

Pollen Morphology of Some Ornamental Plants in Yadanabon University Campus, Mandalay

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Abstract

Pollen morphology of some ornamental plants obtained from Yadanabon University Campus was made. The results showed that total fifteen species pollen taxa were identified belonging to 10 families and 14 genera. The pollen investigated belonging to woody, shrubby and climbing vegetation. Pollen morphology of studied species has been examined by light microscope. The preparations of pollen grain were described standard acetolysis method (Erdtman, 1952). In this study, some pollen morphological features including grain arrangements, numbers of aperture, exine sculpture, shapes and sizes of grain and types of pori and colpi were examined. All grain arrangements were monad. Colpate, colporate and porate aperture types were characterized in all the pollen taxa. The exine sculpturing patterns of studied pollen taxa ranged from psilate, granulate, gemmate, microreticulate, reticulate, strioreticulate to echinate. The shapes of all pollen grain varied from oblate, oblate-spheroidal, prolate, prolate-spheroidal to spheroidal.

Key words: Pollen morphology, monad, apertures, sculpturing

Introduction

The pollen morphology of some ornamental plants from Yadanabon University Campus, Mandalay was presented. The study area is situated in the Amarapura Township, Mandalay District, Myanmar. The present report gives an account the pollen morphology of 15 species belonging to 14 genera distributed in 10 families.

Palynology, a term coined by Hyde and Williams (Hyde 1944) means pollen and spore science. It deals with the walls of pollen grains and spores, not with their live interior. Pollen grain, a coarse to powdery substance produced by matured flowering plants is a distinctive natural marker that does not easily decay due to the possession of resistant organic-walled substance called sporopollenin (Agwu, 2005). Palynological studies are not only helpful in solving many taxonomic problems but it also plays an important role in daily life, for instance aeropalynology is the study of palynology in relation to airborne pollen grains and spores which are the main source of different types of allergies like asthma and hay fever (Aftab & Perveen, 2006).

This paper aimed at studying the fifteen species of pollen characters for plant identification and giving as a reference pollen guide for further studies.

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Materials and Methods

The pollen grains were collected from Yadanabon University Campus during 2018-2019. Specimens were identified using by references material of Flora of Ceylon (1981-1998) and Flora of China (1996-2008). Pollen samples were obtained from fresh flowers that were collected during anthesis. These grains were fixed in acetic acid and stored in bottle. After fixing, the pollen preparations were used by acetolysis methods (Erdtman, 1952). The pollen sample was investigated using a light microscope. The measurements are based on 20-25 grains from each specimen. The terminology used in based on Erdtman (1952), Hoen (1999) and Hesse *et al* (2009).

Results

The description of the pollen grains is arranged in alphabetical order by family. Pollen characters used in this study included pollen unit, shape, size, and aperture type and sculpture patterns. Figure 1 to 2 shows pollen photomicrographs of the studied species.

Apocyanaceae

Nerium oleander L. : Monad, tetraporate, oblate, 30-35 x 40-50 μm in length and breadth; amb circular; pori lolongate, 5.5-6.0 x 3.5-4.5 μm in length and breadth; exine 1.5-2.0 μm thick, sexine as thick as nexine; sculpturing psilate.

Plumeria acutifolia Poir. : Monad, tricolporate, oblate-spheroidal, 23.5-25.5 x 27.5-30.0 μm in length and breadth; amb triangular with straight sides, angulaperturate; colpi longicolpate, 15.5-20.0 x 4.0-6.5 μm in length and breadth; pori lolongate, 6.25-7.50 x 5.0-5.5 μm in length and breadth; exine 1.25-2.00 μm thick, sexine thicker than nexine; sculpturing microreticulate.

Thevetia peruviana (Pers.) K. Schum. : Monad, tricolporate, oblate-spheroidal, 60.0-67.5 x 65.5-70.5 μm in length and breadth; amb triangular with straight sides, angulaperturate; colpi brevicolpate, 25.5-27.0 x 5.0-7.5 μm in length and breadth; pori lolongate, 12.5-15.0 x 3.00-3.75 μm in length and breadth; exine about 5 μm thick, sexine thicker than nexine; sculpturing granulate.

Bignoniaceae

Tecoma stans (L.) Juss.exKunth. : Monad, tricolpate, oblate, 25.5-30.5 x 45.0-55.5 μm in length and breadth; amb circular; colpi longicolpate, 25.5-27.0 x 7.5-10.5 μm in

length and breadth; exine about 3 μm thick, sexine thicker than nexine; sculpturing microreticulate.

Clusiaceae

***Mesua ferrea* L.** : Monad, tricolporate, oblate-spheroidal, 45.0-62.5 x 47.5-65.0 μm in length and breadth; amb circular; colpi longicolpate, 27.5-37.5 x 7.5-10.0 μm in length and breadth; pori lolongate, 10.5-12.5 x 7.5-10.0 μm in length and breadth; exine 1.25-2.50 μm thick, sexine as thick as nexine; sculpturing microreticulate.

Convolvulaceae

***Ipomoea carnea* Jacq.** : Monad, polyporate, spheroidal, 105-115 μm in diameter; pores about 75, circular; 8-12 μm in diameter; interporal space 4.5-7.5 μm ; exine 2.5-4.5 μm thick; sexine thicker than nexine; sculpturing echinate; spine 8.5-12.5 μm in length, straight, pointed, slender; interspinal space 10-13 μm .

Fabaceae

***Bauhinia acuminata* L.** : Monad, tricolpate, prolate, 75.5-90.0 x 65.5-85.0 μm in length and breadth, amb circular, colpi longicolpate, 50.5-65.5 x 20.5-25.0 μm in length and breadth; exine 1.5-2.0 μm thick, sexine as thick as nexine; sculpturing gemmate, each gemma 4.5-9.5 μm in diameter.

***Bauhinia purpurea* L.** : Monad, tricolpate, oblate-spheroidal, 65.5-70.5 x 70-80 μm in length and breadth, amb circular, colpi longicolpate, 50.5-65.5 x 20.5-25.0 μm in length and breadth; exine 2.0-2.5 μm thick, sexine as thick as nexine; sculpturing strioreticulate.

***Caesalpinia pulcherrima* (L.) Swartz.** : Monad, tricolporate, oblate-spheroidal, 68.5-73.5 x 70-75 μm in length and breadth; colpi syncolpate, 62.0-65.5 x 25.5-30.5 μm in length and breadth, colpi membrane reticulate; pori lolongate, 16.0-21.5 x 12.5-18.5 μm in length and breadth; exine 2.5-3.5 μm thick, sexine thicker than nexine; sculpturing reticulate, the lumina heterobrochate, 2.0-3.5 μm in width, the muri simplibaculate, about 1.25 μm wide.

***Parkinsonia aculeata* L.** : Monad, tricolporate, prolate to prolate-spheroidal, 21.5-27.0 x 20-25 μm in length and breadth; amb circular; colpi longicolpate, 20-25 x 4-5

µm in length and breadth; pori circular, 12.5-15.0 µm in diameter; exine about 3.5 µm thick, sexine as thick as nexine; sculpturing reticulate, the lumina heterobrochate, 2.5-7.0 µm in width, the muri simplibaculate, about 1.25 µm wide.

Malvaceae

Hibiscus rosa-sinensis L. : Monad, polyporate, spheroidal, 115-120 µm in diameter; pores about 80, circular; 5-7 µm in diameter; interporal space 4.0-6.5 µm; exine 2.5-3.5 µm thick; sexine thicker than nexine; sculpturing echinate; spine 10.5-12.5 µm in length, straight, pointed, slender; interspinal space 10-15 µm.

Meliaceae

Melia azedarach L. : Monad, tetracolporate, prolate, 40.0-42.5 x 35-40 µm in length and breadth; amb circular; colpi longicolpate, 30-33 x 5.0-7.5 µm in length and breadth; pori lalongate, 4.5-5.0 x 7.5-10.0 µm in length and breadth; exine 2.5-3.0 µm thick, sexine thicker than nexine; sculpturing microreticulate.

Nyctaginaceae

Bougainvillea spectabilis Willd. : Monad, tricolpate, oblate, 30-35x 40-50 µm in length and breadth; amb circular; colpi longicolpate, 20-22 x 3.5-4.5µm in length and breadth; exine 3.5- 5.5 µm thick; sexine thinner than nexine; sculpturing reticulate, the lumina heterobrochate, 3.5-5.5 µm in with, the muri simplibacullate, about 1.5 µm wide.

Rubiaceae

Ixora coccinea L. : Monad, tricolporate, prolate, 35.5-40.5 x 20-25 µm in length and breadth; amb circular; colpi parasyncolpate, 25-30 x 4.0-5.5 µm in length and breadth; pori lalongate, 2.5-3.5 x 5.5-7.5 µm in length and breadth; exine 2.5-3.0 µm thick, sexine thicker than nexine; sculpturing microreticulate.

Sapotaceae

Mimusops elengi L. : Monad, tetracolporate, prolate, 40.0-42.5 x 35-40 µm in length and breadth; amb quadrangular; colpi longicolpate, 25.0-27.5 x 5.0-7.5 µm in length and breadth; pori lalongate, 5.00-6.26 x 7.50-7.75 µm in length and breadth; exine 1.5-2.0 µm thick, sexine as thick as nexine; sculpturing psilate.

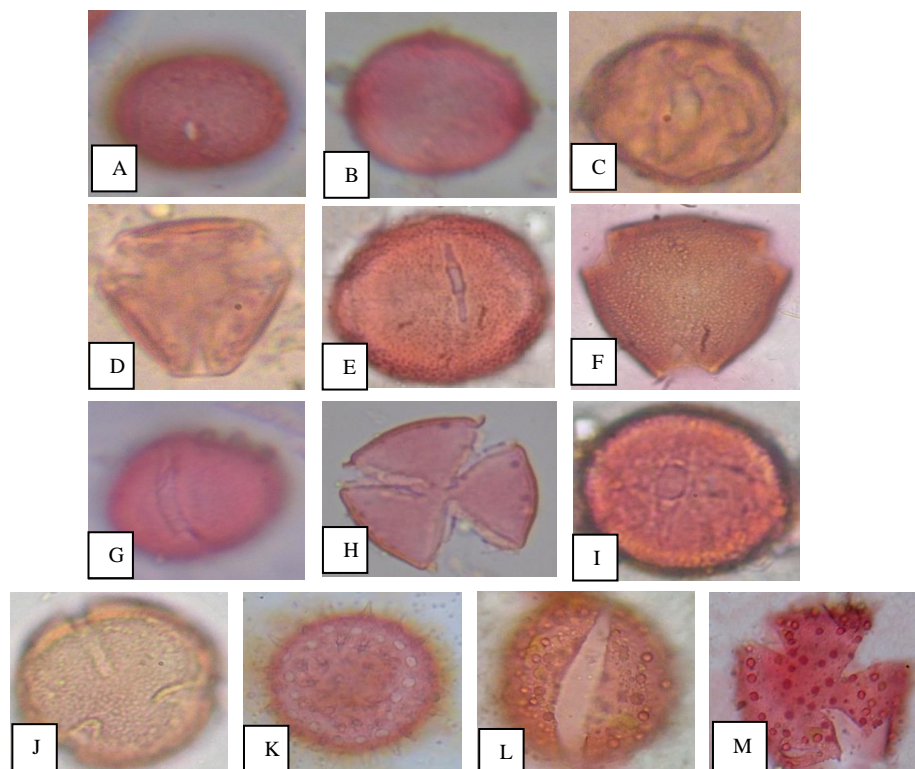


Figure 1. Microphotographs showing the pollen grains of collected species; A. equatorial and B. polar views of *Nerium oleander*; C. equatorial and D. polar views of *Plumeria acutifolia*; E. equatorial and F. polar views of *Thevetia peruviana*; G. equatorial and H. polar views of *Tecoma stans*; I. equatorial and J. polar views of *Mesua ferrea*; K. surface view of *Ipomoea carnea*; L. equatorial and M. polar views of *Bauhinia acuminata*;

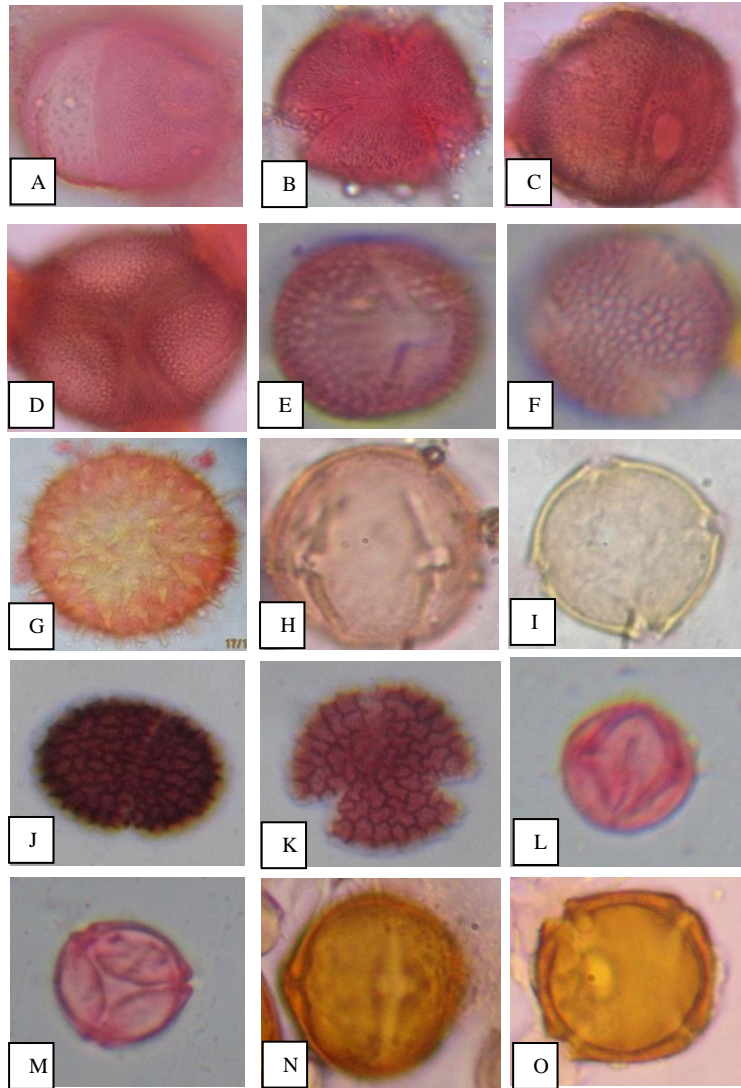


Figure 2. Microphotographs showing the pollen grains of collected species; A. equatorial and B. polar views of *Bauhinia purpurea* C. equatorial and D. polar views of *Caesalpinia pulcherrima*; E. equatorial and F. polar views of *Parkinsonia aculeata*; G. surface view of *Hibiscus rosa-sinensis*; H. equatorial and I. polar views of *Melia azedarach*; J. equatorial and K. polar views of *Bougainvillea spectabilis*; L. equatorial and M. polar views of *Ixora coccinea* N. equatorial and O. polar views of *Mimusops elengi*

Discussion and Conclusion

The ornamental plants in studied area exhibited great diversity in their pollen characters such as in apertures, shape, size and exine patterns. However, the exine patterns and apertural types are the most significant pollen characters. Apertural type has been found to be useful taxonomic character, especially at the tribe level (El Naggar *et al.*, 2008). The result of this study revealed 3 apertural types. Pollen type- 1 is characterized by its porate pollen. Three species have porate pollen. However, in *Ipomoea carnea* and *Hibiscus rosa-sinensis* are

polyporate whereas in *Nerium oleander* is tetraporate. Pollen type- 2 is easily recognized by having colpate pollen. Tricolpate pollen is found in four species such as *Tecoma stans*, *Bauhinia acuminata* and *Bauhinia purpurea* and *Bougainvillea spectabilis*. Pollen type-3 is observed by having colpate pollen. Tricolporate grain is mostly found in *Plumeria acutifolia*, *Thevetia peruviana*, *Mesua ferrea*, *Caesalpinia pulcherrima*, *Parkinsonia aculeata* and *Ixora coccinea*. Two species were tetracolporate (*Mimusops elengi* and *Melia azedarach*). According to (Yu et al, 2018), the taxa having colpate pollen grains reveals primitive evolutionary status while taxa with other types of aperture revealed advanced status.

Pollen shape is another important diagnostic character of taxonomic value. Five pollen shapes were recorded for the study. The recorded shapes are prolate, prolate-spheroidal, oblate, oblate-spheroidal and spheroidal. Yu et al (2014) reported the grain having oblate show primitive character while those having other characters reveals advanced status. Pollen grain of the studied taxa varied greatly in size among the different species. According to (Erdtman, 1952), pollen grains are grouped based on their sizes into very small pollens, small pollens, medium pollens, large pollens, very large pollens and giant pollens. This classification reveals that pollen grains of the studied species ranged from medium to very large. As investigated in this study, pollen grains of most studied taxa are considered to be the largest among Angiosperms, especially for members of Malvaceae and Convolvulaceae.

The diversity of exine ornamentation was observed in seven patterns. Reticulate exine types were found in two species of Fabaceae (*Caesalpinia pulcherrima* and *Parkinsonia aculeata*) and one species of Nyctaginaceae (*Bougainvillea spectabilis*). The microreticulate exine ornamentation was presented in five species (*Plumeria acutifolia*, *Tecoma stans*, *Mesua ferrea*, *Melia azedarach* and *Ixora coccinea*). Echininate patterns were observed in *Ipomoea carnea* and *Hibiscus rosa-sinensis*. Granulate, gemmate and strioreticulate exine patterns were examined in *Thevetia peruviana*, *Bauhinia acuminata* and *Bauhinia purpurea* respectively. The psilate sculpture was presented in *Nerium oleander* and *Mimusops elengi*.

In conclusion, the differences and similarities observed in the pollen characters of the studied taxa give evidence for the importance of palynology in separation and outline of taxa.

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