

SEM observations on the seed coat structure of market samples of Atmagupta [*Mucuna pruriens* (L.) DC.]

C. VIJAYAMBIKA, M. JEGADEESAN AND A. SARAVANA GANTHI

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SUMMARY

Adulteration in market samples is one of the greatest drawbacks in promotion of herbal products from India. Plant samples in the market are stored under undesirable conditions over the years and often contain a mixture of other plant species, thus adversely affecting their bioefficacy. Market samples of 'Atmagupta' an Indian Ayurvedic and Siddha drug contain seeds of seven taxa. Seed morphology standards could help in identification where a seed may look similar in external appearance. SEM study is of great help in distinguishing the seeds based on their seed coat diagnostic characters to differentiate seed of *Mucuna pruriens* (L.) DC., the genuine, with that other taxa adulterant or substitutes.

Key words : SEM, Hilum, Raphae, Adulterants, Substitutes, Spermoderm

Use of herbal drugs is ever increasing worldwide together with their demand. Concomitant with increase in demand and scarcity, adulteration of herbal raw drugs is also more common; 'Atmagupta' [*Mucuna pruriens* (L.)DC.] is one of the important herbal drug most commonly used in Indian system of medicine. The seeds of this plant have been used as food tonic and aphrodisiac (Vasudeva and Shanpru, 1981) by many tribal communities in India since many centuries. *M. pruriens* possess valuable medicinal properties and it has been studied for various activities like anti-diabetic (Akhtar *et al.*, 1990); aphrodisiac, anti-neoplastic, anti-epileptic, antimicrobial activities (Sathiyarayanan and Arulmozhi, 2007). Its learning and memory enhancement has been detailed by Poornachandra *et al.* (2005) just as its aphrodisiac and antivenom activities have been detailed, respectively by Rajendran *et al.* (1997), Shukla *et al.* (2007), Guerranti *et al.* (2002) and Fattepur and Gawade (2008). The seeds of this plant are collected mostly in the wild. Various species of *Mucuna* are being sold in the market under the trade name "Atmagupta". Our preliminary survey in Tamil Nadu (Vijayambika, 2003) also revealed that seeds of seven species *Mucuna pruriens*, *M. cochinchinensis*, *M. deeringiana*, *M. utilis*, *M.*

atropurpurea, *Canavalia ensiformis*, and *C. virosa* are sold as 'Poonaikali' (Tamil vernacular name of *M. pruriens*). The reason for trading of different seeds in the same vernacular name may be ignorance or intentional or confusion in the identity. The present investigation was aimed at studying pattern of seed ornamentation of all the market samples of 'Atmagupta' or 'Poonaikali' through Scanning Electron Microscope (SEM) and make an effort to evolve diagnostic characters to distinguish the authentic one with their adulterants or substitutes.

Seed coat micromorphology has provided useful information on identification, 'Poonaikali', the velvet bean comes under the most important family Fabaceae. Seed coat exhibit complex and highly diverse morphology and anatomy, providing valuable taxonomic characters. The aim of this study is to give a complete description of the surface structures of the seeds of seven marketed species. Heywood (1971) suggested the use of SEM as a tool for providing detailed information on spermoderm morphology in seed identification.

MATERIALS AND METHODS

Dried seeds were used for this study. A portion of seed coat below the hilum was cut off using a sharp blade and mounted as specimen stub using double adhesive tape. Samples were coated with gold using a Hitachi HVS 5 GB Vacuum evaporator to a thickness of 100 Å. Coated samples were viewed in a Hitachi S-450 scanning electron microscope operated at 20KV and photographed.

RESULTS AND DISCUSSION

Seeds of different samples of 'Poonaikali' were purchased from drug stores from different places of Tamil

Correspondence to:

A. SARAVANA GANTHI, Department of Botany, Rani Anna Govt. College for Women, TIRUNELVELI (T.N.) INDIA

Authors' affiliations:

C. VIJAYAMBIKA, Department of Botany, Rani Anna Government College for Women, TIRUNELVELI (T.N.) INDIA

M. JEGADEESAN, Department of Environment and Herbal Science, Tamil University, THANJAVUR (T.N.) INDIA

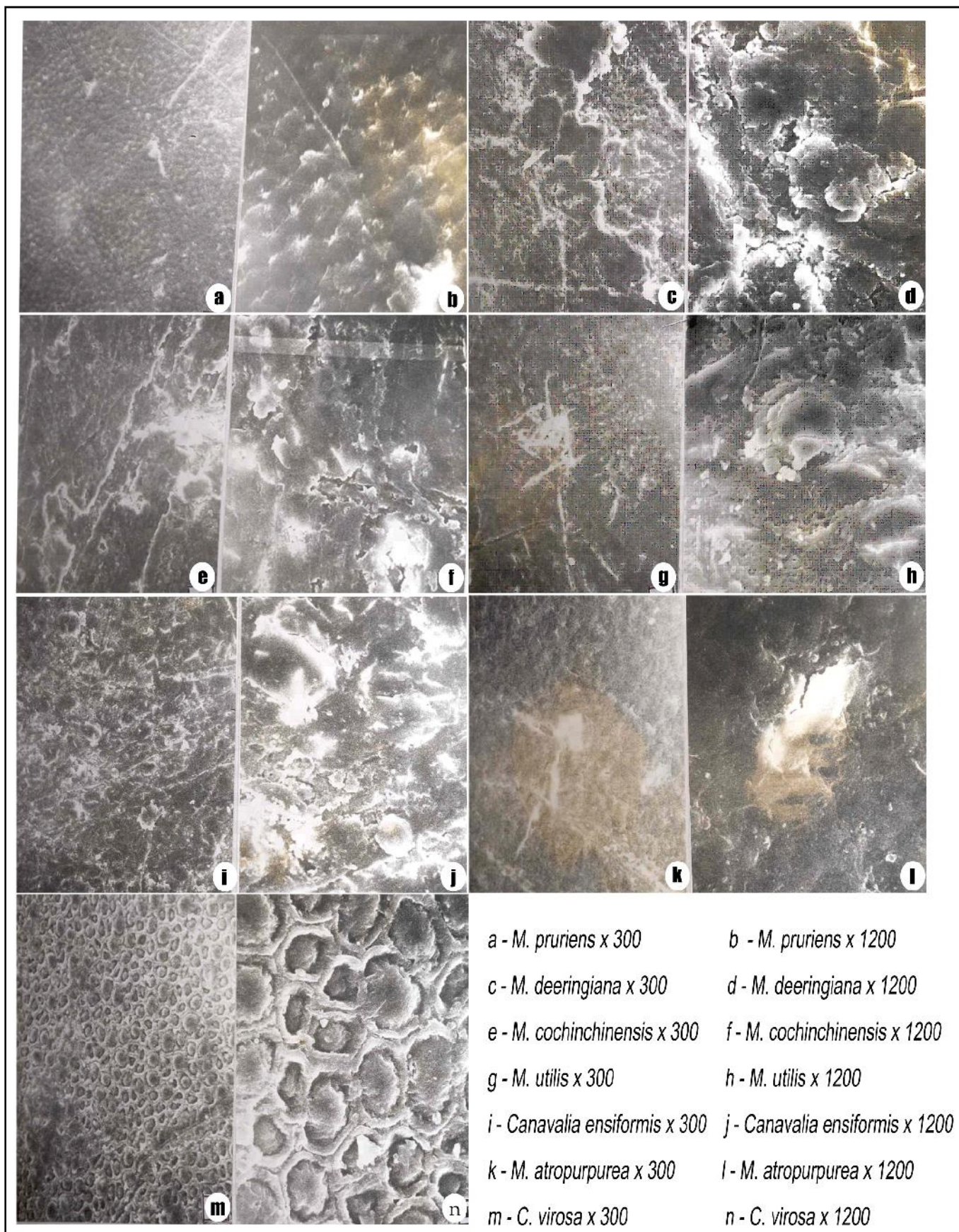


Fig. 1 : SEM photograph on seed coat

Nadu. The identification was confirmed by comparing voucher specimens available in the Botanical Survey of India, Coimbatore and Calcutta. The procured 'Poonakali' seeds consisted of seven different botanical sources viz. *Mucuna pruriens*, *M. cochinchinensis*, *M. deeringiana*, *M. utilis*, *M. atropurpurea*, *Canavalia ensiformis* and *C. virosa*. SEM study was made on these seeds and it was observed that all the seeds studied have distinct seed surface ornamentation and was very useful for identification.

***M. pruriens*:**

The seeds are brown in colour with black flecks. The seeds are smaller when compared to other species of *Mucuna*. The maximum axial length, breadth and thickness of the seed are 13 x 9 x 5 mm. Dimensions of raphae are 6 x 3 mm. SEM studies on the seed coat exhibited reticulate surface with regular pattern. Wax depositions were seen on the tip of the crusts (Plate a and b).

***M. deeringiana*:**

The seeds are larger and dark brown in colour. The maximum axial length, breadth and thickness of the seed are 15 x 11 x 8mm. Dimension of raphae is 6 x 2mm. SEM studies on the seed coat exhibited smooth waxy deposition with irregular cracks (Plate c and d).

***M. cochinchinensis*:**

The seeds are dull white in colour with grey striations. The maximum axial length, breadth and thickness of the seed are 14 x 10 x 7 mm. Dimensions of raphae are 5 x 2mm. SEM studies on the seed coat exhibited smooth waxy deposition but with irregular cracks (Plate e and f).

***M. utilis*:**

The seeds are grey with black spots. The maximum axial length, breadth and thickness of the seed are 16 x 11x 8mm. Dimensions of raphae are 7 x 3mm. SEM studies on the seed coat exhibited tuberculous and thick pattern with irregular wax depositions (Plate g and h).

***Canavalia ensiformis*:**

The seeds are ivory in colour. The maximum axial length, breadth and thickness of the seed is 18 x 11 x 8mm. Dimensions of raphae are 9 x 3mm. SEM studies on the seed coat exhibited reticulate and thick pattern with irregular wax depositions (Plate i and j).

***M. atropurpurea*:**

The seeds are very large in size and light to dark brown in colour. The maximum axial length, breadth and thickness of the seed are 23 x 22 x 11 mm. Dimensions of raphae are 40 x 3mm. SEM studies on the seed coat exhibited reticulate regular pattern with wax depositions in patches. The troughs are very shallow (Plate k and l).

***C. virosa*:**

The seeds are yellowish brown in colour. The maximum axial length, breadth and thickness of the seed are 17 x 10 x 7 mm. Dimensions of raphae are 13 x 2.5mm. SEM studies on the seed coat revealed reticulate and regular pattern with honey comb like structure with deep trough and thick walls (Plate m and n).

Based on the surface characters of the seed coat, the above samples can be grouped into the following categories.

Surface smooth with cracks	- <i>M. cochinchinensis</i>
Surface waxy with irregular cracks	- <i>M. deeringiana</i>
Surface tuberculous with irregular pattern	- <i>M. utilis</i>
Surface reticulate and waxy with regular pattern	- <i>M. pruriens</i>
Surface reticulate with honey comb like regular pattern	- <i>C. virosa</i>
Surface reticulate with regular wax depositions	- <i>M. atropurpurea</i>
Surface reticulate with irregular and thick wax depositions	- <i>C. ensiformis</i>

In present observations, a number of seed features occur in market samples that vary between different species, such as seed shape, size, and seed coat sculpturing. These features can be used in authentication of genuine product. From the above study it is clear that, all the seeds described have clear characteristic features by which one can clearly distinguished. Surface ornamentation of seed coat observed by SEM is usually born by the cuticle on the seed coat or the palisade layer of the seed coat which are stable for a particular taxon. So, it is clear that the SEM study would be helpful for the correct identification of seeds in the powdered form.

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