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**Pollen morphology of medicinally valuable *Cassia L. spp.*  
(*sensu lato*) belong to Nalgonda District, Telangana State**

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**Abstract**

Heterogenous *Cassia L.* genus belongs to Caesalpinioideae of the family Leguminosae. Plants belong to this genus grow in wild and many of them have been used as ethnomedicine (2,54,55). In this work, we described the pollen morphology of 10 species of *Cassia L. sensu lato*, from Nalgonda district of Telangana state from South India, which are known for their medicinal value. This study is useful to identify them based on various pollen morphological features such as symmetry, shape, apertural pattern, exine morphology and also in delimitation of species to find the palynotaxonomical relationship. Pollen belong to these species is tricolporate and prolate to spheroidal in shape.

Key words: *Cassia* species, pollen morphology, ethnomedicine

**Introduction**

Drug discovery from medicinal plants is involved with several fields of inquiry and various methods of analysis. The process usually begins with a botanist or ethnobotanist who collects and identifies the exact plant(s) of interest. Identification is based on morphological, anatomical, chemical and palynological characters of the plants. Irwin & Barneby (1) divided heterogenous taxon *Cassia L.*, namely *Cassia L. (s.str.)*, *Senna Miller* and *Chamaecrista Moech.*

Several ethnobotanical and laboratory based pharmacological studies reported the medicinal value of *Cassia species*.

**1. *Cassia fistula L.*:** It is a source of potential antioxidative and chemoprotective flavonoids, anthraquinones and polyphenolics(2,4). Stem bark and leaf paste is used to cure skin diseases(19). It shows antidiabetic, anti microbial and anti tumor activities(4-24).

**2. *Chamaecrista absus (L.) H.S.Irwin & Barneby (Cassia absus L.)*:** It is an erect annual herb. Various plant parts of the species are used in folk medicine. The seeds are used in the treatment of ophthalmic and skin infections and as cathartic. The seed oil is used in syphilitic ulcers and leucoderma(25). The leaves are used to treat tumours and asthma and roots are used to relieve from constipation(26).

**3. *Chamaecrista pumila (Lam.) K.Larsen (Cassia pumila Lam.)*:** It is a prostrate, diffuse annual herb, usually found in shades of trees and among grasses. It is reported to have antimicrobial and anti-inflammatory properties. Anthraquinone chrysophanol was isolated and showed papaverine like, non-specific spasmolytic activity on isolated ileum of guinea pig(27).

**4. *Senna auriculata (L.) Roxb. (Cassia auriculata Linn.)*:** It is a common perennial shrub, called as Tanner's cassia, used in ethnomedicine as a cure for rheumatism, conjunctivitis and diabetes(28,29,30). Its flowers and leaves are reported to have antihyperglycemic and lipidlowering activity(31,32). It has a strong antihyperglycemic effect in rats comparable to the therapeutic drug Acarbose(33). Aqueous leaf extract found to lower the serum glucose level(34). *C. auriculata* reported to have antioxidant, free-radical-scavenging property, hepatoprotective activity against alcohol injury and anticancer activity(35-41).

**5. *Senna italica Mill.(Cassia italica (Mill.) Lam.ex.Andr.)*:** It is a small herb and traditionally used for various ailments(3). It is a rich source of flavonoids(43) and sennoside from its leaves and pods (44). The ethanolic extract of the whole plant parts(root, stem, leaves and pods) was investigated for bioactivities namely anti-inflammatory, antipyretic, analgesic, prostaglandin (PG) release by rat peritoneal leucocytes, antineoplastic and antiviral activities(45).

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Kazmi *et al* (1994) reported that leaves contain 1,5-dihydroxy-3-methyl anthraquinone and an anthraquinone that possess antimicrobial and antitumour activities(46-48).

**6. *Senna occidentalis* (L.) Link (*Cassia occidentalis* L.)**: It has been used as a traditional medicine for the treatment of inflammation, fever, liver disorders, constipation, worms, fungal infections, ulcers, respiratory infections, snakebite and as a potent abortifacient(48). It exerted antimutagenic activity against benzo[a]pyrene (BaP) and cyclophosphamide(CP)-induced mutagenicity(49). The leaves of the plant produced significant hepatoprotection(50, 51). It is reported to have antibacterial, antifungal, antidiabetic, anti-inflammatory, anticancerous, antimutagenic and hepatoprotective activity(52-54).

**7. *Senna siamea* (Lam.) H.S.Irwin & Barneby (*Cassia siamea*(Lam.))**: It is an avenue tree grows widely and is used in traditional medicine(55,57). The alcoholic extract of flowers reported to have free radical scavenging and hepatoprotective activity(57). It contains anthraquinones, alkaloids, flavonoids, chromones, and terpenoids. It is an important source of anthraquinones from leaves, stem bark, rootbark and heartwood(43,58-62). Anthraquinones from this plant reported to have anti-tumour activity(58-62).

**8. *Senna surattensis* (Burm.f.) H.S.Irwin & Barneby (*Cassia surattensis* Burm.f.)**: It is a small tree/shrub grown along the roadsides and a source of

antioxidants and anthraquinones. It is found to have antimicrobial activity(63-65).

**9. *Senna tora* (L.) Roxb. (*Cassia tora* L.)**: It is an annual, small shrub grows wildly and traditionally used as a laxative and for skin diseases(66). Several studies reported its antiseptic, diuretic, antioxidant, hepatoprotective, antihelminthic and antimutagenic nature (67-92).

**10. *Senna uniflora* (Mill.)H.S.Irwin & Barneby**: It is an annual, small herb grows wildly and shows anti-inflammatory and anti-arthritis activity(92,93)

**Palynological study**: Earlier palynological studies of some *Cassia* species are from West Bengal and Maharashtra states( India)(94-96) and Pakistan(97). This study from Nalgonda District of Telangana, undertook to identify the pollen morphological characters of 10 species belong to *Cassia* genus(*sensu lato*).

### Material and Methods

All the species are collected from different places from Nalgonda district, voucher specimens were prepared and identified. Pollen grains were collected from the fresh flower samples and acetolysed as described by Erdtman(1952, 1960)(98,99). After acetolysis, pollen grains were mounted in glycerin jelly and observed under Olympus 20i microscope. The measurements were based on minimum 15 readings for each specimen.

### Results and Discussion

#### Pollen Key for identification

1. Distinct pore

2. Ora circular

3. Prolate shape, small apocolpium \_\_\_\_\_ *Chamaecrista pumila*

3. Subprolate shape, distinct regulate sculpture \_\_\_\_\_ *Senna uniflora*

3. Spherical shape, large distinct pore with diameter 7-12  $\mu\text{m}$  \_\_\_\_\_ *Chamaecrista absus*

2. Ora lalongate

3. SubProlate spheroidal-Oblate spheroidal

4. Colpus width less than 4 $\mu\text{m}$  and exine thickened at the equator(-4-5  $\mu\text{m}$ ) and apocolpium <7 $\mu\text{m}$  \_\_\_\_\_ *Senna fistula*

4. Colpus width more than 4 $\mu\text{m}$

Colpus width -4-7 $\mu\text{m}$

5. Rugulate sculpture and exine uniformly thick <2 $\mu\text{m}$

\_\_\_\_\_ *Senna italica*

5. Reticulate sculpture and syncolpate \_\_\_\_\_ *Senna siamea*

Colpus width <7  $\mu\text{m}$ , Colpi length >20  $\mu\text{m}$

5. Coarse rugulate sculpture \_\_\_\_\_ *Senna occidentalis*

5. Micro reticulate sculpture \_\_\_\_\_ *Senna surattensis*

2. Ora lalongate

\_\_\_\_\_ *Senna auriculata*

1. Indistinct pore

\_\_\_\_\_ *Senna tora*

Table 1: Palynological measurement data of different *Cassia L.(s.lato)* spp.

S.No	Name	Polar axis(P)	Equatorial diameter(E)	P/E	Pollen shape
1	<i>Cassia fistula</i> L.	23(23.9)27.5	20.4(23.36)27.3	1.02	Prolate spheroidal
2	<i>Chamaecrista absus</i> (L.) H.S.Irwin & Barneby	36.5(38.4)40.2	33.34(38.2)42.5	1.00	Spheroidal
3	<i>Chamaecrista pumila</i> (Lam.) K.Larsen	34.8(39.8)42	20.64(29.5)33.73	1.35	Prolate
4	<i>Senna auriculata</i> (L.) Roxb.	33.8(35.1)36	32(33.5)34	1.05	Prolate spheroidal
5	<i>Senna italica</i> Mill.	28.4(29.6)31.21	27.5(28.1)31	1.05	Prolate spheroidal
6	<i>Senna occidentalis</i> (L.) Link	27(34.17)36.6	27(32.6)36.6	1.04	Prolate spheroidal
7	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	35	39	0.9	Oblate spheroidal
8	<i>Senna surattensis</i> (Burm.f.) H.S.Irwin & Barneby	30.78(34.1)35.32	32.47	1.05	Prolate spheroidal
9	<i>Senna tora</i> (L.) Roxb.	28.4(31.9)33.9	27(32)36	0.99	Oblate spheroidal
10	<i>S.uniflora</i> (Mill.)H.S.Irwin & Barneby	34(36.5)38.9	31(31.4)31.9	1.2	Subprolate

The above results show that the pollen grains are trizonicolporate, prolate to oblate spheroidal. The polar dimension ranges from 23 to 42  $\mu\text{m}$  while the equatorial dimension ranges from 20.4  $\mu\text{m}$  to 42.5  $\mu\text{m}$ . Pollen shape is deduced based on P/E ratio. Variation in size is not considerable. Pollen shape, pore shape, colpi measurements and exine sculpture are the main criteria for the identification of the species. Based on pollen key, the species of *Cassia L.(s.lato)* pollen may be identified.

### Conclusion

The pollen morphological features of medicinal species have wide range of usage in their identification in mellitopalynological, aeropalynological and

pharmacognostic samples. *Cassia L.(s.lato)* genus is known for its medicinal value. It includes *Cassia L.(s.stricto)*, *Senna* Miller and *Chamaecrista* Moench. Several ethnobotanical and pharmacological studies have shown the importance of the phytochemicals present in these plants and their usage in curing various ailments.

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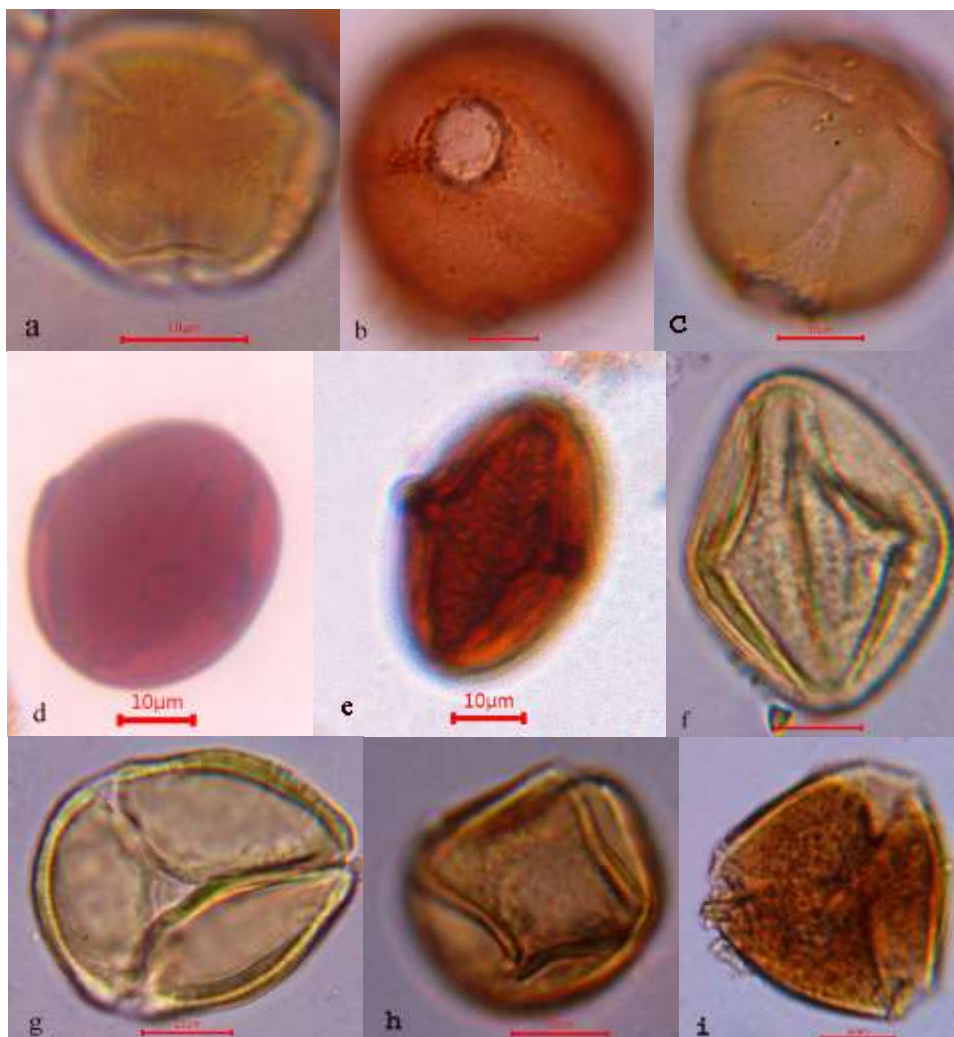


Plate 1: a. *Cassia fistula*(x1000), b-c. *Chamaecrista absus*(x1000), d-e. *C. pumila*(x400), f-g. *Senna siamea*(x1000), h-i. *S. tora*(x1000). Scale bar 10µm.

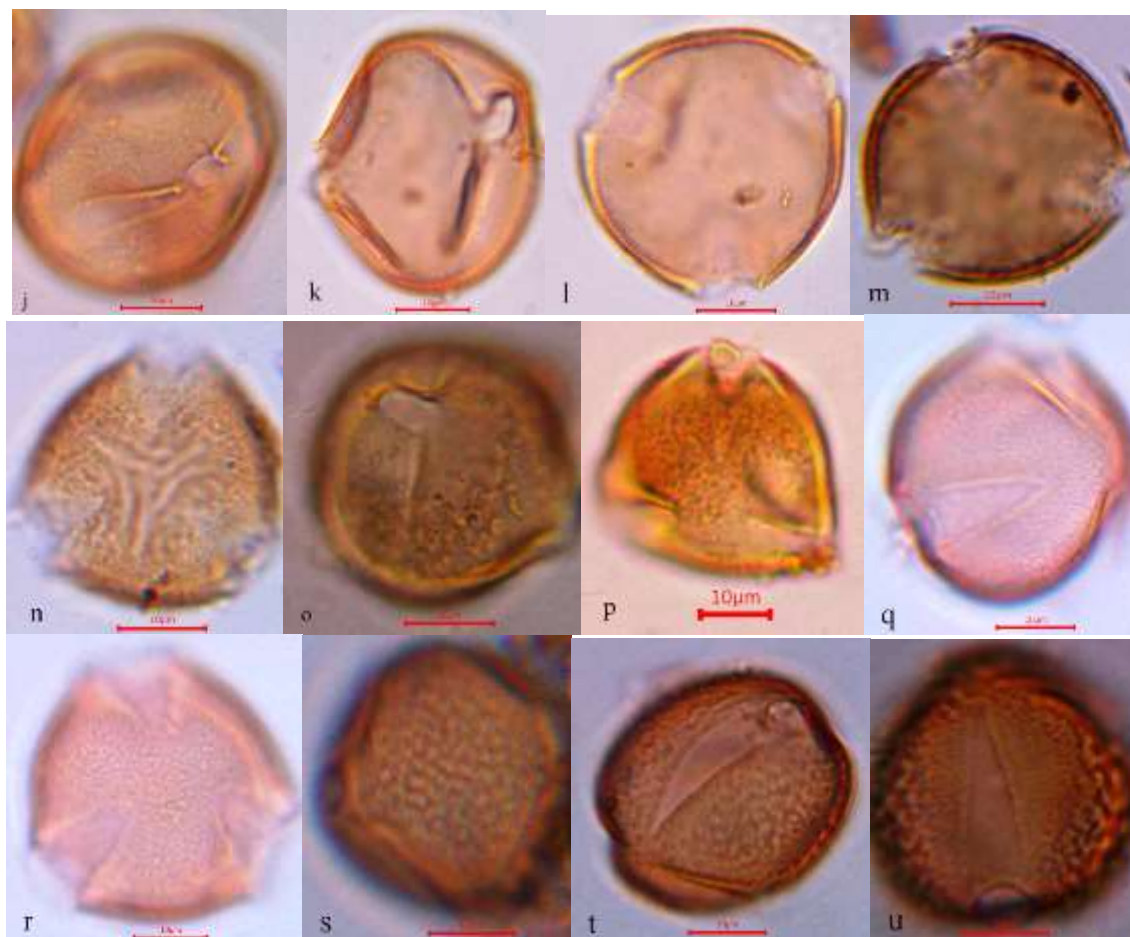


Plate 2: j-l *S.auriculata*(x1000); m-n. *S.italica*(x1000); *S.occidentalis* o(x1000),p(x400); q-r *S.surattensis*(x1000); s-u *S.uniflora* (x1000). Scale bar 10µm.

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