International Journal of Botany Studies
ISSN: 2455-541X
Impact Factor: RJIF 5.12
www.botanyjournals.com
Volume 3; Issue 2; March 2018; Page No. 121-123

Pollen biology and morphology of *Anogeissus latifolia,* (Roxb. ex DC) Wall. ex Bedd. (Combretaceae)

Byraiah Dinesh
Department of Sericulture/Life Science, Bangalore University, Bangaluru, Karnataka, India

Abstract
Anogeissus latifolia is a deciduous tree widely distributed in tropical and evergreen forests and an important component of agroforestry and food plant of tropical tasar silk worm. The pollen viability, germination and morphology were studied using light and scanning electron microscopy. The pollen viability was found to be 71±2.96 % and maximum germination was found to be 68±2.15 %. Pollen grains are yellow, prolate–spherical, manods, radially symmetrical, tricolporate with three subsidiary colpi and exine surface micro regulates-echinate.

Keywords: *Anogeissus latifolia*, pollen viability, germination, pollen morphology, SEM

1. Introduction
The genus *Anogeissus* belongs to Combretaceae with six species, five native to South Asia, one native to Africa. In India four species *A. latifolia*, *A. acuminate*, A. *philly rosaefolia* and *A. pendula* have been reported [1].
A. latifolia is a medium sized tree up to 36 m height with straight and cylindrical bole, commonly known as axle wood. It is distributed throughout India in dry deciduous and evergreen forests of except in arid areas and moist areas of North-West India [16], and found exclusively in hilly tracts, Western Ghats and very common in most districts of southern of Karnataka [14]. It is one of the useful trees as medicinally important[12], timber, fuel, production of agriculture implements and the leaves and bark are being used for tanning, also called as Indian or Ghatti gum [13, 11].
India is known as homeland for several sericigenous insects and their host plants. The tropical tasar silk is produced by cocoons of wild silkworm *Antheraea mylitta*, Drury (Lepidoptera) with wide distribution and ecoraces. These ecoraces are polyphagous and feeds on food plants which are classified as primary, secondary and tertiary food plants based on choice of the feeding. *A. latifolia* is considered as one of secondary food plants of tropical tasar silkworm [7, 2, 10] and is in focus for conservation and agroforestry [9].
The pollen biology and morphology of *A. latifolia* has not been reported, however the pollen morphology of *A. acuminita* has been reported from Thailand [8] and other genera of Combretaceae [4] and SEM studies [3].
In the present study, phenology, pollen viability, germination and morphology was investigated using light microscopy (LM), scanning electron microscopy (SEM).

2. Materials and Methods
Field studies were undertaken in different localities of Karnataka to collect Phenological data in their natural habitats representing dry deciduous to evergreen forests of Savanadurga, Banneraghata, BR hills. The specimens were collected and were authentically identified [14]. For Pollen viability, germination and morphology, the material was collected from the germplasm maintained at Jnana Bharathi campus, Bangalore University, Bangalore.

2.1 Pollen germination and viability
Flowering twigs were collected from healthy plants during early hours of the day between 7-8 Am. Fresh pollen was used for viability and germination studies.
The pollen viability was tested by staining with triphenyl tetrazolium chloride (TTC, 1%) and the percentage of viable pollen was recorded after two hours [15]. The percentage of viable pollen grains was recorded from 5 replications and calculated by the following formula.

$$\% \text{ Pollen Viability } = \frac{\text{No. of stained pollen}}{\text{Total No. of pollen}} \times 100$$

Pollen germination was conducted in different concentration of sucrose ranging from 5, 10, 15 and 20% in Brewbekar and Kawck medium by Hanging drop method [15]. Pollen tube initiation and growth was monitor from 0 hours to 6 hours. The percentage of germination was recorded from 5 replications and estimated by using the formula

$$\% \text{ Pollen germination } = \frac{\text{No. of germinated pollen}}{\text{Total No. of pollen}} \times 100$$

2.2 Pollen morphology (LM and SEM)
Anthers were collected and fixed in 70 % ethyl alcohol and acetolysis was carried out following the method of Erdtman [5]. Pollen grains were mounted on a clean microscopic slide using glycerin jelly. The measurements of polar axis (P), Equatorial diameters (E) and length of colpus was recorded. The range and mean value with standard deviation (SD) and the ratio of the polar to equatorial axes (P/E) was calculated for about 25 samples.
The acetolysed pollen grains were dehydrated with ethyl

alcohol and dusted on the surface of double stick tape pasted on to the stub and coated with gold in a spotter coater. The stub were placed in a vacuum evaporator and observed in the Scanning Electron Microscope (JEOL-JSM840A) [3]. The aperture types and exine morphology were photographically recorded.

The general pollen terminology on morphology of Erdtman [4] and Hesse [6] were followed.

3. Results and Discussion

3.1 Phenology

The trees shed leaves during February to May; new leaves develop in May, then initiates the flowering. Flowers are usually available in June to September and fruiting from December to January. Flowers in globose heads, found on the short axillary branches or extra- axillary, actinomorphic, bisexual and epigynus. Fruit is a drupe, less than the number of flowers, variable in shape and size with broadly two winged seed per fruit.

3.2 Pollen viability and Germination

Pollens were collected at the time of anthesis and viability was found to be 71±2.96 % at anthesis (table-1). The pollen germination with various concentrations was observed in the increasing order as that of concentration of sucrose. The minimum germination of 32±1.75 % was observed in 5% sucrose and maximum of 68±2.15% in 20% sucrose. The maximum germinated pollen tube length was 45±5 µm (table-1).

Table 1: Pollen viability, germination and pollen tube length in *A. latifolia*

Concentration of sucrose (%) with BKM	Germination (%)	Pollen tube length (µm)	Viability (%)
5	32±1.75	45±5	71±2.96
10	41±1.93		
15	53±2.03		
20	68±2.15		

3.3 Pollen morphology

The pollen grains were monads, radially symmetrical, isopolar, small in size with polar axis of 18.35 µm and equatorial diameter of 17.06 µm, prolate - spherical in shape, heterocolpate, tricolporate (Fig.1.A & C), colpus length 15±05, three subsidiary colpi are visible in polar view (Fig.1. B). Exine surface micro regulates- echinate (Fig.1.D), Table 2.

Table 2: Pollen morphology of *A. latifolia*.

Species	Polar axis Mean ± SD (µm)	Equatorial diameter Mean ± SD (µm)	P/E	Shape	Size classes	Colpus type	Colpus length (µm)	Subsidiary colpi	Exine surface
A.latifolia	18.35±0.42	17.06±.06	1.07	Spheriodal-Prolate	Small	Tricolporate	15±05	Three	Micro rugulate - echinate

In the present study, pollen viability and germination indicate similar behavior with viability of 71% and relatively low germination of 68 % (Table-1), which may the reason for less fruit setting observed in the natural habitats.

The pollen morphology is in general similar to pollen grains found in family *Combretaceae* in having heterocolpate and tricolporate condition. However, the exine morphology varies with different genera. Erdtman [4] describe the pollen of Combretaceae by light microscopic observation of *quisqualis* later both LM and SM studies were reported for various taxa *Combretaceae* including different species of *Anogeissus* Ghazali [3] and Krachai and Pornpongungrueng [8].

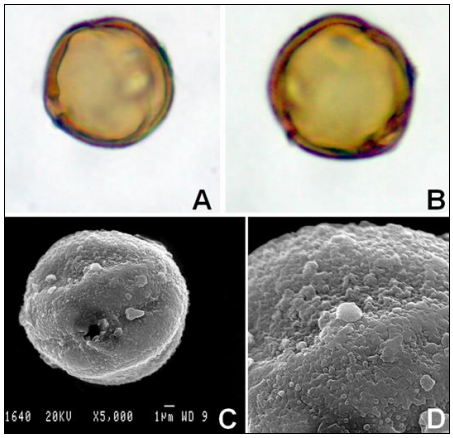

Fig 1: LM; A- polar view, B- equatorial view, SEM; C-equatorial view, D- exine surface.

Ghazali [3] described divers exine sculpturing in six species of *Anogeissus* including *A. latifolia* showing micro-echinate exine similar to five other species, while micro-striate condition in *A. biocarpa*. Krachai and Pornpongungrueng[8] have reported pollen morphology of Combretaceae from Thailand with reference to taxonomic significance including *A. acuminate* with micro-echinate exine. However, the present study indicate that the pollen morphology of *A. latifolia* is identical with respect to size, shape and aperture type but slightly differ in exine sculpturing in having micro rugulate-echinate condition. This morphological difference may be due to geographical variations in distribution of this taxon representing south India.

4. Acknowledgements

I thank Dr. Munirajappa, Department of Sericulture / Life Science and R. Nijagunaiah, Department of Botany, Bangalore University, Bangaluru-560056, for guide and help.

5. References

1. Brandis D. Indian trees. A Constable & Co, London, 1906.
2. Dash K, Nayak BK, Dash MC. The effect of different food plants on coccon crop performance in the India tasar silkworm Antheraea mylitta Drury (Lepidoptera: Saturniidae). Journal of Research on the Lepidoptera. 1992; 31(1-2):127-131.
3. EL Ghazali GEB, Tsuji S, El Ghazaly GA, Nilsson S. Combretaceae R.Brown. World Pollen and Spore Flora,

1998; 21:1-40.
4. Erdtman G. Pollen morphology and plant taxonomy - Angiosperms. Almquist and Wiksell: Stockolm, 1952.
5. Erdtman, G. The acetolysis method, a revised description. Svensk. Botany. Tidskr. 1960; 54:561-564.
6. Hesse M, Halbritter H, Zetter R, Weber M, Buchner R, Frosch-Radivo A, Ulrich S. Pollen Terminology. An illustrated handbook. Springer Wien. New York, 2009.
7. Jolly MS, SEN SK, Ahsen MM. Tasar culture: Ambica publishers, Bombay, India, 1974.
8. Krachai P, Pornpongungrueng P. Pollen morphology of combretaceae from Thailand and its taxonomic significance, Thai for Bull (Bot.). 2015; 43:4-14.
9. Manohar Reddy R. Conservation need of tropical tasar silk insect, Antheraea mylitta Drury (Lepidoptera: Saturniidae)-Strategies and Impact. Journal of Entomology. 2010; 7(3):152-159.
10. Ojha NG, Manohar Reddy R, Hansda G, Sinha MK, Suryanarayana N, Vijaya Prakash NB. Status and Potential of Jata, a New Race of Indian tropical Tasar Silkworm (Antheraea mylitta Drury). Academic Journal of Entomology. 2009; 2(2):80-84.
11. Orwa C, Mutua A, Kindt R, Jamnadas R, Antony S. Agroforestry database. A tree reference and selection guide version 4.0.world agroforestry Centre. Kenya, 2009.
12. Raghavan G, Madhvan V, Chandana VR, Annie S, Shanta M, PALPU P. Healing potential of Anogeissus latifolia for dermal wounds in rats. Acta Pharma. 2004; 54:331-338.
13. Reddy KK, Rajadurai S, Nayudamma Y. Studies on Dhava (Anogeissus latifolia) tannins part 111. Polyphenols of bark sapwood and heartwood of Dhava. Indian Journal of chemistey. 1965; l(3):308-310.
14. Saldanha JC. Flora of Karnataka, Oxford and IBH Pub.Co.Ltd. New Delhi, 1996. 2.
15. Shivanna KR. Rangaswamy NS. Pollen biology: A laboratory manual, Narosa publishing House, New Delhi.
16. Singh. R.V. Fodder trees of India, Oxford and IBH Co, New Delhi, India, 1982-1992.