

Pollen Morphology of Some Species of an Ornamental Plants Found in Mandalay and Its Surrounding Area

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Abstract

The pollen morphology of ten species of an ornamental plants from family Acanthaceae has been studied. The specimens were collected from Mandalay and its surrounding areas during December 2018 to December 2019. The aperture types of pollen grains are biporate, tetraporate, tricolpate and tricolporate. The exine sculptures of studied species are plicate, striate, obscurely and distinctly reticulate. The shapes of the pollen grains were variously found as prolate, perprolate, oblate and spheroidal in this research. The pollen description, an artificial key and colour photographs were also presented. This research paper will give different types of pollen information for identifying of various species.

Keywords: Pollen morphology, Ornamental Plants

Introduction

Palynology is the study of spores and pollen grains. Spores and pollen grains have a number of morphological and ultrastructural features. The characters of pollen grains can be used to identify a plant species. Pollen, the male gametophyte of flowering plants is the male partner in the fertilization process. The wall of pollen grains consists of two layers, exine (outer wall) and intine (inner wall). The exine may be smooth or ornamented and this distinctive ornamentation permits the identification of the pollen grains. The sculpturing of the exine and the constant features make pollen grains appreciably recognizable feature through which parent genera or even species can be recognized (Moore and Webb 1991).

Family Acanthaceae is one of the widely distributed families in tropical to subtropical and temperate regions. Kress *et. al.*, (2003) stated that 43 genera and 280 species were attributed to Myanmar. Most of the genera of family Acanthaceae are ornamental plants mainly because of their brightly coloured flowers which are sometimes large and massed in conspicuous inflorescences and the variegated bracts add to the attractiveness of inflorescences.

Erdtman (1952) described Acanthaceae pollens are isopolar, bilateral, di-polyaperturate, 2- to 4-porate; perprolate, prolate; colporate grains are sometimes provided with pseudocolpi. Some of the pollen in Acanthaceae are similar to those of the Bignoniaceae and the Pedaliaceae.

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The present paper focuses on type, shape, size, sculpture of pollen of ten species of an ornamental plants from family Acanthaceae. The aims of the present work are to construct pollen key for the plant identification of the studied species and to give the morphological differences systematically in pollen grains of the collected ornamental plants.

Materials and Methods

The specimens were collected from Mandalay and its surrounding area. The specimens were identified by referring to Backer (1965), Dassanayake (1998) and Kai Larsen (1991). The pollen grains were collected from the anther of flowers. These pollens are stored in glass vial with acetic acid.

Pollen samples were prepared by Erdtman's acetolyses method. And then pollen features were observed under light microscope and the pollen morphological characters were studied. For each species, polar and equatorial length, colpi length, pore diameter and exine thickness and sculpture were measured and recorded.

Finally, the literature of Hoen (1999) and Hesse *et al.*, (2009) was used for the terminology of the pollen.

Results

Ten species of ornamental plants from family Acanthaceae were identified and the morphological characteristics of pollen grains were studied.

An Artificial key to the Pollen Morphology

1. Porate -----2
1. Colpate and colpate -----3
 2. Tetraporate, pore without operculum-----7. *Odontonema strictum*
 2. Biporate, pore with operculum -----10. *Sanchezia parvibracteata*
3. Tricolpate -----3. *Crossandra infundibuliformis*
3. Tricolporate -----4
 4. Distinctly reticulate-----5
 4. Obscurely reticulate -----7
5. Pollen grain more than 70 in length-----1. *Asystasia gangetica*
5. Pollen grain less than 65 in length -----6
 6. Pori lalongate-----8. *Pachystachys lutea*
 6. Pori lolongate-----9. *Pseuderanthemum reticulatum*
7. Perporate -----5. *Justicia carnea*
7. Prolate ----- 8
 8. Pori circular-----4. *Ecbolium ligustrinum*

8. Pori lalongate-----9
9. Sexine as thick as nexine -----2. *Calliaspidia guttata*
9. Nexine thicker than sexine -----6. *Justicia decussata*

Description of pollen grains morphology

1. *Asystasia gangetica* (L.) T. Anders. (Fig. 1. A, B)

Tricolporate, prolate, 75-90×63-75 μm in length and breadth; pori lalongate, about 5.0×7.5 μm in length and breadth ; colpi longicolpate, 65-80×2.5 μm in length and breadth, obscurely pseudocolpi present, the number of pseudocolpi 6, the colpi alternate with two obscurely pseudocolpi; sculpturing distinctly reticulate, the lumina heterobrochate, 1.0-2.5 μm in width, the muri simplibaculate, about 1 μm wide ; exine about 5 μm thick, sexine thicker than nexine.

2. *Calliaspidia guttata* (Brandegg.) Bremek. (Fig. 2. A, B)

Tricolporate, prolate, 63-70×52-56 μm in length and breadth; pori lalongate, about 1.25×2.5 μm in length and breadth; colpi longicolpate, 58-63×2.5 μm in length and breadth, obscurely pseudocolpi present, the number of pseudocolpi 6, the colpi alternate with two obscurely pseudocolpi; sculpturing obscurely reticulate ; exine about 5 μm thick, sexine as thick as nexine.

3. *Crossandra infundibuliformis* (L.) Nees (Fig. 2. C, D)

Tricolpate, perprolate, 75-80×25-30 μm in length and breadth; colpi longicolpate, 70-75×2.5 μm in length and breadth; sculpturing obscurely reticulate; exine about 3.5 μm thick, sexine thicker than nexine.

4. *Ecbolium ligustrinum* (Vahl) Vollesen (Fig. 2. E, F)

Tricolporate, prolate, 60-70×55-60 μm in length and breadth; ambi circular; pori circular, about 12 μm in diameter; colpi longicolpate, 50-55×10 μm in length and breadth, distinctly pseudocolpi present, the number of pseudocolpi 6, the colpi alternate with two pseudocolpi; sculpturing obscurely reticulate; exine about 2.5 μm thick, sexine thicker than nexine.

5. *Justicia carnea* Hook. (Fig. 3. A, B)

Tricolporate, perprolate, 60-68×30-43 μm in length and breadth; pori lalongate, about 4.5×6.5 μm in length and breadth; colpi brevicolpate, 26-30×5 μm in length and breadth; sculpturing obscurely reticulate; exine about 2.28 μm thick, sexine as thick as nexine.

6. *Justicia decussata* Roxb. (Fig. 3. C,D)

Tricolporate, prolate, 45-50×35-40 μm in length and breadth; pori lalongate, about 1.5×3.5 μm in length and breadth; colpi longicolpate, 40-47×2.5 μm in length and breadth, distinctly pseudocolpi present, the number of pseudocolpi 6, the colpi alternate with two pseudocolpi; sculpturing obscurely reticulate; exine about 5 μm thick, nexine thicker than sexine.

7. *Odontonema strictum* Kuntze (Fig. 3. E, F)

Tetraporate, spheroidal, 50-65 μm in diameter; amb circular; pori circular, about 1 μm in diameter; sculpturing striate; exine about 1.65 μm thick, sexine as thick as nexine.

8. *Pachystachys lutea* Nees. (Fig. 4. A, B)

Tricolporate, prolate, 55-60 \times 45-63 μm in length and breadth; pori lalongate, about 5 \times 7.5 μm in length and breadth ; colpi longicolpate, 50-55 \times 6 μm in length and breadth, distinctly pseudocolpi present, the number of pseudocolpi 6, the colpi alternate with two pseudocolpi; sculpturing distinctly reticulate, the lumina heterobrochate, 3.0-5.5 μm in width, the muri simplibaculate, about 1 μm wide ; exine about 3.5 μm thick, sexine as thick as nexine.

9. *Pseuderanthemum reticulatum* Radlk. (Fig. 4. C, D)

Tricolporate, prolate, 55-60 \times 50-65 μm in length and breadth; pori lolongate, about 5 \times 3.5 μm in length and breadth ; colpi longicolpate, 48-53 \times 2.5 μm in length and breadth, distinctly pseudocolpi present, the number of pseudocolpi 6, the colpi alternate with two pseudocolpi; sculpturing distinctly reticulate, the lumina heterobrochate, 0.25-1.25 μm in width, the muri simplibaculate, about 0.5 μm wide ; exine about 5 μm thick, sexine thicker than nexine.

10. *Sanchezia parvibracteata* Sprague. & Hutchinson (Fig. 4. E, F)

Biporate, oblate, 80-85 \times 93-100 μm in length and breadth; amb ellipsoid; pori lolongate, about 18 \times 13 μm in length and breadth, pore with operculum, ring about 2.5 μm thick; distinctly pseudocolpi present, long and narrow, the pseudocolpi longitudinal strips which encircle the pollen grain, each strip has a single row of microperforations in the centre; sculpturing plicate; exine about 2.5 μm thick, sexine as thick as nexine.

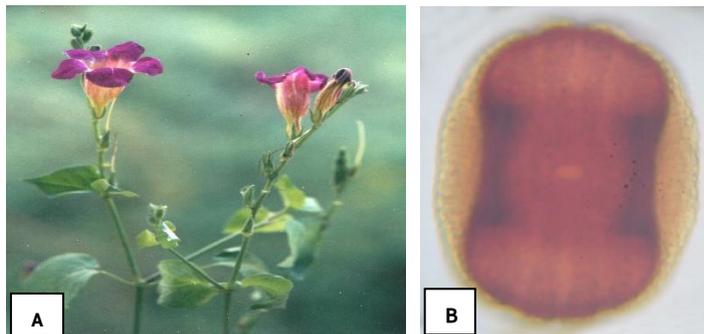


Figure 1. A. Inflorescences, B. Equatorial view of *Asystasia gangetica* (L.) T.Anders

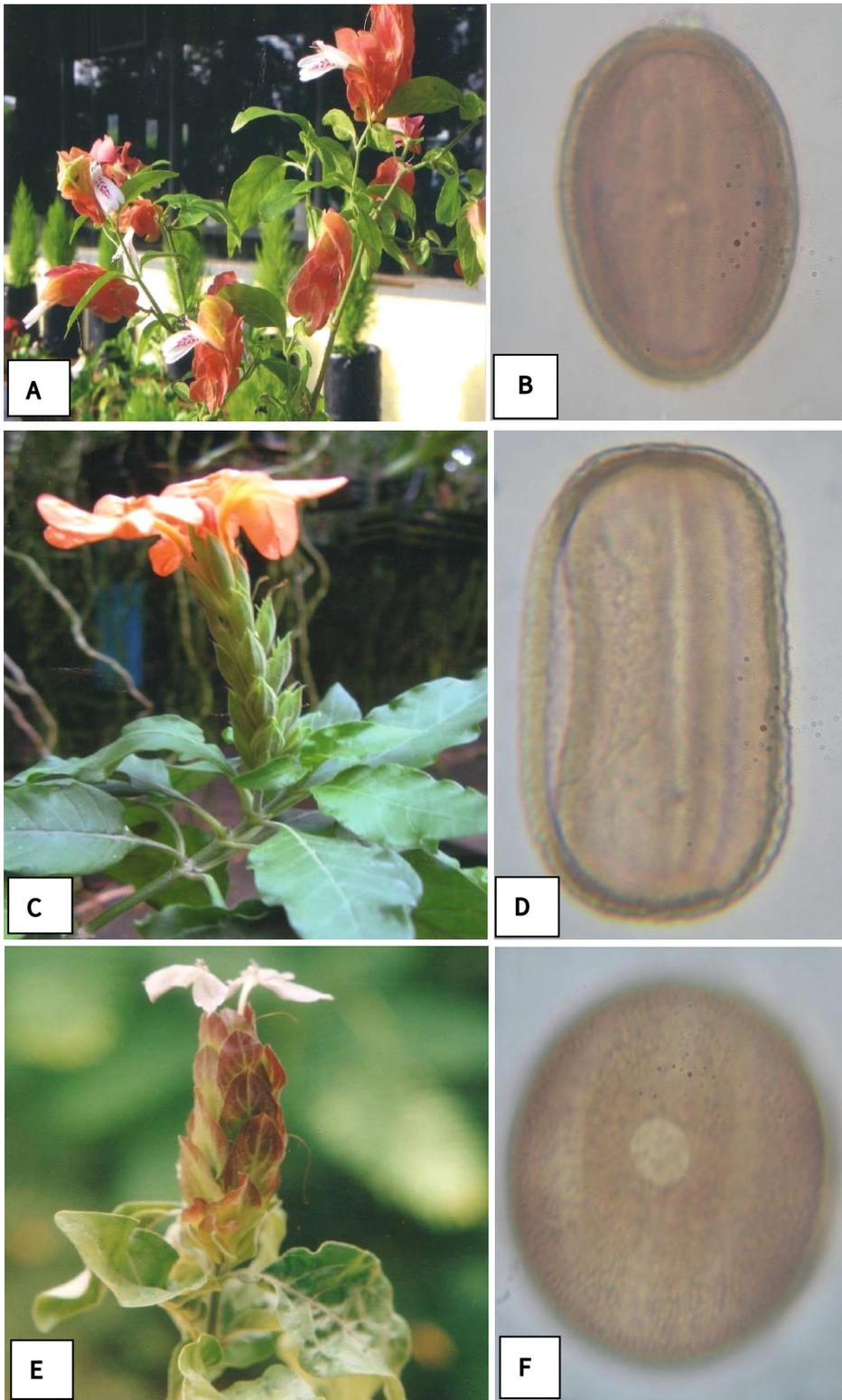


Figure 2. A. Inflorescences, B. Equatorial view of *Calliaspidia guttata* (Brandegg.) Bremek.
 C. Inflorescences, D. Equatorial view of *Crossandra infundibuliformis* (L.) Nees
 E. Inflorescences, F. Equatorial view of *Ecbolium ligustrinum* (Vohl) Vollesen

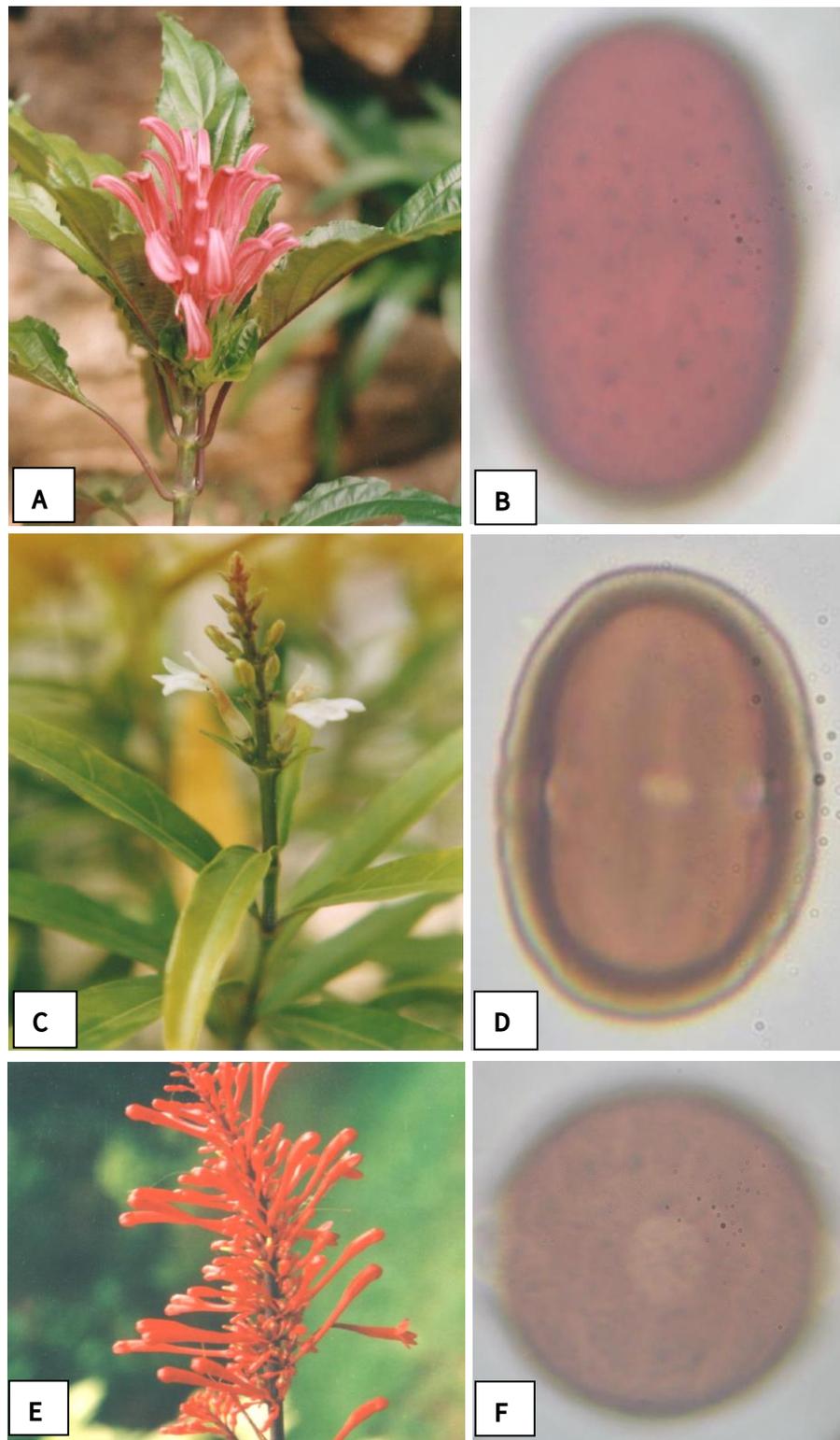


Figure 3. A. Inflorescences, B. Equatorial view of *Justicia carnea* Hook.
 C. Inflorescences, D. Equatorial view of *Justicia decussata* Roxb.
 E. Inflorescences, F. Equatorial view of *Odontonema strictum* Kuntze

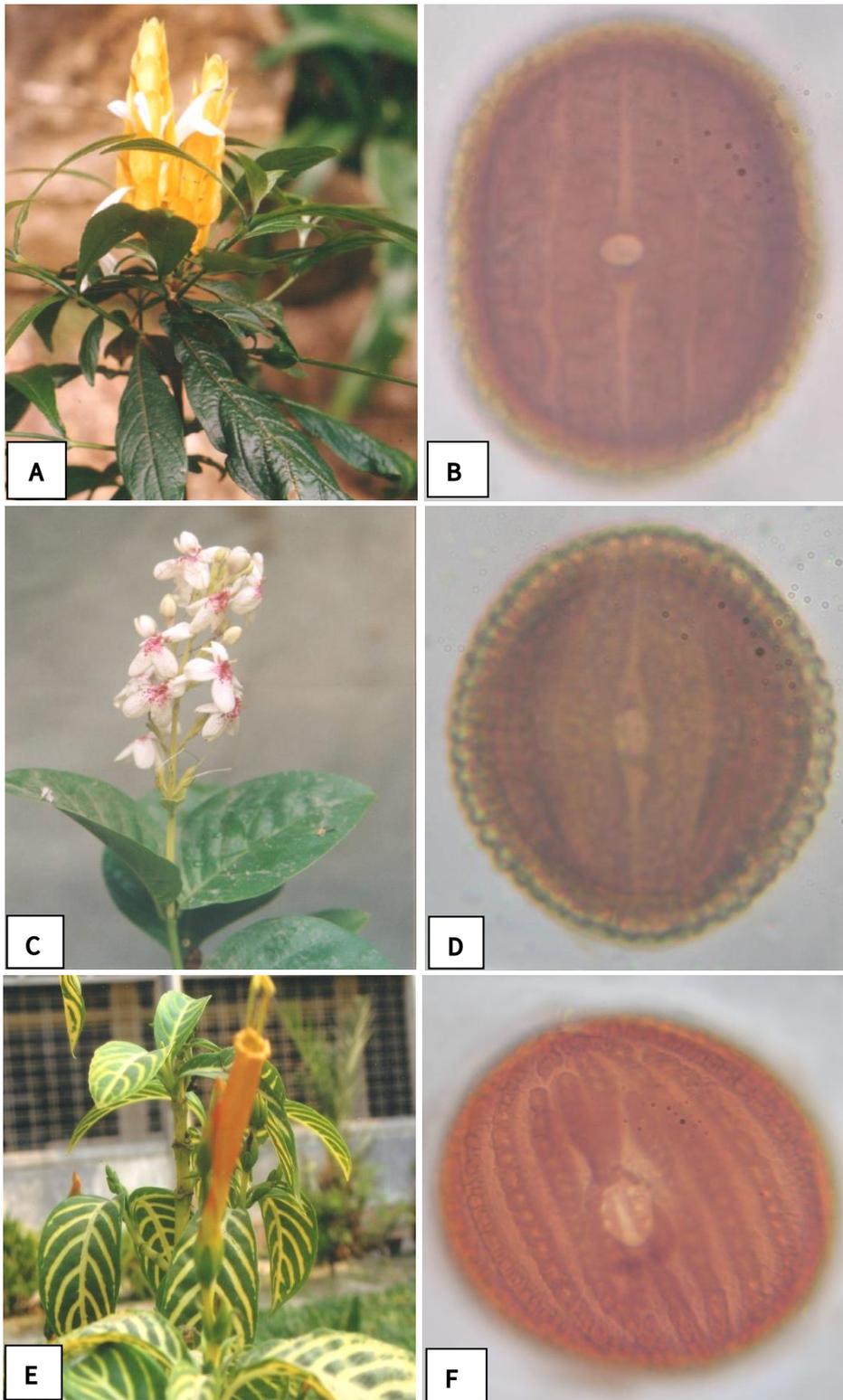


Figure 4. A. Inflorescences, B. Equatorial view of *Pachystachys lutea* Nees.
 C. Inflorescences, D. Equatorial view of *Pseuderanthemum reticulatum* Radlk.
 E. Inflorescences, F. Equatorial view of *Sanchezia parvibracteata* Sprague & Hutchinson

Discussion and Conclusion

The pollen morphology of ten species from family Acanthaceae found in Mandalay and its surrounding area has been studied and described. Many species of Acanthaceae are wild and a few are cultivated for its beautiful inflorescences. Acanthaceae is an eurypalynous family, thus the pollen morphology is diverse within the genera and not within the species.

In this study, pollen grains are varying in shape from prolate, perprolate, oblate to spheroidal. Biporate type of pollen grains were found in *Sanchezia parvibracteata*; tetraporate type found in *Odontonema strictum*; tricolpate in *Crossandra infundibuliformis* and tricolporate type found in the rest 7 species.

Three types of exine sculpture have been recorded: Plicate type in *Sanchezia parvibracteata*; striate exine type in *Odontonema strictum*; distinctly reticulate type in (*Asystasia gangetica*, *Pachystachys lutea* and *Pseuderanthemum reticulatum*); obscurely reticulate type in the remaining 5 species.

The simplibacculate type of muri, heterobrochate type of lumina and the different size of muri and lumina were occurred in the present study. In some genera heterocolpate pollen grains were found in *Asystasia gangetica*, *Calliaspidia guttata*, *Ecbolium ligustrinum*, *Justicia decussata*, *Pachystachys lutea* and *Pseuderanthemum reticulatum*. These species have pseudocolpi thus these colpi alternate with two or more pseudocolpi. In *Sanchezia parvibracteata*, the long and narrow pseudocolpi longitudinal strips which encircle the pollen grain, each strip has a single row of microperforations in the centre.

The cultivated varieties of ornamental plants are the best choice for discerning decorated purposes in gardens and landscape designs as houseplants. It is hoped that this paper will give some pollen morphological information for further studies in various ways.

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References

- Backer, C. A., and Van Den Brick, R. C. B. 1965. **"Flora of Java"**. Vol. 1. The Rijksherbarium, Leyden, N. V. P. Noorhoff.
- Cronquist, Arthur. 1981. **An Integrated System of Classification of Flowering Plants**. Columbia University Press. New York.
- Dassanayake, M.D. 1998. **A Revised Handbook to the Flora of Ceylon**, Vol. 12. Amerind Publishing Co. Pvt. Ltd. New Delhi.
- Erdtman, G. 1952. **"Pollen morphology and plant taxonomy (Angiosperms)"**. The Chronica Botanica. Co., Waltham, Mass.
- Fægri, K. and J. Iversen, 1989. **Textbook of pollen analysis**, Fourth edition. John Wiley and Sons, Chichester, UK.
- Hesse *et al.*, 2009. **"Pollen Terminology an Illustrated Handbook"**. Springer- Verlag Wien. New York.
- Hoen, P. 1999. **"Glossary of pollen and spore terminology"**, Utrecht. Netherland.
- Kai Larsen, 1991. **Flora of Thailand**. Vol.9. The Forest herbarium, Department of National Parks, Wildlife and Plant Conservation, Bangkok.
- Kress *et al.*, 2003. **A checklist of the trees, shrubs, herbs and climbers of Myanmar**. Department of Systematic Biology-Botany, Natural Meuseum of Natural History, Washington DC, USA.
- Moore, P. D., Webb, J. A. and Collinson, M. E., 1991. **"Pollen Analysis"**, 2nd ed. Oxford. Blackwell Scientific Publication, London.