

PALYNOLOGICAL STUDY ON SOME SPECIES OF CONVOLVULACEAE FROM SHWEDAUNG TOWNSHIP

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Abstract

The pollen morphology of twelve species belonging to six genera of Convolvulaceae family were studied in the present paper. The pollen grains of all specimens were collected from Shwedaung Township, Bago Region (west). The pollen morphological characteristics of all species were studied. The aperture type and sculpture pattern of each grain were examined by electric microscope. Three types of aperture (tricolpate, pentacolpate and porate) and four types of exine sculpture echinate, granulate, reticulate and striato-reticulate are found. The outline of pollen images for each species were presented by polar and equatorial view and then were recorded by photomicrographs of clear cut pollen images and types of habit and flower.

Keywords: pollen grains, exine sculpture, flower.

Introduction

Palynology is the science of the study of plant pollens, spores, microscopic planktonic organisms, in both living and fossil form. Pollen morphology is one of the most important and fundamental branches of palynology. 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 number of apertures on the wall, size and shape of the pollen grains etc, play an important role in identification and relationships of plants at various taxonomic levels (Nair, 1964).

Palynology is the study of pollen and spores of plants. Spores and pollen grains have a number of morphological and ultrastructural 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. The examination of pollen grains, both recent and ancient can be of value in a range of scientific studied (Moore *et al.*, 1991).

The family Convolvulaceae comprise a large number of species (about 50 genera and over 1200 species; Lawrance, 1968). In Myanmar, about 133 species from 26 genera had been recorded by the previous studies of Kress *et al.* (2003).

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 Shwedaung Township, Bago region (west). Shwedaung Township is situated on the eastern bank of Ayeyarwady River in western of Bago Region. It lies between 18°20' 10" and 18°45' 0" north latitudes and 95°2' 20" and 95°23' 0" east longitudes.

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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 Lawrence (1968), Backer (1963-1968), Ali and Nasir (1979-1990), Gilbert (1994), Dassanayake (1983-2000) and HU.Qi-ming & WU Delin (SCBG), (2007-2009). Myanmar names were referred to Hundley and Chit Ko Ko (1987) and Kress *et al.* (2003).

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 were 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 then transferred into a test tube and 5-9 drops of concentrated sulphuric acid were 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 were centrifuged with distilled water and decanting the clear parts. These were carried out repeatedly for 3 or more times. Then glycerine jelly with safranin were 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 were 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, recorded by photographs.

Results

In pollen morphology, the 12 species belonging to the 5 genera of Convolvulaceae family were identified and studied the morphological characteristics of pollen grains.

Pollen Morphology of Study Species

1. *Argyrera barbiger* Choisy. Mem. Soc.Phys. Geneve 6: 424 (1833 publ. 1834)

Myanmar Name : Min-go-kha

English Name : Notknown

Flowering period : December to March

Polyporate (about 50), pantoporate, spheroidal, large, 70-80 µm in diameter; amb circular; pori circular, about 5 µm in diameter, inter poral spaces 7.5-10.0 µm ; exine about 5 µm in thick, sexine thicker than nexine; sculpturing echinate, spine 7.5-10.0 µm in length, straight, pointed.

2. *Camonea vitifolia* (Burm.f.) A.R.Simoes & Staples. Bot. J.Linn.Soc. 183:583 (2017)

Myanmar Name : Not-known

English Name : Grape glory

Flowering period : February to April

Pentacolpate, zonocolpate, suboblate, medium, 37.5-42.5 x 45.0-47.5 µm in length and breadth; amb rounded; colpi longicolpate, 25-30 x 5-10 µm in length and breadth; exine 1.7-2.5 µm thick, sexine thicker than nexine; sculpturing reticulate.

3. *Evolvulus alsinoides* (L.) L. Sp. Pl. ed. 2: 392 (1762)

Myanmar Name : Kyauk-hkwe-pan

English Name : Not-known

Flowering period : October – December

Tricolpate, zonocolpate, suboblate, large, 42.5-47.5 x 19.0-22. µm in length and breadth; amb rounded triangular; colpi longicolpate (38.5-43.5 x 17.5-18.5 µm in length and breadth; exine 3.7-3.8 µm thick, sexine thicker than nexine; sculpturing striato-reticulate.

4. *Ipomoea alba* L. p. Pl.: 161 (1753)

Myanmar Name : Nwe-kazon-phyu

English Name : Moon flower

Flowering period : September to December

Polyporate, (about 136), pantoporate, spheroidal, very large, 105-140 µm in diameter; amb circular; pori circular, 5.0-10 µm in diameter, inter poral spaces 7.5-10 µm in width,; exine 6.2-7.5 µm thick, sexine thinner than nexine; sculpturing echinate, spines 5.0-7.5 µm in length, rounded, globoid.

5. *Ipomoea carnea* Jacq. Enum. Syst. Pl.: 13 (1760)

Myanmar Name : Lathar-pan

English Name : Pink morning glory

Flowering period : October to December

Polyporate, (about 30), pantoporate, spheroidal, large-very large, 95-110 µm in diameter; amb circular; pori circular, 2.5-5.0 µm in diameter, inter poral spaces 10 - 12.5 µm in width; exine 3.7-5.0 µm thick, sexine thicker than nexine; sculpturing echinate, spines 10.0-12.5 µm in length, rounded, slightly curved.

6. *Ipomoea hederifolia* L., Syst. Nat. ed.10, 925 (1759)

Myanmar Name : Myat-lay-ni-yaing

English Name : Star Ipomoea or Scarlet creeper

Flowering period : October to December

Polyporate, (about 50), pantoporate, spheroidal, large-very large, 100 - 112.5 µm in diameter; amb circular; pori circular, 3.7 - 5.0 µm in diameter, inter poral spaces 10 - 11.2µm in width; exine 5.0 - 7.5 µm thick, sexine thicker than nexine; sulpturing echinate; spines about 5.0 µm in length, subacute, straight.

7. *Ipomoea nil* (L.) Roth. Catal. Bot. 1: 36 (1797)

Myanmar Name : Pan-kha-mauk

English Name : Blue morning glory

Flowering period : October to December

Polyporate, (about 60), pantoporate, spheroidal, 87.5-107.5 μm in diameter; amb circular; pori circular; exine 6.2-7.5 μm thick, sexine thicker than nexine; sculpturing echinate, spines 5.0 - 10 μm in length, subacute, straight.

8. *Ipomoea obscura* (L.) Ker Gawl. Bot. Reg. 3: t. 239 (1817)

Myanmar Name : Not known

English Name : Obscura morning glory

Flowering period : August to December

Polyporate, (about 30), pantoporate, spheroidal, large, 55-70 μm in diameter; amb circular; pori circular, 5.0-7.5 μm in diameter; exine 3.7-5.0 μm thick, sexine as thick as nexine; sulpturing echinate; spines 5.0-7.5 μm in length, pointed, straight.

9. *Ipomoea triloba* L. Sp. Pl.: 161 (1753)

Myanmar Name : Yoikha-ma-shokthwe

English Name : Aiea morning glory

Flowering period : September to December

Polyporate, (about 46), pantoporate, spheroidal, large, 55.0 - 67.5 μm in diameter; amb circular; pori circular, 2.5-5.0 μm in diameter; exine 2.5 -5.0 μm thick, sexine thinner than nexine; sculpturing echinate; spines 5.0-7.5 μm in length, pointed, straight.

10. *Merremia aegyptia* (L.) Urb. Symb. Antill. 4: 505 (1910)

Myanmar Name : Not-known

English Name : Hairy woodrose

Flowering period : October to December

Tricolpate, zonocolpate, suboblate, medium, 40-45 x 45-50 μm in length and breadth; amb rounded triangular; colpi longi colpate, 30-32.5 x 2.5-5 μm in length and breadth; exine 2.5-3.7 μm thick, sexine thicker than nexine; sculpturing striato-reticulate.

11. *Merremia gemella* (Burm.f.) Hallier f. Bot. Jahrb. Syst. 16: 552 (1893)

English Name : Not-known

Myanmar Name : Not-known

Flowering period : October – December

Tricolpate, zonocolpate, oblate spheroidal, medium, 35-37.5 x 40 μm in length and breadth; amb rounded triangular, colpi longicarpate, 10 x 2.0 -3.0 μm in length and breadth; exine 2.5 - 5.0 μm thick, sexine as thick as nexine; sculpturing granulate.

12. *Operculina turpethum* (L.) Silva Manso. Enum. Subst. Braz: 16. 1836.

Myanmar Name : Nyan-nwe; Kyar-hin

English Name : Transpaent woodrose

Flowering period : December to March

Tricolpate, zonocolpate, oblate spheroidal, large, 53.0-58.0 x 55.0-60.0 μm in length and breadth; amb rounded triangular; colpi longi colpate, 32.0-40.0 x 3.0 μm in length and breadth; exine 2.0-3.0 μm thick, sexine thicker than nexine; sculpturing striato-reticulate.

1. *Argyrera barbiger* Choisy.



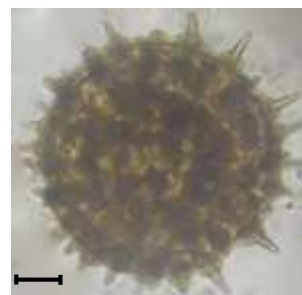
Habit



Flower



Surface view



Surface view

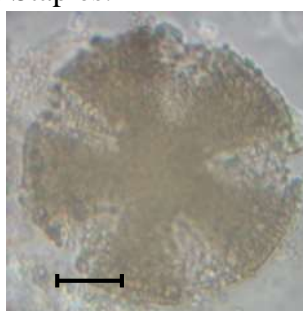
2. *Camonea vitifolia* (Burm.f.) A.R.Simoes & Staples.



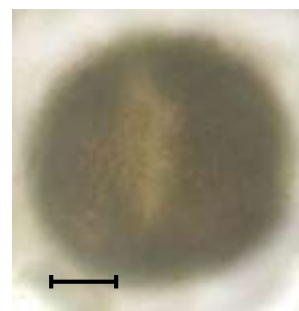
Habit



Flower



Polar view



Equatorial view

3. *Evovulus alisnoides* L.



Habit



Flower



Polar view



Equatorial view

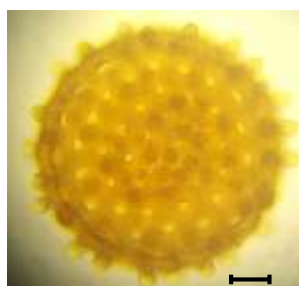
4. *Ipomoea alba* L.



Habit



Flower



Surface view



Surface view

5. *Ipomoea carnea* Jacq.

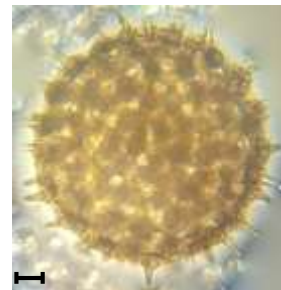
Habit



Flower



Surface view



Surface view

6. *Ipomoea hederifolia* L.

Habit



Flower



Surface view



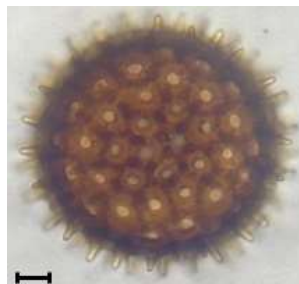
Surface view

7. *Ipomoea nil* (L.) Roth.

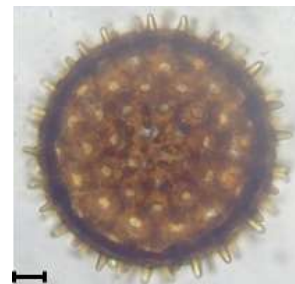
Habit



Flower



Surface view



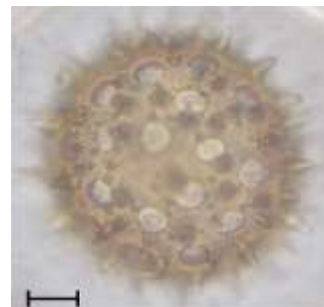
Surface view

8. *Ipomoea obscura* (L.) Ker Gawl.

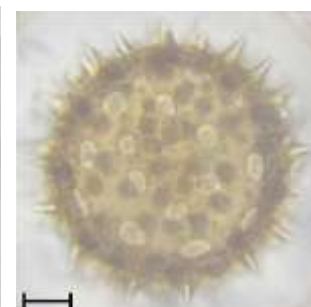
Habit



Flower



Surface view



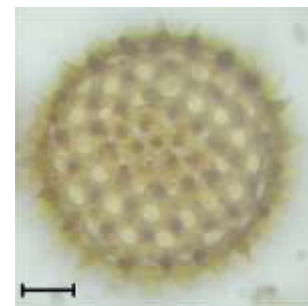
Surface view

9. *Ipomoea triloba* L.

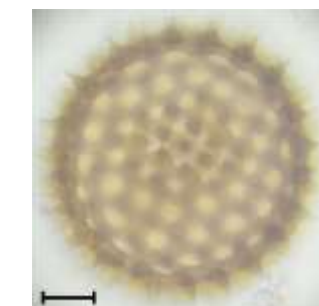
Habit



Flower



Surface view



Surface view

10. *Merremia aegyptia* (L.) Urb.

Habit



Flower



Polar view



Equatorial view

11. *Merremia gemella* (Burm.f.) Hallier.

Habit



Flower



Polar view



Equatorial view

12. *Operculina turpethum* (L.) Silva Manso.

Habit



Flower



Polar view



Equatorial view

Discussion and Conclusion

Family Convolvulaceae belonging to Order Solanales is one of the largest family of flowering plants. This family is widely distributed throughout the world but especially in the tropic and subtropic on both hemispheres and a few in temperate region. It is composed of about 1500 taxa (Cronquist; 1981). In Myanmar, about 133 species from 26 genera had been recorded by the previous studies of Kress *et al.* (2003). In the present paper, pollen morphology of 12 species belonging to 6 genera of family Convolvulaceae has been studied.

In the classification of taxa, taxonomic characters of pollen morphology are apertures type, number, position, sculpture, shapes and grain size. The types of all pollen grains occur in Convolvulaceae are colpate (sometimes colporate), rupate, rugate or forate (porate). The *Ipomoea* type- grains polyporate, very large, crassinexinous, spiniferous. The sexine consist of more or less rod like elements. These rods often coalesce with the spines to form basal rootlets (Erdtman *et al.*, 1961).

In the present paper, the type of pollen grains are colpate and porate. Among the colpate grains, tricolpate grains are found in *Evovulus alisnoides* L., *Merremia aegyptia* (L.) Urb., *M gemella* (Burm.f.) Hallier. and *Operculina turpethum* (L.) Silva Manso. Pentacolpate grains are found in *Camonea vitifolia* (Burm.f.) A.R.Simoes & Staples.. The rest of all *Ipomoea* species and *Argyrera barbigera* Choisy. are polyporate grains.

Hesse *et al.*, (2009) stated that pollen size varies less than 10µm to more than 100 µm. In this research, smallest pollen (35-37.5 x 40 µm in length and breadth) is found in *Merremia gemella* (Burm.f.) Hallier f. and the largest pollen (105-140 µm in diameter) is found in *Ipomoea alba* L.

In this study, the sculpture pattern of the pollens were observed as granulate, echinate, reticulate and striao-reticulate. The granulate sculpture is found in *Merremia gemella* (Burm.f.) Hallier f. The reticulate sculpture is found in *Camonea vitifolia* (Burm.f.) A.R.Simoes & Staples.. The striao-reticulate sculpture found in *Evolvulus alsinoides* L., *Merremia aegyptia* (L.) Urb., and *Operculina turpethum* (L.) Silva Manso.

The echinate sculpture is the distinct character of pollen grains in the family of Convolvulaceae representing the genus *Argyrera* and *Ipomoea*. The length and shape of spines in echinate sculpture of *Ipomea* varies according to the species. In the present study, the spines varies within range of 5.0- 12.5 µm in length. Among them, the largest spine of *Ipomoea carnea* Jacq. is 10.0-12.5 µm in length and the smallest spine about 5.0 µm in *Ipomoea hederifolia* L.

In the present study, the thickness of the exine in Convolvulaceae range was found between 1.7 µm and 7.5 µm in thick. The thinnest exine found in *Merremia* species and the thickness exine found in *Ipomoea* species.

Therefore, aperture and exine sculpture forms useful taxonomical characters in systematic study of Convolvulaceae. Hence, the pollen characters may support additional identification and classification of flowering plants. The present result will provide valuable information for the further studies of palynology.

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References

- Aftab, R., & A. Perveen. (2006). **A palynological study of some cultivated trees from Karachi**. Department of Botany University of Karachi-Pakistan.
- Ali, S. I., and Y. J. Nasir. (1979-1990.) **Flora of West Parkistan**. Department of Botany, University of Karachi, Karachi.
- Backer, C. A. (1963-1968). **Flora of Java Vol. 1-3**. Noordhoof & Groningen. The Netherlands.
- Byng J.W., M.W. Chase, M.J.M. Christenhusz & M.F. May. (2016). **An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV**. Botanical Journal of the Linnean Society 181:1-20
- Cronquist, A. (1981). **An Intergrated System of Classification of Flowering Plant**. Columbia University Press, New York.
- Dassanayake, M. D. (1980-2000). **A Revised Handbook to the flora of Ceylon**, Vol 1-14. Washington. D.C., U.S. A.
- Erdtman, G. (1952). **Pollen Morphology and Plant Taxonomy, Angiosperms**. Chron. Bot. Co., Waltham, Massachusetts.

- Erdtman, G., B. Berglund., and J. Pragłowski. (1961). **An Introduction to A Scandinavian Pollen Flora.** Boktryckery Aktiebolag, UPPSALA.
- Erdtman, G. (1969). **Handbook of Palynology** Munksgaard, Copenhagen.
- HLI. Qi – ming and WU Delin (SCBG), Hong Kong Herbarium. (2007-2009). **Flora of Hong Kong.** (Vol 1-3), Agriculture, Fisheries and Conservatiomn Department, Hong Kong.
- Hesse, M., Hakbritter, H., Zetter, R., Weber, M. (2009). **Pollen Terminology.** University of Vienna, Austria.
- Hundley, H. G., and Chit Ko Ko. (1987).**List of Trees, Shrubs, Herbs and Principle Climbers of Myanmar.** Government Printing Press, Yangon.
- Kress *et al.* (2003). **A Checklist of the Trees, Shrubs, Herbs and Climbers of Myanmar.** Department of Systematic and Biology-Botany, National Museum of Natural History Washington, D.C.
- Lawrence, G.H.M, (1968). Taxonomy of Vascular Plants. The Mecmillal Company: New Yoke.
- Moore, P. D. , J. A. Webb, and M. E. Collinson. (1991). **Pollen analysis**, Second edition. Blackwell Scientific Publications, Oxford, London.
- Nair, P.K.K. (1964). **Pollen Grains of Western Himalayan Plants.** Asia Publ. H., London.
- Simpson, M. G. (2006). **Plant Systematic.** Elsever Academic Press. 84 Theobaid's Road, London. WC1X 8RR, UK
- Walker, J. W. and Doyle, J. A. (1975). **The bases of angiosperm pholgeny: palynology.** Ann. Missouri Bot. Gard., 62: 664 –723.