

Palynomorphological studies of some Ornamental Plants of Mall Road, Lahore

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ABSTRACT

The Research work was conducted to analyze the palynomorphological data of ornamental plants collected from Lahore city. The results compiled indicated that total 14 pollen taxa were identified belonging to 12 families and 14 different genera. The pollen identified belonging to woody, herbaceous and shrubby vegetation. Among them nine were exotic taxa and five were native species. Woody pollen was abundant in samples while the percentage of the herbaceous pollen consisted of only 21.42%. Colpate and prolate type of apertures were characterized in all the pollen taxa. It was observed that circular apertures were only present in *Hibiscus rosa-sinensis* Linn. and *Cassia fistula* Linn. The maximum pollen size was recorded in *Hibiscus rosa-sinensis* Linn. and *Lagerstroemia indica* Linn.

Keywords: Ornamental plants, palynomorphological studies, pollen

INTRODUCTION

Palynology is the science that studies fossil and contemporary palynomorphs that include spores, pollen, acritarchs, chitinozoans, scolecodonts, orbicules and dinoflagellate cysts particulate organic matter (POM) and together with kerogen found in sediments and sedimentary rocks. The knowledge of palynology is used in geography, geology and immunology. Palynology, as a forensic tool, has been considered as a discipline of plant ecology (Horrocks *et al.*, 1998; Mildenhall, 2006; Mildenhall *et al.*, 2006). The scope, aspects and prospects of the science have been discussed in India (Sahni, 1948; Nair, 1960; Mittre, 1961; Srivastava, 1962), and also abroad (Erdtman, 1955). The functional importance of pollen grains have been realized by the ancient Assyrians as early as 717 B.C. the potentialities of pollen and spores as a morphological entity in plants have become increasingly understood, since the time Hooke developed a prototype microscope in 1665 (cit. Wodehouse, 1935). The great advances in the technology of the microscope have been paralleled in the science of palynology. The increase in knowledge, the science has widened its scope of interest. Various aspects of palynological studies have been delimited under two main divisions, basic palynology and applied palynology (Erdtman, 1963).

Hyde & Williams (1945) coined the term palynology, for the science concerning the study of spores and pollen. Hyde & Williams chose the term palynology on the basis of two Greek words *paluno* meaning 'to sprinkle' and *pale* meaning 'dust' (Bhattacharya *et al.*, 2006)

The publication of Pollen Morphology and Plant Taxonomy by Erdtman, (1952) marked the beginning of a new phase. He made available pollen

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characters of all angiosperm families to taxonomists. Since then they are increasingly used in systematic work.

Pollen characters such as number and position of the furrows, number and position of the apertures and details of sculpturing of the exine are of taxonomic value. The exine possesses the unique morphological characters that are always specific to a particular taxon (Moore, 1978; Milne, 2005).

MATERIALS AND METHODS

Government College University Campus and its Botanical Garden were selected for the collection of samples. About 10-15 flowers were collected from selected trees and herbs. The samples were collected in the month of February and March 2010 because maximum ornamental flowers bloom in this season. The pollen grains were prepared for light microscopy by the standard methods described by Erdtman (1952) (Perveen *et al.*, 2004; Perveen & Qaiser, 2002 and observation were made with a Meiji CO., LTD, Japan, Model NO. 35440, light microscope, using digital camera 4.1 mega pixel using 10X eye piece. The terminology used is in accordance with Erdtman (1952, 1960, 1969), Faegri & Iversen (1964) and Walker & Doyle (1975).

RESULTS AND DISCUSSION

A total of 15 mature flowers were collected from Lahore city-namely *Rosa damascena* Mill., *Cassia fistula* Linn., *Hibiscus rosa-sinensis* Linn., *Lagerstroemia indica* Linn., *Delonix regia* Rafin., *Justicia brandegeana* Wassh & Smith, *Punica granatum* Linn., *Papaver somniferum* Linn., *Jacarandra mimosifolia* D. Don., *Bougainvillea glabra* Choisy, *Erythrina suberosa* Roxb., *Petunia hybrida* Vilm., *Amaryllis vittata* L'Herit., *Euphorbia milii* Ch. des Moulins. The plants collected belonged to 12 families and 14 different genera. The families identified included Rosaceae, Caesalpiniaceae, Malvaceae, Lythraceae, Punicaceae, Papaveraceae, Bignoniaceae, Nyctaginaceae, Fabaceae, Solanaceae, Amaryllidaceae and Euphorbiaceae (Appendix I). Among them nine are exotic taxa and five are native. The palynomorphological studies of 14 pollen were identical. The percentage of the herbaceous pollen was 21.42 %, the woody pollen was 42.85 % and the shrubby pollen was 35.73 %. The size, symmetry, shape, aperture, spine and exine of the pollen were determined and the results were compiled as:

1. Family: Rosaceae

Botanical name: *Rosa damascena* Mill.

Flowering Season: Summer months

Palynomorph Tricolpate, Perforate, striate, composed of muri and wide striae, striae run parallel and are deep. The apocolpium and mesocolpium is striate. The length of pollen 6µm, breadth 4µm, pollen size 24µm. Shape of pollen: Elliptical.

2. Family: Caesalpiniaceae

Botanical name: *Cassia fistula* Linn.

Flowering Season: April-June

Palynomorph Tricolpate, sub-porate, non-angular, length of colpi 21µm and breadth 12.6µm. Size of pollen is 263.6 µm. Grains 3-colporate prolate, small to medium, sub-triangular, testate, granulate, colpi and pores distant, colpi 2-7 µm wide and more than the length of polar axis, spherical, diameter 3.6-4.6µm.

3.Family: Malvaceae

Botanical name: *Hibiscus rosa-sinensis* Linn.

Flowering Season: Throughout the year

Palynomorph: Pentoporate, isopolar, globose to spherical, bilateral symmetry in equatorial view and radial in polar view, circular to oval. Size of pollen is 143µm. Number of pores 16 µm. Number of spines 24 µm. Echinulate. Echini regularly arranged. Central spines which form a ring are somewhat different. Dimorphic with blunt apex, rounded and bifurcated. Apex is as much wide as base in some spines. Tectums reticulate. Tectum densely granulated between spines and perforated. Aperture clear and large.

4.Family: Lythraceae

Botanical name: *Lagerstroemia indica* Linn.

Flowering Season: Spring and summer months

Palynomorph Prolate, Tricolporate, elliptical long aperture, ends. The length of pollen 15µm, breadth 10µm, pollen size is 150 µm, sexine thicker than nexine. Colpi 12µm long.

5.Family: Caesalpiaceae

Botanical name: *Delonix regia* Rafin.

Flowering Season: April-June

Palynomorph: Tricolporate, sub-prolate, triangular colpi breadth 2.1µm, length 6.3µm, Mesocolpium 12.6. Apocolpium 14.7. Sexine thicker than nexine. Tectum regulate-reticulate.

6.Family: Acanthaceae

Botanical name: *Justicia brandegeana* Wassh. & Smith

Flowering Season: Summer season

Palynomorph Pollen grains 3-8 colpate, isopolar, prolate-perprolate, colporate.

7.Family: Punicaceae

Botanical name: *Punica granatum* Linn.

Flowering Season: April-July, September-December

Palynomorph: Grains prolate, 3-colporate. Sexine slightly thicker than nexine, probably tegillate, the outer margins more lobed or undulated. Meridional ridges with a very faint pseudocolpus. Size of pollen 24 µm.

8.Family: Papaveraceae**Botanical name:** *Papaver somniferum* Linn.**Flowering Season:** April-June**Palynomorph:** Pollen grains colpate, rupate, rugate, forate or provided with irregular apertures, sub-oblate, prolate. Sexine usually as thick as nexine or thicker. Aperture membrane granulate, reticulate, sub-prolate.**9 Family:** Bignoniaceae**Botanical name:** *Jacaranda mimosifolia* D.Don.**Flowering Season:** Mid April-May**Palynomorph:** Grains 50 µm, spheroidal, prolate, exine 4 µm thick, surfacereticulate.**10Family:** Nyctaginaceae**Botanical name:** *Bougainvillea glabra* Choisy**Flowering Season:** Throughout the year**Palynomorph:** Grains 3-colpate, oblate, reticulate (muri provided with scattered spinuloid excrescences), lumina baculate; at low power of the microscope.**11.Family:** Papilionaceae**Botanical name:** *Erythrina suberosa* Roxb.**Flowering Season:** March-April**Palynomorph:** Grains 3-colporate, sub-triangular, small to medium, tectate, granulate to finely reticulate, anguloaperturate, colpi and pores distinct, pore diameter 5.2µm, exine 1.2 µm thick.**12.Family:** Solanaceae**Botanical name:** *Petunia hybrida* Vilm.**Flowering Season:** March-April**Palynomorph:** Grain 35 µm, Spheroidal, 3-4 zonocolporate, margins of colpi, thickened, endocolpium, and surface feveolate.**13.Family:** Amaryllidaceae**Botanical name:** *Amaryllis vittata* L'Herit.**Flowering Season:** Twice every year**Palynomorph:** Length about 60 µm, sexine with small spinules.**14.Family:** Euphorbiaceae**Botanical name:** *Euphorbia milii* Ch. des Moulins**Flowering Season:** February-November**Palynomorph:** 3-colporate, 3-zonoclpate, prolate-spheroidal to prolate or sub-prolate, ectoaperturate colpi not sunken along long margin, irregular, end acute. Circular endoaperture.

Table 1: List of Plants collected from Mall Road and GCU Botanic Garden

Sr.No.	Name of Plants	Habit	Family	Site of Collection	Origin
1.	<i>Rosa damascene</i> Mill.	Shrubby	Rosaceae	GCU	Native
2.	<i>Cassia fistula</i> Linn.	Woody	Caesalpinaceae	GCU	Native
3.	<i>Hibiscus rosa-sinensis</i> Linn.	Shrubby	Malvaceae	GCU	Exotic
4.	<i>Lagerstroemia indica</i> Linn.	Woody	Lythraceae	GCU	Exotic
5.	<i>Delonix regia</i> Rafin.	Woody	Caesalpinaceae	GCU Botanical Garden	Exotic
6.	<i>Justicia brandegeana</i> Wassh. & Smith	Shrubby	Acanthaceae	GC Botanical Garden	Exotic
7.	<i>Punica granatum</i> Linn.	Woody	Punicaceae	GCU	Native
8.	<i>Papaver somniferum</i> Linn.	Herbaceous	Papaveraceae	GCU	Native
9.	<i>Jacarandra mimosifolia</i> D. Don.	Woody	Bignoniaceae	GCU	Exotic
10.	<i>Bougainvillea glabra</i> Choisy	Shrubby Climber	Nyctaginaceae	GCU	Exotic
11.	<i>Erythrina suberosa</i> Roxb.	Woody	Papilionaceae	GCU	Native
12.	<i>Petunia hybrida</i> Vilm.	Herbaceous	Solanaceae	GCU Botanical Garden	Exotic
13.	<i>Amaryllis vittata</i> L'Herit.	Herbaceous	Amaryllidaceae	GCU	Exotic
14.	<i>Euphorbia milii</i> Ch. des Moulins	Shrubby	Euphorbiaceae	GCU	Exotic

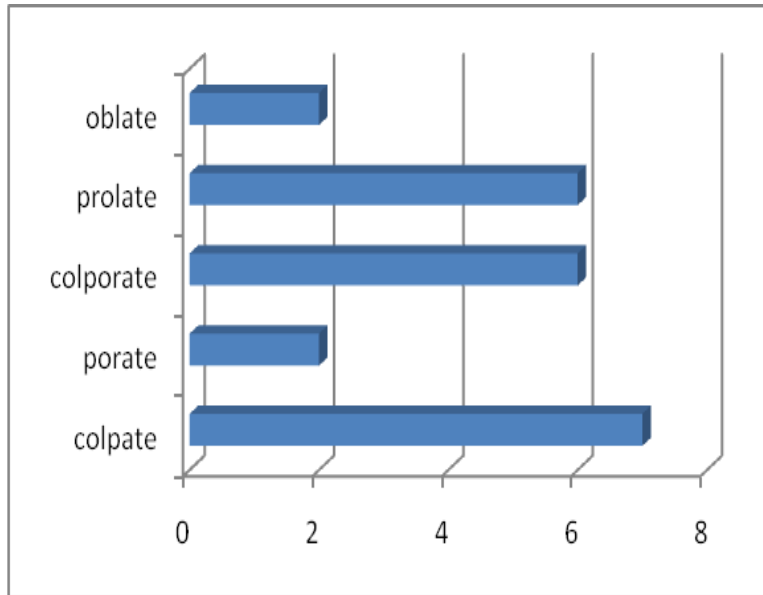


Fig., 1: Pollen Morphology of Plants

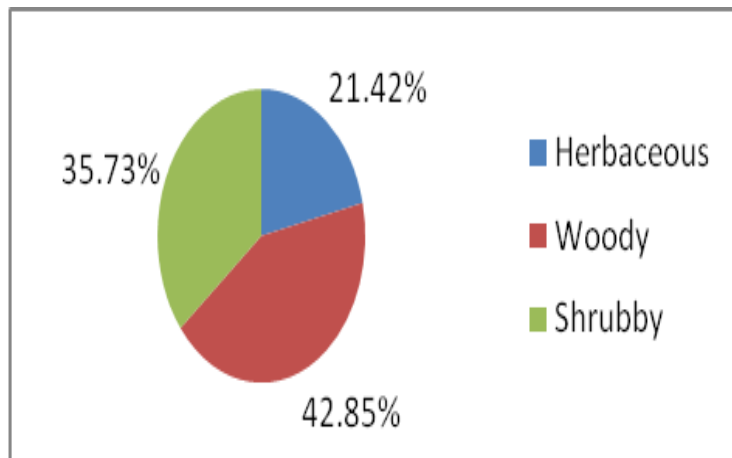


Fig., 2: Percentages of Different Plant Habits

It is clear from the figure 2 that the majority of the plants collected have woody habit. Similarly the percentage of the herbaceous plants was below the shrubby plants.

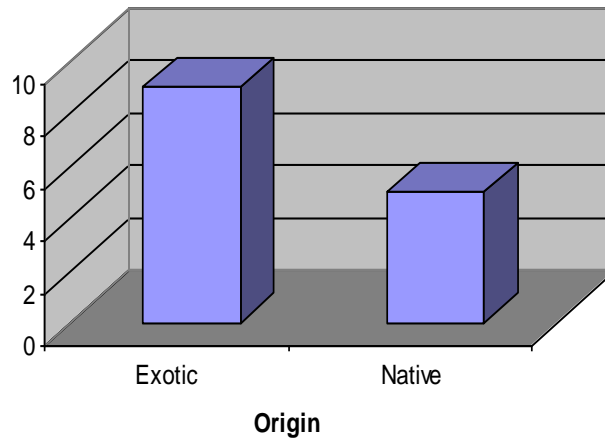


Fig., 3: Origin of the Different Plants

The above figure 3 shows that majority of the pollen collected from plants that were introduced from different parts of the world i.e., exotic and only five plants were native.

The pollen morphology of the species varies among different plant species e.g., *Rosa Damascena* Mill., *Cassia fistula* Linn., *Lagerstroemia indica* Linn., *Bougainvillea glabra* Choisy, *Papaver somniferum* Linn., *Justicia brandegeana* Wassh. and Smith, *Euphorbia milii* Ch. Des Moulins and *Punica granatum* Linn. showed the colpate type, the same results were also reported by Noor *et al.* (2004). Similarly, the pollen having pores in their cell wall were *Hibiscus rosa-sinensis* Linn. and *Cassia fistula* Linn., also confirmed by Hussain *et al.* (2008) and Kholá & Hanif (2012).

Bougainvillea glabra Choisy and *Papaver somniferum* Linn. also showed that their polar axis is shorter than the equatorial axis. But in *Jacaranda mimosaeifolia* D. Don., *Delonix regia* Rafin., *Lagerstroemia indica* Linn., *Punica granatum* Linn. and *Papaver somniferum* Linn. the pollen axis was longer than the equatorial axis. The same results were also reported by Noor *et al.*, (2009).

Pollen having both the elongated aperture and pores were observed only in *Delonix regia* Rafin., *Euphorbia milii* Ch. Des Moulins, *Erythrina suberosa* Roxb. These results were also in agreement with Aftab & Perveen (2006).

The size of the pollen grains varies and it was observed that there is a great variation in the sizes of the pollen grains. Maximum pollen size was observed in *Hibiscus rosa-sinensis* Linn. and *Lagerstroemia indica* Linn. having 143 μ m and 150 μ m respectively.

As it is clear from the fig. 3 that the ratio of the exotic plants varies which is an indication that the many exotic plants introduced in the city because in the past the Lahore city was considered as the city of gardens (Kausar *et al.*, 1990). So there is a need to conserve our native plants for the protection and sustainability of the ecosystem.

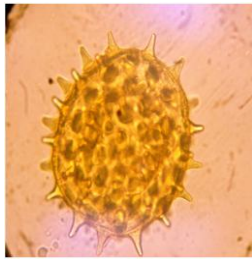


Fig. 1 *Hibiscus rosa-sinensis* Linn



Fig. 2 *Delonix regia* Rafin

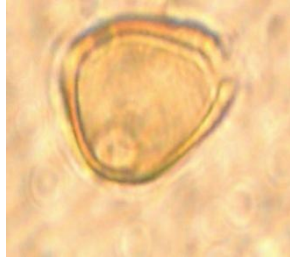


Fig. 3 *Erythrina suberosa* Roxb.

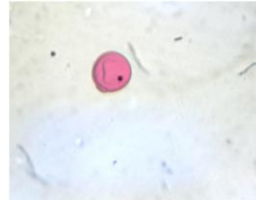


Fig. 4 *Rosa damascene* Mill

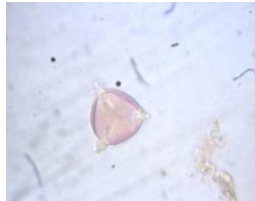


Fig. 5 *Cassia fistula* Linn.



Fig. 6 *Justicia brandegeana* Wassh. & Smith



Fig. 7 *Euphorbia milii* Ch. des Moulins



Fig. 8 *Lagerstroemia indica* Linn.



Fig. 9 *Punica granatum* Linn.



Fig. 10 *Papaver somniferum* Linn.

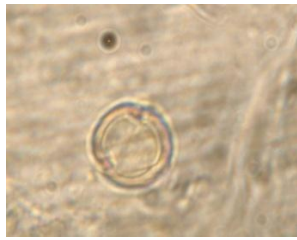


Fig. 11 *Petunia hybrida* Vilm.



Fig. 12 *Amaryllis vittata* L'Herit.



Fig.13 *Jacaranda mimosaefolia* D.Don

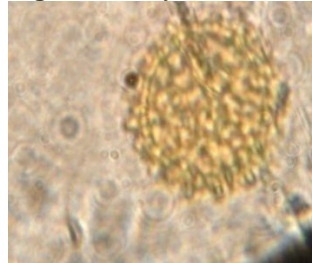


Fig. 14 *Bougainvillea glabra* Choisy

REFERENCES

- Aftab, R. & Perveen, A., 2006. A Palynological study of some cultivated trees from Karachi. *Pak. J. Bot.*, **38**(1): 15-28.
- Bhattacharya, K., Majumdar, M. R. & Bhattacharya, S. G., 2006. A Textbook of Palynology. New Central Book Agency (P) Ltd. Kolkata, India.
- Erdtman, G. 1952. Pollen Morphology and Plant Taxonomy-Angiosperms (An Introduction to Palynology I), Almqvist & Wiksell. Stockholm, 539.
- Erdtman, G., J. Praglowski & S. Nilsson. 1963. *An Introduction to a Scandinavian Pollen Flora. II* Almqvist & Wiksell, Stockholm.
- Pollen Grains and Spores. Munksgaard, Copenhagen.
- Faegri, K. & Iversen, J. 1964. Textbook of Pollen Analysis, Hafner Pub. Co., New York.
- Hyde, H. A. & William, D. A., 1945. "Palynology" Nature, London. 155-265.
- Horrocks, M., Coulson, S. & Walsh, K., 1998. Forensic palynology: variation in the pollen content of soil surface samples. *J. Forensic Sci.*, **43**: 320-323.
- Hussain, M, Bibi, N. & Akhtar, N. 2008. Palynological study of some cultivated species of *Hibiscus* from North West Frontier (N. W. F. P.) Pakistan. *Pak. J. Bot.*, **40**(4): 1561-1569.
- Khola, G. & Hanif, U. 2012. Palynological study of Soil samples collected from an Archaeological site (GULABI BAGH) in Lahore, Pakistan. *J. Anim. Plant Sci*, **22**(4): 1113-1117.
- Kauser, S. Brand, M. & Wescoat, J. L., 1990. Shalimar Garden Lahore, Landscape, form and meeting. Department of Archaeology and Museum. Ministry of Culture, Pakistan.
- Mildenhall, D. C., Wiltshire, P. E. J. & Bryant, V. M., 2006. Forensic Palynology: Why do it and how it works. *Forensic Sci Int.*, **163**: 163-172.
- Mildenhall, D. C., 2006. An unusual appearance of a common pollen type indicates the scene of the crime. *Forensic Sci Int.*, **163**: 236-240.

- Milne, L. A. 2005. *A Grain of Truth*. Reed New Holland, Sydney.
- Mittre, V., 1961. Contacts of Palynology. *Bull. Nat. Inst. Sci. India*. **19**:2-14.
- Moore, P. D., 1978. *An Illustrated Guide to Pollen Analysis*. Hodder and Stoughton, London.
- Nair, P. K. K. 1960. Palynology: India –A review. *Ibid.* **2**:51-53.
- Noor, M. J.Khan, M. A. & Camphor, E. S., 2009. Palynological analysis of Pollen Loads from Pollen sources of Honeybees in Islamabad, Pakistan. *Pak. J. Bot.*, **41**(2): 495-501.
- Perveen, A & Qaiser, M., 2002. Pollen Flora of Pakistan XXXIV. Sapotaceae. *Pak. J. Bot.*, **34**(3): 225-228.
- Perveen, A., Qaiser, M. & Khan, R. 2004. Pollen Flora of Pakistan-XLII. Barsicaceae. *Pak. J. Bot.*, **36**(4): 683-700.
- Sahni, B. 1948. The Prospects of Palynology in India. *Svensk. Bot. Tidskr.*, **42**: 474-477.
- Srivastava, S. K. 1962. Palynology-A gift of flowers. *Sci. Cult.*, **28**: 265-269.
- Walker, J. W. & Doyle, J. A., 1975. The basis of Angiosperm phylogeny: Palynology. *Ann. Mo. Bot. Gard.*, **62**:664-723.