipta prostrata* (L.) L., *Gnaphalium luteo-album* L., *Helianthus annuus* L. and *Sonchus oleraceus* L. There were three species: *Cosmos sulphureus* Cav., *Galinsoga parviflora* Cav., *Sonchus asper* (L.) Hill, each with a larger equatorial diameter than a larger polar diameter.

3. The pollen grains were generally trizonocolporate with a non-lacunate aperture, except for *Cyanthillium cinereum* (L.) Robinson, *Sonchus asper* (L.) Hill. and *Sonchus oleraceus*, which were lacunate types. The aperture membrane was spinate (echinate). The studies on pollen grains of Asteraceae by Jain and Nanda¹⁰ and Nair *et al.*¹¹ are almost similar.

4. The pollen grains of most of the species were echinatus, except for *Xanthium indicum*. The spines were projecting normally from the surface of the pollen, with a broad and flat base. The only plant studied was *Cosmos sulphureus* Cav., which has slightly curved spines. The length of the spine was 6.2 µm in this species. The length of spines among the studied members varied from 1.5 µm to 6.8 µm. The lowest value of 1.5µm was recorded in *Cyanthillium cinereum* (L.) Robinson and the highest at 6.8µm in *Bidens bipinnata* L. The average spine length was 4.2 µm.

Table 1- Summary of pollen measurement, shape and sculpturing in Asteraceae

Sn	Name	Polar Dia	Equatorial Dia	P/E Ratio	Length of Spines	Aperture Type	Pollen Class
1	<i>Ageratum conyzoides</i> L.	23.31	20.1	1.16	3.8	Nonlacunate	Trizonocolporate
2	<i>Ageratum houstonianum</i> Mill.	19.5	17.6	1.11	3.1	Nonlacunate	Trizonocolporate
3	<i>Aster amellus</i> L.	29.5	27.8	1.06	4.1	Nonlacunate	Trizonocolporate
4	<i>Bidens bipinnata</i> L.	27.4	25.8	1.06	6.8	Nonlacunate	Trizonocolporate
5	<i>Bidens biternata</i> (Lour.) Merr. & Sherff	26.6	25.4	1.05	5.1	Nonlacunate	Tri to Hexazonocolporate
6	<i>Blanvillea acmella</i> (L.) Philipson	31.8	24.2	1.31	5.2	Nonlacunate	Trizonocolporate
7	<i>Blumea sinuata</i> (Lour.) Merr.	21.5	18.9	1.14	4.33	Nonlacunate	Trizonocolporate
8	<i>Calendula officinalis</i> L.	37.3	35.2	1.06	6.1	Nonlacunate	Trizonocolporate
9	<i>Cosmos bipinnatus</i> Cav.	28.7	25.4	1.13	5.3	Nonlacunate	Trizonocolporate
10	<i>Cosmos sulphureus</i> Cav.	25.5	26.8	0.95	6.2	Nonlacunate	Trizonocolporate

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11	<i>Cyanthillium cinereum</i> (L.) Robinson	25.1	23.5	1.07	1.5	Lacunate	Trizonocolporate
12	<i>Dahlia imperialis</i> Ortgies in Gaert.	35.2	34.4	1.02	6.5	Nonlacunate	Trizonocolporate
13	<i>Eclipta prostrata</i> (L.) L.	19.7	17.2	1.15	4.2	Nonlacunate	Trizonocolporate
14	<i>Emilia prenanthoides</i> DC.	32.2	31.9	1.01	2.2	Nonlacunate	Trizonocolporate
15	<i>Galinsoga parviflora</i> Cav.	21.8	22.8	0.96	4.4	Nonlacunate	Trizonocolporate
16	<i>Galinsoga quadriradiata</i> Ruiz & Pav.	25.2	24.8	1.02	4.2	Nonlacunate	Trizonocolporate
17	<i>Gnaphalium luteo-album</i> L.	20.2	18.2	1.11	2.6	Nonlacunate	Trizonocolporate
18	<i>Helianthus annuus</i> L.	26.8	24.5	1.09	4.2	Nonlacunate	Trizonocolporate
19	<i>Launea asplenifolia</i> (Willd.) Hook.	31.2	30.6	1.02	2.3	Nonlacunate	Trizonocolporate
20	<i>Parthenium hysterophorus</i> L.	19.8	19.2	1.03	2.1	Highly Nonlacunate	Trizonocolporate
21	<i>Sonchus asper</i> (L.) Hill.	33.2	36.5	0.91	2.1	Lacunate	Trizonocolporate
22	<i>Sonchus brachyotus</i> DC.	29.9	30.3	0.99	2.1	Nonlacunate	Trizonocolporate
23	<i>Sonchus oleraceus</i> L.	34.8	32.2	1.08	2.4	Lacunate	Trizonocolporate
24	<i>Spilanthes uliginosa</i> Sw.	28.2	26.8	1.05	3.8	Nonlacunate	Trizonocolporate
25	<i>Synedrella nodiflora</i> (L.) Gaertn.	28.2	26.3	1.07	5.8	Nonlacunate	Trizonocolporate
26	<i>Tagetes erecta</i> L.	29.8	30.2	0.99	4.8	Highly Nonlacunate	Trizonocolporate
27	<i>Tagetes minuta</i> L.	30.5	30.2	1.01	5.3	Slightly Nonlacunate	Trizonocolporate
28	<i>Tagetes patula</i> L.	34.6	35.1	0.99	4.3	Nonlacunate	Trizonocolporate
29	<i>Tithonia rotundifolia</i> (Mill.) S. F. Blake	23.6	24.2	0.98	4.8	Nonlacunate	Trizonocolporate
30	<i>Tridax procumbens</i> L.	27.8	26.1	1.07	6.7	Nonlacunate	Trizonocolporate
31	<i>Wedelia biflora</i> (L.) DC.	22.4	22.3	1.00	5.9	Nonlacunate	Trizonocolporate
32	<i>Wedelia chinensis</i> (Osbeck.) Merr.	22.3	22.5	0.99	5.6	Nonlacunate	Trizonocolporate
33	<i>Xanthium indicum</i> Koen.	24.8	23.5	1.06	absent	Nonlacunate	Trizonocolporate
34	<i>Zinnia elegans</i> Jacq. Coll.	25.8	24.6	1.05	3.8	Nonlacunate	Trizonocolporate

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