

Palynotaxonomic studies in some *Caesalpinia* L. Species

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Abstract

The pollen of *Caesalpinia* species are tricolporate and trizonicolporate. Tricolporate pollens are recorded in three species of *Caesalpinia* viz. *Caesalpinia coriaria*, *C. pulcherrima* var. *flava* and *C. pulcherrima* var. *pulcherrima* while trizonicolporate is in *C. bonduc*. Palynology is not only helpful in solving taxonomic problems but it also plays an important role in daily life. Shape of pollen grains of *C. bonduc* and *C. pulcherrima* var. *flava* were oblate-spheroidal type while in *C. pulcherrima* var. *pulcherrima* was prolate-spheroidal and *C. coriaria* sub-oblate.

Keywords: *Caesalpinia*, Pollen morphology, taxonomic-relationships, Patna.

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I. Introduction

Palynology is a science of pollen and spore morphology. Pollen morphological characters were fully appreciated by Lindley. Von Mohl and Fritzsche as early as 1830-1840. Earlier work on pollen morphology during the nineteenth century. Wodehouse (1935) and Erdtman (1943, 1952, 1954, 1963 & 1969) made the most remarkable contribution in the field of pollen morphology. Members of the Caesalpiniaceae are the commonest trees in the deciduous woodland which covers very large area in East and Central Africa. It is the most productive source of bee wax and honey in Africa. Therefore, from the beekeeping point of view, a knowledge of the pollen grains of the Caesalpiniaceae is useful (Smith, 1964). The genus *Caesalpinia* L. with seven species found in the Botany of Bihar and Orissa (Haines, 1921-25) is widely distributed throughout Bihar. Three species of *Caesalpinia* (four taxa) have been identified from Patna district, viz. *C. bonduc*, *C. coriaria*, *C. pulcherrima* var. *flava* and *C. pulcherrima* var. *pulcherrima*.

Typical pollen characters have been well emphasized in taxonomy by Wodehouse (1935), Erdtman (1943, 1952, 1963 & 1969) and Jeffery (1962). Morphological and comparative studies in palynology may solve intricate taxonomic problems. Pollen characters are useful in solving several complicated problems of interrelationships between various taxa and assessment of their status in the classification.

The classification of pollen is based on number, position and character analysis known as 'NPC system' suggested by Erdtman (1963). The 'NPC' system helps in the formulation of diagnosis below family level. Palynologists have studied extensively the subject matter from this perspective. It is gratifying to record that recent classification by Cronquist (1968) have made exclusive use of pollen features as one of the strange characters in construction of taxonomic fabric of angiosperm classification. The significance of pollen morphology attributes 'NPC' data in solving taxonomic problems.

The morphological studies of the pollen are very important. It is also applicable in genetic study, forensic science in tracing history of vegetation, which consist of individual species, community and climate change study. It is also applicable in gas, coal and oil industries. Apart from this it is also used in the field of agriculture, forestry, archaeology and plant geography. These are some reports available on pollen morphology of some of dicot families from various part of World. Different families have been studied by different workers such as Apocynaceae has been studied by Schill and Leuenberger (1972) and Van Campo et al. (1979). The families Caesalpiniaceae and Mimosaceae have been studied by Ferguson (1981), Graham & Baker (1981), Guinet (1981), Ferguson & Pearce (1984), Lock (1988) and Perveen & Qaiser (1998 a).



Fig 1. *C. bonduc*



Fig 2. *C. coriaria*



Fig 3. *C. pulcherrima* var. *flava*



Fig 4. *C. pulcherrima* var. *pulcherrima*.

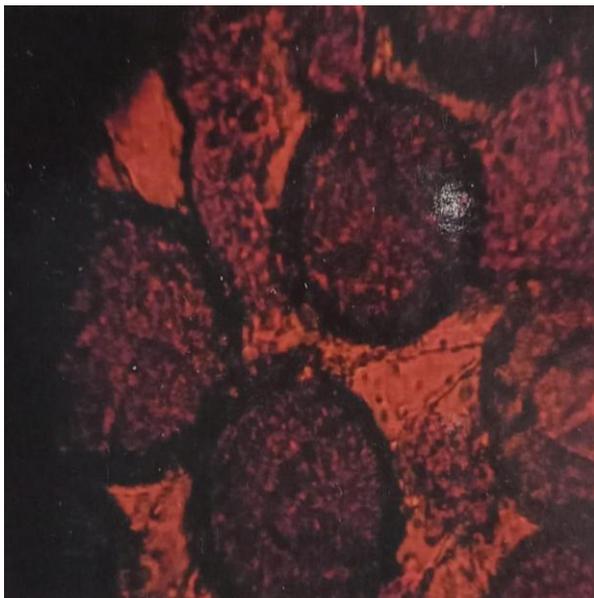


Plate 1. Pollen grains of *C. bonduc*

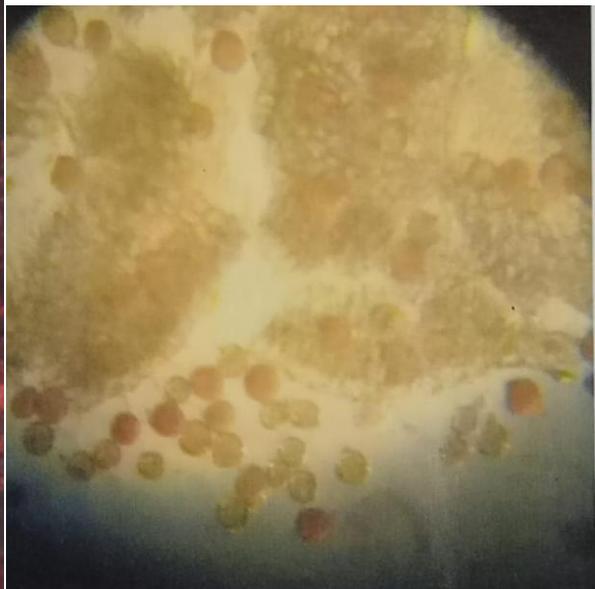


Plate 2. Pollen grains of *C. coriaria*

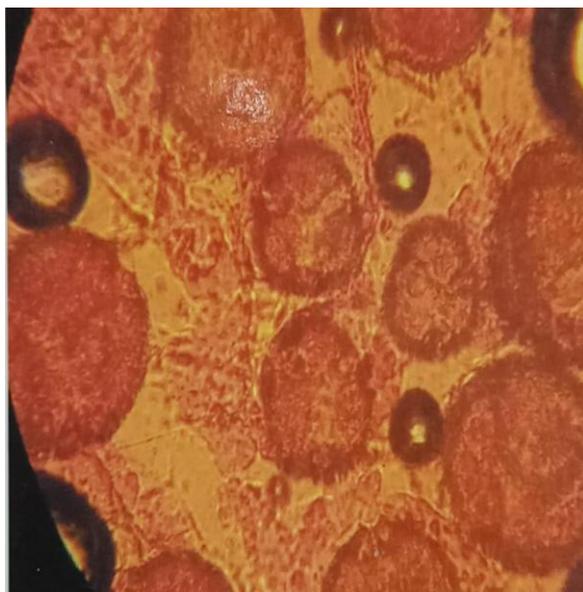


Plate 3. Pollen grains of *C. pulcherrima* var. *flava*

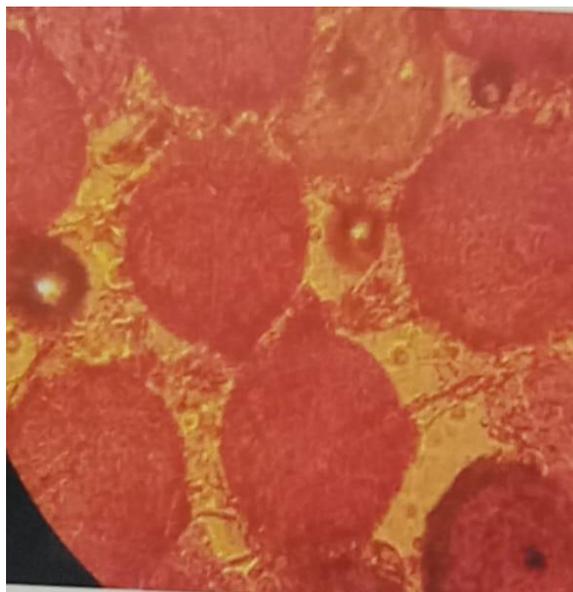


Plate 4. Pollen grains of *C. pulcherrima* var. *pulcherrima*

The study of pollen morphology of the family Caesalpiniaceae dates back to the year 1935 when Mohl recorded variation in pollen grains. The pollen morphology of the relevant species has been studied by Selling (1947), Erdtman (1952), Ikuse (1957), Nair and Sharma (1962) Vishnu- Mittre (1962), Smith (1964), Vidal & Hul-Thol (1976), Tsukada (in press), Senesse (1980). The pollen grains of the Caesalpiniaceae are fairly large and often have distinctive characteristics. These can be used to determine genera and according to pollen characteristics some genera appear to need revision and some of the divisions already proposed are confirmed (Smith, 1964), since they show controversial morphology Selling (1947) describes the grains 3 - colporate while Erdtman (1952) describes them as 3 - aperturate. Nair and Sharma (1962) noted that an optical section of apertures in *Caesalpinia* pollen shows a difference in different species, eg *C.crissta* *C. nuga*, *C.sappan* and *C. sepiaria*. But *C. crista* pollen is not easily distinguished by its slightly protruding margins of spores because some other *Caesalpinia* show the same features.

II. Materials And Methods

For pollen studies flower buds were fixed in 1:3 acetic alcohol. Fixed materials were kept in refrigerator. Buds were pricked by needle and anthers were warmed in 2% acetocarmine solution for 20 to 25 mins. Few drops of FeCl₃ solution was used as mordant. Anthers were taken on slides and squashed with 2% acetocarmine stain. The slides were pressed uniformly for separation of pollen. Pressed slides were sealed with paraffin wax. Photographs of well spread pollen grains were taken from temporary slides. Prepared slides were studied under the Light microscope. For each slide measurements were recorded. Following characters were noted and measurements were taken: Grain shape, Symmetry, Equatorial diameter, Polar diameter, Number of colpi. Terminology used for pollen description has been borrowed from Erdtman (1952) and Clarke (1977).

III. Results And Discussion

Palynological studies are not only helpful in solving many taxonomic problems but it also plays an important role in daily life, for instance aeropalynology is the study of palynology in relation to airborne pollen grains and spores which are the main source of different types of allergies like asthma and hay fever. It is also useful in Melissopalynology with its use in honey study. It also gives evolutionary mechanism of different type of corolla. Therefore, Palynology is a new upcoming science which has provide new dimensions to the complications of taxonomy. The joint work of Erdtman and Metcalfe (1963) on palynology has been of immense value to taxonomy.

The size and shape of pollen grains are mostly sub-prolate, rarely oblate, tricolporate or colpate rarely prolate. The most three major types of pollen can be distinguished in terms of aperture character 3-zonicolporate 3-margocolporate and 3-synmargocolporate grains and can be further divided on the basis of apertural types. Four distinct pollen types are recognized, pollen type I: Non-aperturate pollen, pollen type II: Colpate type, pollen type III: Prolate type and pollen type IV: Colporate type. Pollen type is found in *Caesalpinia* Linn species which has been earlier reported by Selling (1947). Colporate pollen type is further separated into seven

subtypes on the basis of shape i.e. sub-type I: Perprolate; sub-type II: Prolate, sub-type III: Subprolate, sub-type IV: Spheroidal; sub-type V: Suboblate, sub-type VI: Oblate and sub-type VII: Peroblate.

Sub-type IV: Spheroidal is also further divided into two groups i.e. I: Prolate spheroidal and II: Oblate spheroidal. In subtype IV- Spheroidal, pollen grains is prolate spheroidal in shape only one species is included viz. *C. pulcherrima* var. *pulcherrima* which is earlier reported by Perveen and Qaiser (1998) and pollen grains are oblate spheroidal in *C. bonduc* and *C. pulcherrima* var. *flava* which is earlier reported by Vishnu- Mittre and Sharma (1962). Pollen grains sub oblate in shape in only one species viz *C. coriaria*. These species are further separated on the basis of polar and equatorial length, which are 55.6 μm x 59.5 μm in *C. bonduc*, 36 μm x 41 μm in *C. coriaria* where as 79.6 μm x 80.58 μm in *C. pulcherrima* var. *flava*. Only two sub types IV and V that is spheroidal and sub oblate pollen grains are present in *Caesalpinia* species (Table-2).

Table 1: Morphological character of *Caesalpinia* species

S. No.	Characters	<i>C.bonduc</i>	<i>C.coriaria</i>	<i>C.pulcherrima</i> var. <i>flava</i>	<i>C.pulcherrima</i> var. <i>pulcherrima</i>
1.	Habit	Scandant shrub	Small sized tree	Shrub	Shrub
2.	Leaf size	2-5.8x1.2-2.7 cm	3.9x1-2 mm	1-2.5x0.5-1.2 cm	1-2.5x0.5-1.2 cm
3.	Flower Colour Size Fl. time	Yellow 1.3 cm July-Nov	Pale-greenish white 0.8-1 cm Oct. To Nov.	Yellow 3 cm Throughout year	Crimson-red 3 cm Throughout year
4.	Pod Shape Colour	Oblong Reddish brown	Ovate-oblong Dark-brown	Ovate-oblong Dark-brown	Ovate-oblong Dark-brown
5.	No. Of seed/pod Shape Colour	1-2 Globular Ash colour	3-6 Obovate Brown	8-10 Obovate Brown	8-10 Obovate Brown

Table 2: Pollen variation in *Caesalpinia* species

Name of Species	Shape	P/E ratio in μm	Polar length(P) in μm	Equatorial diameter(E) in μm
<i>C.bonduc</i>	Oblate-spheroidal	0.93	55.6	59.50
<i>C.coriaria</i>	Sub-oblate	0.88	36.0	41.00
<i>C.pulcherrima</i> var. <i>flava</i>	Oblate-spheroidal	0.91	79.6	86.58
<i>C.pulcherrima</i> var. <i>pulcherrima</i>	Prolate-spheroidal	1.06	89.5	83.70

Shape of pollen grains of *C.bonduc* and *C. pulcherrima* var. *flava* were oblate-spheroidal type while in *C.pulcherrima* var. *pulcherrima* was prolate-spheroidal and *C.coriaria* sub-oblate.

The pollen of *Caesalpinia* species are tricolporate and trizonicolporate. Tricolporate pollens are recorded in three species of *Caesalpinia* viz. *Caesalpinia coriaria*, *C. pulcherrima* var. *flava* and *C. pulcherrima* var. *pulcherrima* while trizonicolporate is in *C. bonduc*.

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