

## Palynological Study on Some Plants from Shwe-nat-taung Area in Shwedaung Township

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### Abstract

The pollen morphological characteristics of 12 species belonging to 12 genera of 12 families were studied. The specimens were collected from Shwe-nat-taung Area, Shwedaung Township, Pyay District, Bago Region (West) during flowering period. The collected specimens represent only one species in each family of Orchidaceae, Asphodelaceae, Costaceae, Zingiberaceae, Fabaceae, Plumbaginaceae, Rubiaceae, Loganiaceae, Apocynaceae, Convolvulaceae, Acanthaceae and Verbenaceae. The morphological characters on pollen grains of each species showed the pollinia, polyad and monads. In this paper, the type of pollen grains, the shape of pollens and the type of exine ornamentation were studied. The pollen photomicrographs of each species was presented by polar and equatorial view. The pollen morphology provides the knowledge for identification and systematic research work.

Key words: pollen grains, exine ornamentation, stamens.

### Introduction

Palynology is the study of spores or pollen grains and the principle tool used for correct identification. Pollen morphology is one of the most important and fundamental branches of palynology. Pollen grains have a number of morphological and ultra-structural features. These palynological features have provided a wealth of characters that have been important in inferring phylogenetic relationship of plants (Simpson, 2006).

The morphological studies of pollens are very important. It is also used in the field agriculture, forestry, archaeology and plant geography (Aftab & Perveen, 2006). Walker & Doyle (1975) stated that principal pollen characters are phylogenetically useful at higher taxonomic levels and many palynological characters and concepts are subjected to re-examination, particularly in an evolutionary phylogenetic context. The examination of pollen grains, both recent and ancient, can be of value in a range of scientific studies (Moore *et al.*, 1991).

The study of pollen morphology helps in the confirmation of relationship and affinities between the related taxa. Pollens of related families and genera are usually of more or less the same type. The sculpture and pattern of outer wall, exine, the number of apertures on the wall, size and shape of the pollen grains, etc. play an important role in identification and relationship of plants at various taxonomic levels (Nair *et al.*, 1965).

The aims of this research are to study the pollen morphology of the collected species, to support some information into the features use for pollen identification and to provide the valuable pollen characters that can be used in plant classification and identification.

### Materials and Methods

The specimens were collected from Shwe-nat-taung Area, Shwedaung Township, Bago region (west). The study area lies between north latitudes 18°33'20" & 18°5'40" and east longitudes 95°10'30" & 95°14'35". All the specimens were recorded while flowering. Describing and classifying of the species were used fresh specimens. Identification of specimens were accomplished in accordance with the taxonomic procedures. By using floristic literatures of Hooker (1885), Backer (1963-1968), Ali and Nasir (1979-1990), Gilbert (1994), Dassanayake (1983-2000) and

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HU.Qi-ming & WU Delin (SCBG), (2007-2009). Myanmar names were referred to Hundley and Chit Ko Ko (1987) and Kress *et al.* (2003). In the present study, these species were arranged in types of pollen grains.

For the pollen study, pollen samples of the specimens were freshly collected from the anthers in blooming flowers. Pollens of each species were stored in glass vials with 1cc of glacial acetic acid/glass bottle with 99.9% alcohol and the specimen was labeled with its specific name. The pollen sample in glacial acetic acid was acetolysed by the standard acetolysis method of Erdtman (1952). The anther specimen in a glass vial were crushed with a glass rod and 1cc of glacial acetic acid were added and then transferred into a test tube, and 5-9 drops of concentrated sulphuric acid was added depending on the amount of pollen materials. The test tubes were put in a water-bath for 15-30 minutes at 70-80°C.

The fluid in the test tubes were stirred frequently, and after boiling, it was centrifuged with distilled water and decanting the clear parts. These were carried out repeatedly for 3 or more times. Then, glycerine jelly with safranin was added to the polliniferous materials according to the method of Kisser formula (Erdtman, 1952).

For the pollen study, the storage bottles were warmed in water bath and a drop of polliniferous jelly was taken out and placed on the glass slide and then covered with a glass coverslip. A glass slide mounted with pollen sample was examined under electric light microscope with (x400) and photomicrograph. The samples of pollen grains for each species were measured and studied. The shape, size, and exine sculpture of the pollens were studied and recorded by photographs.

### Results

In pollen morphology, the 12 species belonging to the 12 genera of 12 families were identified and studied the morphological characteristics of pollen grains.

#### Pollen Morphology of Study Species

- ***Habenaria* spp.**, Sp. Orchid. Pl. 311. 1835.  
 Family : Orchidaceae  
 Myanmar Name : Notknown  
 English Name : Notknown  
 Masscular (pollen grains are connected together to form a type of composite pollen). Pollen grains are linked together to form the masscular club shape, 212.5-150µm in length, super gigantic, sculpturing striate.
- ***Boesenbergia rotunda* (L.) Mansf.**, in Kulturpfl. Vi. 239. 1958.  
 Family : Zingiberaceae  
 Myanmar Name : Seik-phoo  
 English Name : Finger root  
 Inaperturate, elliptic (obtuse), 35.0-37.5 x 25 µm in length and breadth, coherent exine, exine about 0.75 µm thick; sculpturing faintly reticulate.
- ***Aloe vera* (L) Burm.f.**, Boiss., Fl. Or. 5: 329. 1882.  
 Family : Asphodelaceae  
 Myanmar Name : Shazaung-lat-pat  
 English Name : Aloe  
 Monosulcate, zonosulcate, boat shaped, 23.7-25.0 x 17.5-20.0 µm in length and breadth; amb elliptic; colpi longicolate; exine about 1.25 µm thick; sculpturing faintly reticulate.
- ***Costus speciosus* Sm.**, Trans. Linn. Soc.London 1: 249. 1791.  
 Family : Costaceae  
 Myanmar Name : Hpalan-taunghmwe

English Name : Indian spiral ginger  
 Twosulcate, prolate spheroidal, 60.0-77.5 x 57.5- 75 µm in length and breadth; amb ribbon shape; circum aperturate; exine tenuimarginate (thin), about 0.5-0.7µm thick, sexine thinner than nexine; sculpturing gammate.

- ***Albizia procera* (Roxburgh.) Benth.** London J.Bot. 3:89,1844.  
 Family : Fabaceae  
 Myanmar Name : Sit  
 English Name : Tall siris  
 Polyad (12), 60-75 µm in diameter; amb oval-circular; each grain triporate; oblate; pori circular; exine 2.5-3.7 µm thick; sculpturing psilate.
- ***Plumbago zeylanica* L.**, Sp. Pl. 151. 1753.  
 Family : Plumbaginaceae  
 Myanmar Name : Kant-chok-pyu  
 English Name : Ceylon leadwort  
 Tricolpate, zonocolpate, suboblate, 38.7-42.5 x 47.5-48.7µm in length and breadth; amb rounded triangular; colpi longicolpate; exine 2.5-5.0 µm thick; sculpturing foveolate.
- ***Morinda persicaefolia* Buch.** Ham, Trans. Linn. Soc. 8:535. 1822.  
 Family : Rubiaceae  
 Myanmar Name : Taw-sabe:  
 English Name : Not known  
 Tricolporate, zonocolporate, oblate spheroidal, 31.2-32.5 x 33.7 - 37.5 µm in length and breadth; amb rounded triangular; colpi longicolpate; pori lolongate; exine about 2.5 µm thick; sculpturing reticulate.
- ***Strychnos nux-vomica* L.**, Sp. Pl. 189. 1753.  
 Family : Loganiaceae  
 Myanmar Name : Kha-baung, Khabaung-gyi  
 English Name : Myanmar strychnine  
 Tricolporate, zonocolporate, suboblate, 20.0-21.2 x 22.5-25.0 µm in length and breadth; amb rounded triangular; colpi longicolpate; pori lolongate; exine 1.2 - 1.7 µm thick; sculpturing reticulate.
- ***Holarrhena antidysenterica* Wall.** Ex A.DC., Prodr, 8: 413. 1844.  
 Family : Apocynaceae  
 Myanmar Name : Lettok-gyi  
 English Name : Pandhra kuda  
 Triporate, zonoporate, sub spheroidal, 20.0 -25.0 x 22.5-27.5 µm in length and breadth; amb rounded; pori circular, 2.5-6.2 µm in diameter; exine 0.7-1.2µm thick; sculpturing reticulate.,
- ***Ipomoea hederifolia* L.** Syat. Nat. (ed.10) 925. 1759.  
 Family : Convolvulaceae  
 Myanmar Name : Myat-lay-ni-yaing  
 English Name : Star ipomoea  
 Polyporate, (about 50), pantoporate, spheroidal, 100 - 112.5 µm in diameter; amb circular; pori circular; exine 5.0 - 7.5 µm thick; sulpturing echinate
- ***Asystasia gangetica* (L.)T.Anderson.**, FRPS 70: 217. 2002.  
 Family : Acanthaceae  
 Myanmar Name : Kyauk-kwe  
 English Name : Chinese violet  
 Tricolporate, zonocolporate, prolate, 47.5-55.0 x 30- 35 µm in length and breadth; amb triangular; colpi longicolpate, pseudocolpi present; pori

alongate; exine 1.2 - 2.5  $\mu\text{m}$  thick, sexine thinner than nexine; sculpturing lophoreticulate.

- ***Lantana camara* L.**, Sp. Pl. 2: 627. 1753.

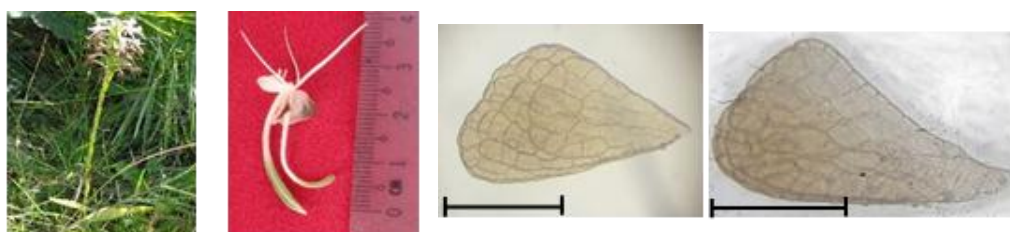
Family : Verbenaceae

Myanmar Name : Sein-na-ban

English Name : Lantana

Tri-tetra colporate, zonocolporate, spheroidal, 18.75 - 27.5  $\mu\text{m}$  in diameter; amb rounded tri-tetra angular; colpi longicollate; pori lolongate; exine 1.2 - 2.0  $\mu\text{m}$  thick; sculpturing faintly reticulate.

- ***Habenaria* spp.**



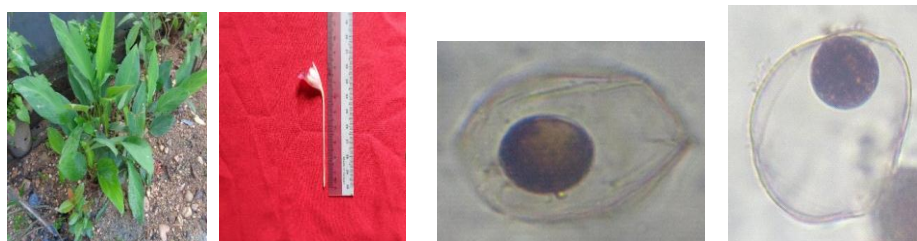
Habit

Flower

Surface view

Surface view

- ***Boesenbergia rotunda* (L.) Mansf**



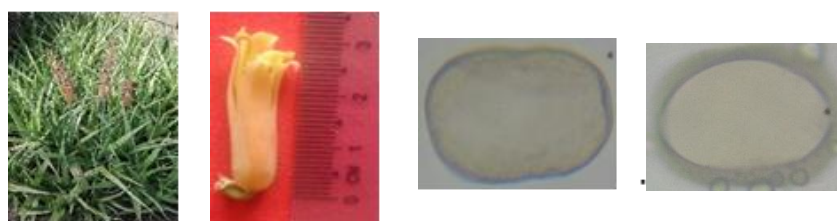
Habit

Flower

Surface view

Surface view

- ***Aloe vera* L.**



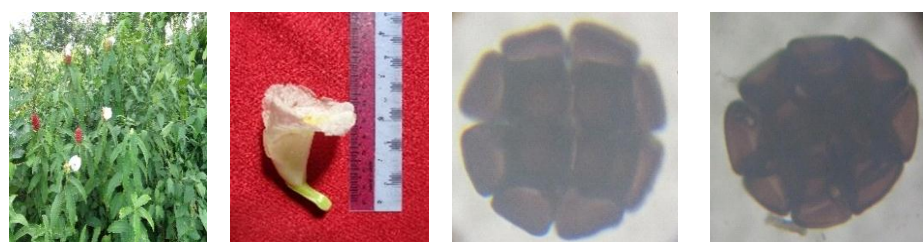
Habit

Flower

Polar view

Equatorial view

- ***Costus speciosus* Sm.**



Habit

Flower

Polar view

Equatorial view

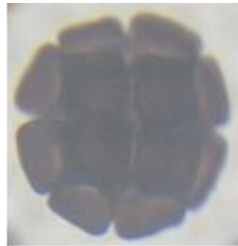
- ***Albizia procera* (Roxburgh.) Benthum**



Habit



Flower



Polar view



Equatorial view

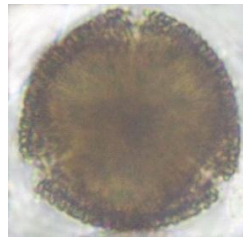
- ***Plumbago zeylanica* L.**



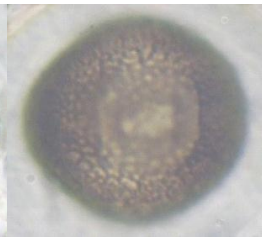
Habit



Flower



Polar view



Equatorial view

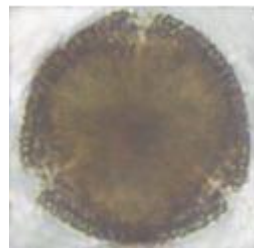
- ***Morinda persicaefolia* Buch.**



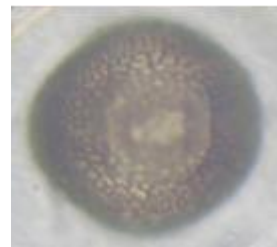
Habit



Flower



Polar view

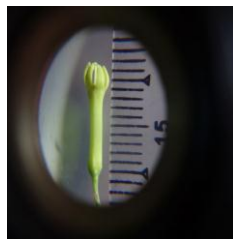


Equatorial view

- ***Strychnos nux-vomica* L.**



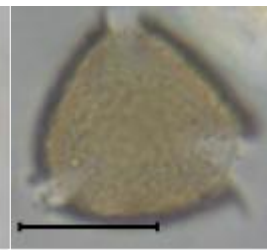
Habit



Flower



Polar view



Equatorial view

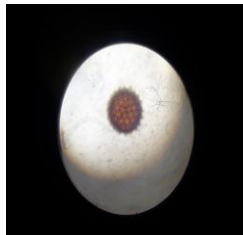
- ***Holarrhena antidysenterica* Wall.**



Habit



Flower

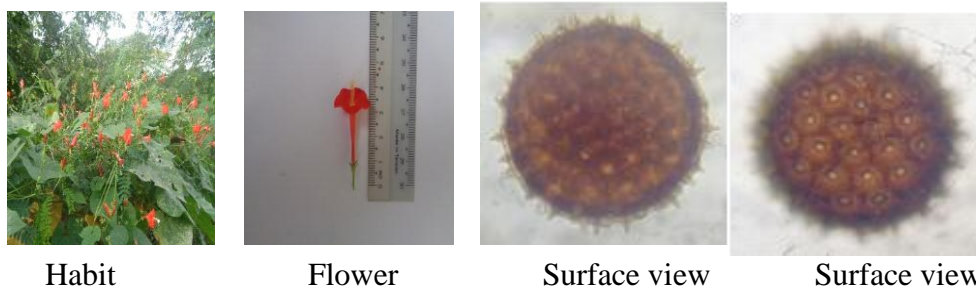


Polar view



Equatorial view

- *Ipomoea hederifolia* L.



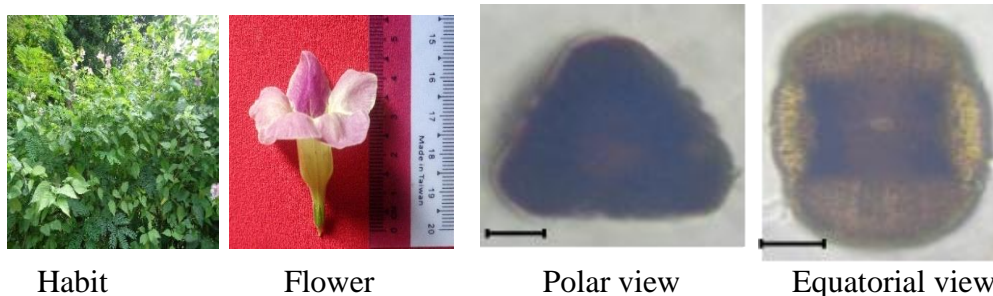
Habit

Flower

Surface view

Surface view

- *Asystasia gangetica* (L.) T. Anderson.

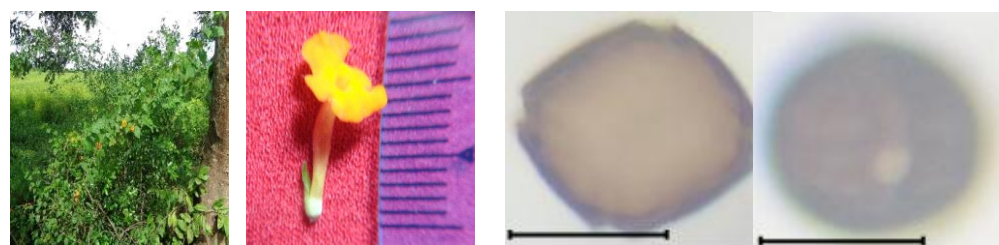


Habit

Flower

Polar view

Equatorial view



- *Lantana camara* L.

Habit

Flower

Polar view

Equatorial view

### Discussion and Conclusion

Pollen morphology of 12 species belonging to 12 genera of 12 families has been studied. All the species of these families were collected from Shwe-nat-taung and its surrounding area, Shwedaung Township, Bago Region (west).

According to phylogeny point of view, Endtman (1969) proposed the NPC system for the classification of pollen grains based on the number, position and characters of the aperture. From the collected species, *Habaneria* spp., *Aloe vera* L., *Costus speciosus* Sm. *Boesenbergia rotunda* (L.) Mansf. are monocots plants. They have inaperturate, 1 or 2 sulcate and then boat shaped pollen grains. The remaining species are eudicot plants. They have basically three aperturate.

The types of pollen grains found in this study were monads, polyad and masscular (pollen grains are connected together to form a type of composite pollen). Masscular was found in *Habaneria* spp. (Orchidaceae); polyad in one species of *Albizia procera* (Roxburgh.) Benthum (Fabaceae) and the rest species are monads.

With respect to the number of aperture, pollen may be classified as non aperturate and aperturate. In this study, non aperturate pollen grains are found in *Habaneria* spp., *Boesenbergia rotunda* (L.) Mansf.; the grains of the rest of the species are aperturate.

In aperturate, the investigated pollens may be colpate, colporate or porate. In the present study, 3 species are colpate, 4 species of colporate and 3 species are porate.

Thus the species of colpate grains are *Aloe vera* L., *Costus speciosus* Sm., *Plumbago zeylanica* L., So, these characters of colpate grains were in agreement with Endtman *et al* (1961). Based on the nature of colpi, Pike (1956) recognized three pollen types (1) longicolpate (2) syn or parasyncolpate and (3) brevicolpate. In the study, circum aperture grain is found in *Costus speciosus* Sm and the rest of the species are longicolpate. *Morinda persicaefolia* Buch. (Rubiaceae), *Strychnos nuxvomica* L. (Loganiaceae), *Asystasia gangetica* T.Anders., (Acanthaceae) and *Lantana camara* L. (Verbenaceae) are colporate grains .

According to these present research, these characters were in agreement with Endtman *et. al* (1961). *Holarrhena antidysenterica* Wall. (Apocynaceae), and *Ipomoea hederifolia* L. (Convolvulaceae) are porate grains. According to these present research, these characters were in agreement with Endtman *et al* (1961). Based on the nature of pori, Walker and Doyle (1975) described three pori shaped (1) circular, (2) lalongate and (3) lolongate.

In this study, the pori lolongate shaped of grain is found in *Strychnos nuxvomica* L. (Loganiaceae), *Lantana camara* L. (Verbenaceae); pori lalongate found in *Asystasia gangetica* T.Anderson. (Acanthaceae) and the rest of the species are circular. Based on the shape of equatorial view, angiosperm pollens can be grouped into 9 classes such as peroblate, oblate, suboblate, oblate-spheroidal, spheroidal, prolate-spheroidal, subprolate, prolate and perprolate grains (Walker and Doyle, 1975). In this research, oblate spheroidal grains are found in *Morinda persicaefolia* Buch. and the rest of the species are prolate, prolate spheroidal, oblate, sub oblate, sub spheroidal and spheroidal. In this paper, the sculpture patterns of these pollens were observed as striate, perforate, gammate, reticulate, faintly reticulate, lophoreticulate, foveolate, psilate and echinate.

It was concluded that in this study, inaperturate pollen grain is the most primitive than aperturate. Porate pollen grains are advanced type. Therefore, this research was not only for the taxonomic verification based on morphological and palynological point of view but also for providing the classification and identification of plants by valuable pollen characters. It is believed that the palynological study will be useful in phylogenetic relationship.

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