

Pollen Morphology of Some Herbs found in Tawma Village of Sintgaing Township, Mandalay Region, Myanmar

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Abstract

The pollen morphology of 9 species from 9 genera belonging to 8 families in Tawma Village of Sintgaing Township, Mandalay Region was examined from 2018 October to 2019 February. Polleniferous material and complete plant specimens were properly collected, identified and utilized for studies. Pollen morphology varied considerably among these species. Grains were mostly porate, colpate and colporate. Similarly exine sculpturing was also extremely varied, ranging from almost reticulate, obscurely reticulate, echinate and retipilate. All species comprised monad type. The shapes of pollen grains were prolate, subprolate, spheroidal, subspheroidal and oblate in equatorial view. Pollen characters were considered to be important characters used as an aid of taxonomy in all species. The pollen key to the species had also been constructed on the basis of the acquired palynological data. Photo-micrographs of all species had included both equatorial and polar views.

Key words: pollen, specimens, equatorial view, polar view

Introduction

Tawma Village is located in the Sintgaing Township, Mandalay Region, Myanmar which lies between on the highway of Mandalay and Kyaukse Road. In this area, the distributions of plants are found the tropical species. Trees, shrubs and herbs are mostly abundantly found in this area. Among them, 9 species of some herbaceous plants were selectively collected from Tawma Village. The flowers were collected at the time of blooming and extracted the anthers and preserved with pure alcohol (ethanol) $\text{CH}_3\text{CH}_2\text{OH}$ for further study of pollen morphology.

In the study of pollen morphology, it was based upon the polarity, symmetry, shape and size, characters of aperture and sculpture pattern of pollen grains. Polarity in the pollen grain was identified at the microspore tetrad stage. The pole nearest to the centre of the tetrad is the proximal pole and the distal pole is other hands from the central of tetrad. The two poles are connecting a line; it is so called polar axis. The equatorial axis is perpendicular to the polar axis and then divided the two halves of the pollen.

In shape, pollen grains vary in form. The shape can be studied on both equatorial and polar views. The shapes of grain in equatorial view are spheroidal, oblate, oblate-spheroidal, prolate and sub-prolate while in polar view, the shapes are circular, ellipsoid, triangular and rhombic.

The size of pollen grain classes are distinguished from size expressed as length of the longest axis. The characters of aperture are mainly important factor for the classification of pollen grains. Any pollen grains or spores are classified on the basis of shape, number and position of the apertures. The apertures may occur as circular pores (pori) or as elongate furrows (colpi). Pollen grains have both a colpus and a pore is called colporate.

In this paper, the pollen morphology of 9 species from 9 genera of 8 families from Tawma Village was studied. It was concluded that palynological data was very important not only for taxonomist's point of view but other scientific working in related disciplines of pure and applied sciences.

Research Objectives

This research consisted of three objectives:

- to understand the pollen morphological characters
- to provide an important source of phylogenetic information
- to give account of the pollen characters and structure of exine pattern

Research Methodology

These specimens were collected from Tawma Village, Sintgaing Township. Data collection was made from 2018 October to 2019 February. All the collected species were recorded by colored photographs while flowering times. All the collected specimens had been identified and described by fresh specimens. According to the resulting morphological characters, the plants were identified by using the floristic literature. The identification of each species was referred to Dassanayake (1983).

Collection of pollen samples

Fresh pollens of each species were stored in small glass vials with 1cc of glacial acetic acid and the specimen was labeled with scientific name.

Acetolysis of reference material

(1) The specimen in a glass vial was crushed with a glass rod and 1cc acetic acid was added to it.

(2) The above mixture was transferred into a test tube and a few drops (depending on the amount and quality of the specimen) of concentrated sulphuric acid were added.

(3) The mixture was heated in a water-bath for 15-30 minutes (depending on the size and sculpture of the pollen grain).

(4) After heating, the material was allowed to cool and then it was diluted with distilled water and transferred to a centrifuge tube and centrifuge for 15-30 minutes. This process was repeated at least twice.

(5) The distilled water was decanted and glycerin jelly with saffranin was added to the residue. This was then slightly warmed to evaporate the remaining water and finally cooled and stored in air-tight vials.

Preparation of glycerin jelly

The glycerin jelly was prepared according to Kissler's formula (Erdtman, 1952). 50 gm of gelatin, 150 ml of glycerin and 7 gm of phenol crystals were mixed with 175 ml of distilled water in a beaker and stirred with a glass rod. This mixture was heated in a water bath till homogenous, the process taking about 3 hours. 0.05 g of saffranin was finally added before removal and storage. Only the amount of material needed was removed from the bottle.

A water bath was used for warming the glycerin jelly to avoid overheating. A useful technique is to store in some of the jelly within the small glass vials. The content of a vial can then be warmed to liquefy it for daily use.

Preparation of slide

Firstly, the sample bottle was warmed in a water bath and stirred with a glass rod. A drop of melted glycerin jelly was taken out and placed on the glass slide, and then covered by a glass cover slip. The glass slide well mounted with pollen sample was examined by using light microscope with 40 X and imaged by Canon A2400IS digital camera. The micrometer was used to measure the size of pollen grain. 15-20 pollen grains per sample were measured. The terminology used in the identification of pollen was referred to Erdtman (1952), Moore & Webb (1991), Heese (2009), Hoen (1999) and Paldat (2005).

Measurement

All size pollen was first measured under the microscope; this was then cross-checked on the computer.

Results

In this study, 9 species belonging to 9 genera of 8 families under class Magnoliopsida (Dicotyledoneae) were studied. And then, these plants were detail investigated for their pollen characters.

Family – Acanthaceae

1. *Andrographis echioides* Nees.

Myanmar name - Unknown

Tricolporate; prolate, 52 - 60 x 42 - 51 μm in length and breadth; amb circular, colpi longicolpate, 47 - 53 x 7 - 10 μm in length and breadth; pori lolongate, 7 - 10 x 9.3 - 11.3 μm in length and breadth; exine 3.5 μm thick, sexine thicker than nexine; sculpturing reticulate; lumina heterobrochate 3-4 μm in width; muri simplibaculate about 0.5 μm wide.

Family - Asteraceae

2. *Eclipta prostrata* L.

Myanmar name - Kyeik hman

Tricolporate; spheroidal, 16 - 23 μm in diameter; amb rounded triangular; colpi $\frac{3}{4}$ way upto the pole, 13 - 15 x 4 - 5 μm in length and breadth; pori circular, 3 - 4 μm in diameter; exine 4 μm thick, sexine thicker than nexine; sculpturing echinate; spine pointed, 2.5 - 3.3 μm long, tip sharp.

3. *Tridax procumbens* L.

Myanmar name - Nay kya gale

Tetracolporate; spheroidal, 19 - 20 x 26 - 27 μm in length and breadth; amb rounded quadrangular; colpi longicolpate, 15 - 16 x 2.5 - 3.0 μm in length and breadth; pori lalongate, 1 - 2 x 2 - 3 μm in length and breadth; exine 4 μm thick, sexine thicker than nexine; sculpturing echinate; spine pointed, 3 - 4 μm long, tip sharp.

Family - Boraginaceae

4. *Heliotropium indicum* L.

Myanmar name - Sin namaung gyi

Tricolporate; prolate, 30 - 40 x 21 - 30 μm in length and breadth; amb circular; colpi brevicolpate, 7.5 - 9.5 x 2 - 3 μm in length and breadth; pori lalongate, 4 - 6 x 6 - 8 μm in length and breadth; exine about 3 μm thick, sexine thicker than nexine; sculpturing obscurely reticulate.

Family – Euphorbiaceae

5. *Euphorbia geniculata* Orteg., Hort.

Myanmar name - Se pale

Tricolporate; prolate, 45 - 48 x 40 - 43 μm in length and breadth; amb trilobed; colpi longicolpate, 44 - 45 x 4 - 8 μm in length and breadth; pori circular, 4 - 7 μm in diameter; exine 4.0 - 4.5 μm thick, sexine thicker than nexine; sculpturing retipilate; lumina heterobrochate; muri simplibaculate.

Family - Lamiaceae

6. *Ocimum basilicum* L.

Myanmar name - Pin sein

Hexacolpate; peroblate, 40 - 43 x 55 - 65 μm in length and breadth; amb circular; colpi longicolpate, 40 - 50 x 2 - 5 μm in length and breadth; exine 4.5 μm thick, sexine thicker than nexine; sculpturing reticulate; lumina heterobrochate; muri simplibaculate.

Family - Rubiaceae**7. *Spermacoce articularis* L.f.****Myanmar name - Unknown**

Polyporate; oblate, 60 - 63 x 59 - 62 μm in length and breadth; amb circular; colpi 10 -12 in number, colpi brevicolpate, 8.5 - 10.5 x 3.0 - 5.0 μm in length breadth; exine 3 μm thick; sexine thicker than nexine; sculpturing reticulate; lumina heterobrochate; muri simplibaculate.

Family - Solanaceae**8. *Physalis angulata* L.****Myanmar name - Bauk the**

Tricolporate; subprolate, 20 -25 x 18 - 28 μm in length and breadth; amb rounded triangular; colpi longicolpate, 15 - 16 x 3 - 5 μm in length and breadth; pori lalongate, 3 - 5 x 6 - 8 μm in length and breadth; exine 1.5 - 2 μm thick, sexine thinner than nexine; sculpturing obscurely reticulate.

Family - Zygophyllaceae**9. *Tribulus terrestris* L.****Myanmar name - Tsu le**

Polyporate (about 30), subspheroidal in surface view, 40 - 45 μm in diameter; amb circular; pori 2.5 - 3 μm in diameter; exine 2.5 - 3.5 μm thick, sexine thicker than nexine; sculpturing retipilate; lumina heterobrochate; muri about 1.3 μm wide, pila surrounding the pore, forming a polygonal shaped boundaries.

**Discussion and Conclusion**

In this present study, pollen morphology of 9 species from 9 genera of 8 families had been investigated. And then study of pollen morphology was also presented.

In this study, the pollen of *Andrographis echinoides* Nees. wall was tricolporate in polar view, prolate in equatorial view and distinctly reticulate sculpture. In *A. echinoides* Nees., the lologate pores were similarly investigated in the previous study.

In *Eclipta prostrata* L., the pollens were tricolporate, spheroidal, rounded triangular and sculpturing echinate; tetracolporate in *Tridax procumbens* L. All of these finding by previous study were corroborated with the study of recent findings.

The pollen characters of *Heliotropium indicum* L. were tricolporate, prolate and sculpturing retipilate. These findings were same with previously studied.

The specie of family Euphorbiaceae was *Euphorbia geniculata* Orteg., Hort. In this specie, the pollen grains were tricolporate, prolate and sculpturing retipilate. These characters investigated by previous study were agreed with the present study.

In this paper, *Ocimum basilicum* L. was described the hexacolpate and peroblate of pollen grains. But the previous author said the pollen grains were hexacolpate and oblate.

The pollen characters of *Spermacoce articularis* L.f. were polyporate, oblate and sculpturing reticulate. These findings were corroborated with the previous study.

The pollen characters of *Physalis angulata* L. were tricolporate, subprolate and sculpturing obscurely reticulate. All of these findings by previous study were corroborated with the study of recent findings.

The pollen characters of *Tribulus terrestris* L. were polyporate, spheroidal and sculpturing retipilate. These findings were similarly investigated in the previous study.

In this study, classification of pollen characters are described on apertures and exine sculpture and then based on other characters such as sizes, shapes, exine thickness, lumina width and muri wide. It is sincerely hoped that these results can provide the information for the systematic classification and identification of the families.

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