

# A representative analysis of LM and SEM studies of *Jatropha* L. pollen (Euphorbiaceae)

Bir Bahadur, C.G.K. Ramanujam\*, G.V.S. Murthy\*\*, S. Govardhan & T.P. Kalpana\*

*Botany Department, Kakatiya University, Warangal*

\* *Botany Department, P.G. College of Science, Saifabad, Hyderabad*

\*\* *Central National Herbarium, Botanical Survey of India, Howrah*

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The paper incorporates a comparative analysis of LM and SEM studies of the pollen of seven species of *Jatropha* L. of Euphorbiaceae. These are *J. glandulifera*, *J. tanjorensis*, *J. curcas*, *J. integerrima*, *J. panduraefolia*, *J. multifida* and *J. podagrica*. The investigation has clearly brought to light the taxonomic significance of sculptural features of the sporoderm such as 1. subtle variation in the crotonoid pattern, 2. size, shape, ornamentation and density of clava/pila processes, 3. presence or absence of free processes in lumina and their number, and 4. details of brochi and muri.

**Key-words**—*Jatropha*, LM and SEM studies

## INTRODUCTION

THE Euphorbiaceae is a highly eurypalynous family exhibiting a significant diversity in the morphology of its pollen types (Erdtman 1953; Punt 1962). During palynological investigation of various species of *Jatropha* L. it has been observed that the finer aspects of pollen sculpture provide fairly reliable criteria for taxonomic consideration. Erdtman (1952) studied the pollen of *Jatropha* and proposed the descriptive epithet "crotonoid pattern" for the special type of sculptural pattern encountered in some members of Euphorbiaceae. Subsequently Miller and Webster (1962) investigated 11 species of *Jatropha* and 5 species of *Cnidocolus* and commented upon the diversity in the crotonoid pattern of the exine.

An attempt is made in the present study to highlight the taxonomic significance of some of the finer details of the sporoderm sculpture within this genus.

## MATERIAL AND METHOD

The pollen grains of all the seven species studied viz., *Jatropha glandulifera*, *J. tanjorensis*, *J. curcas*, *J. integerrima*, *J. panduraefolia*, *J. multifida* and *J. podagrica* were subjected to acetolysis (Erdtman 1952) and the slides were pre-

pared in glycerine jelly. A set of each of the vouchered slides are stored in the sporotheca collection of Prof. Bir Bahadur and Prof. C.G.K. Ramanujam. All measurements are averages taken on a minimum of ten counts each. Most SEM observations were made on acetolyzed grains; in some cases, however, pollen stored in absolute alcohol were used. Therefore, dehydrated and acetolyzed pollen, depending on the species, were sputter coated with gold and photographed at suitable magnification with Phillips SEM 515 installed at the Central National Herbarium, Botanical Survey of India, Howrah, Calcutta.

## OBSERVATION

The palynodata of all the seven species of *Jatropha* investigated are presented together under two headings, LM and SEM to facilitate proper analysis and interpretation.

**LM**—Pollen  $\pm$  spheroidal, radially symmetrical, 51.0 to 66.0 $\mu$ m in diam (*J. multifida* 51.0 $\mu$ m and *J. panduraefolia* 66.0 $\mu$ m), inaperturate (ominaperturate), heavily sculptured with pila/clavate processes aligned reticulately (penta or hexagonally) to form moderately dense or lax crotonoid pattern; processes 1.8 to 5.4 $\mu$ m long, their heads 1.5 to 4.5 $\mu$ m., rounded to subtriangular

in *J. glandulifera*, *J. curcas* and *J. integerrima* and triangular in *J. tanjorensis*, *J. panduraefolia*, *J. multifida* and *J. podagrica*. Lumina generally psilate except in *J. tanjorensis* and *J. curcas* where they are with some free clava/pilla; ectexine much thicker than endexine (Pl.1, figs 1-10).

**SEM-** Pollen  $\pm$  spheroidal, inaperturate, sporoderm heavily sculptured with pilate/clavate processes aligned in crotonoid pattern; muri delimiting, lumina distinct except in *J. glandulifera* and *J. tanjorensis*; heads of processes usually psilate, or either faintly (*J. glandulifera* and *J. curcas*) or prominently (*J. tanjorensis*) striate; striae aligned in radiating pattern. Lumina smooth in *J. glandulifera* but studded with a variable number (upto six) of free pila/clava at least locally in other species; heads of lumina processes striate in *J. tanjorensis* and psilate in other species (Pl. 2-4, figs 11-24).

## DISCUSSION

The Euphorbiaceae is one of the largest families and most interesting palynologically because of the extreme eurypalyny as evidenced by a large variety of pollen types. The pollen characters of various subfamilies are briefly outlined below (Punt 1987) :

### 1. *Phyllanthoideae*

a. Pollen primitive, colpiate, somewhat finely reticulate.

b. Pollen coarsely reticulate and oblate.

### 2. *Oldfieldioideae*

Pollen types polyaperturate with Six or more apertures or pantoaperturate.

### 3. *Acalyphoideae*

Pollen types exhibit large variation, hence heterogeneous. The pollen types might be linked in a phylogenetical scheme.

### 4. *Crotonoideae*

Crotonoid pattern is found in different pollen types; otherwise varied in several features such as apertures, size and shape.

### 5. *Euphorbioideae*

Pollen types 3-6 colpiate and consistent in shape, size and ornamentation.

Miller and Webster (1962) studied the pollen morphology of five species of *Cnidocolus* and eleven species of *Jatropha* and showed that the pollen of these two taxa resemble each other not only in their large size (50-90 $\mu$ m) but also in their crotonoid pattern of exine ornamentation. As defined by Erdtman (1952) this special feature of pollen grains is due to essentially triangular to rounded (in cross section) excrescences (clava/pila) aligned in a regular polygonal or circular pattern around depressions delimited by muroid ridges. The size of the pollen of eleven species of *Jatropha* belonging to four sections is reported to range from 50.0 to 87.0  $\mu$ m (Miller & Webster 1962).

Table 1 highlights all such finer aspects of sculptural features that are considered taxonomically significant. These features included size, shape and the smooth or ornamented nature of the heads of clava/pila, presence or absence of free processes in lumina, dense or lax nature of crotonoid pattern and the nature of muri. In possessing striate clavate/pilate heads (under SEM) *Jatropha tanjorensis* pollen shows striking similarity with the pollen of *J. gossypifolia* described recently by Bahadur *et al.* (1997). We have observed that the density of crotonoid pattern is related to and controlled by the degree or development of the muroid ridges. When the muroid ridges are discrete and well developed delimiting the lumina, the crotonoid pattern appears lax. Conversely, when the muroid ridges are poorly developed, faint and obscure, the crotonoid pattern appears dense. Thanikaimoni *et al.* (1984) noted similar features in the crotonoid pattern of the pollen of *Croton* and *Domohinea*. Instead of any single character, it is the totality of the finer aspects of sculpture enumerated above that are of utilitarian value for a meaningful characterization of various species of *Jatropha*, notwithstanding a high degree of overlapping of various characters.

The pollen grains of *Jatropha* are similar to

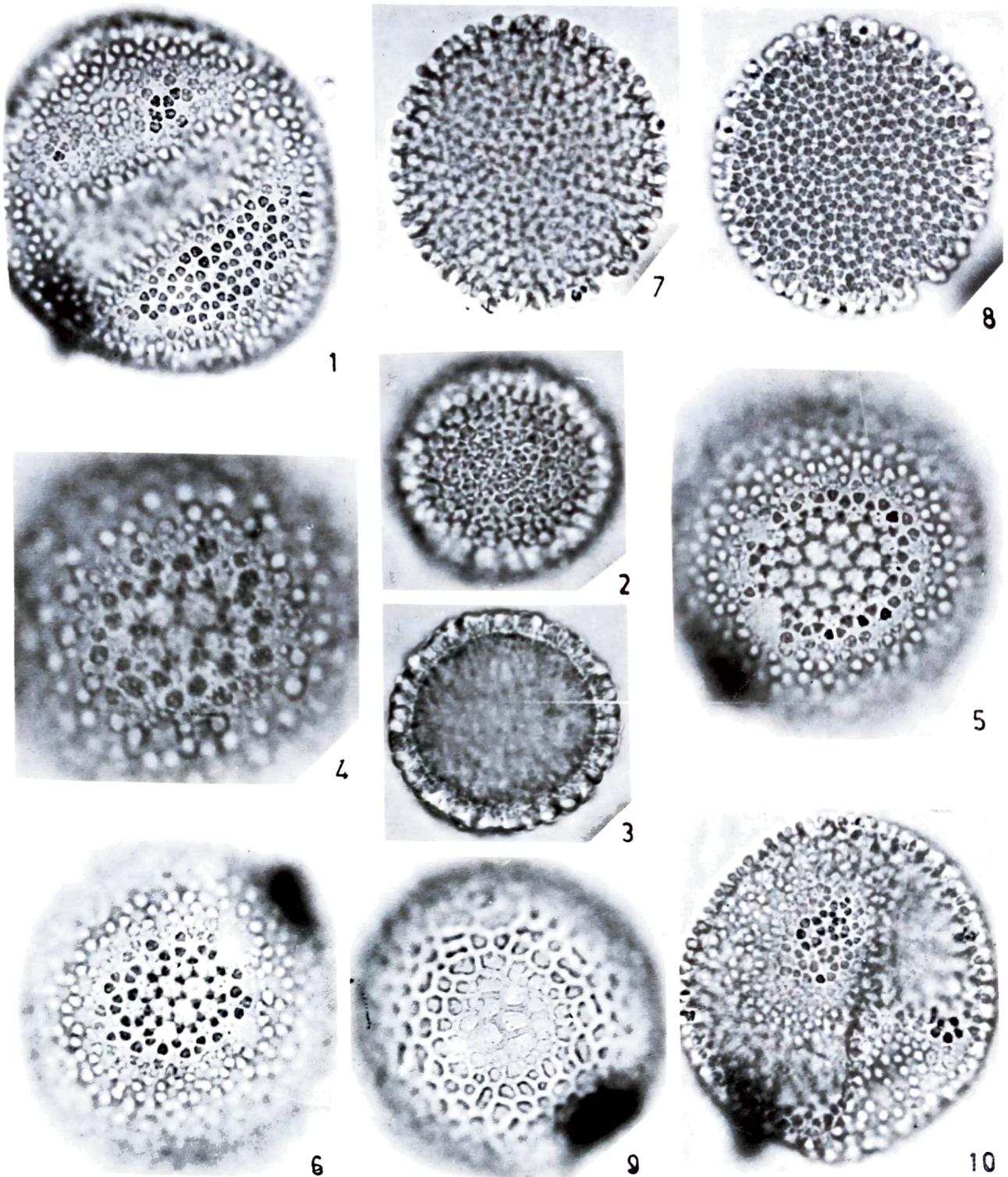


PLATE 1

Pollen of *Jatropha* under LM

(Unless otherwise mentioned all figs x 750)

1. *Jatropha glandulifera*; 2,3. *J. tanjorensis* x 600; 4. *J. curcas* x 850; 5,6. *J. panduraefolia*; 7,8. *J. integerrima*; 9. *J. multifida*; 10. *J. podagrica*

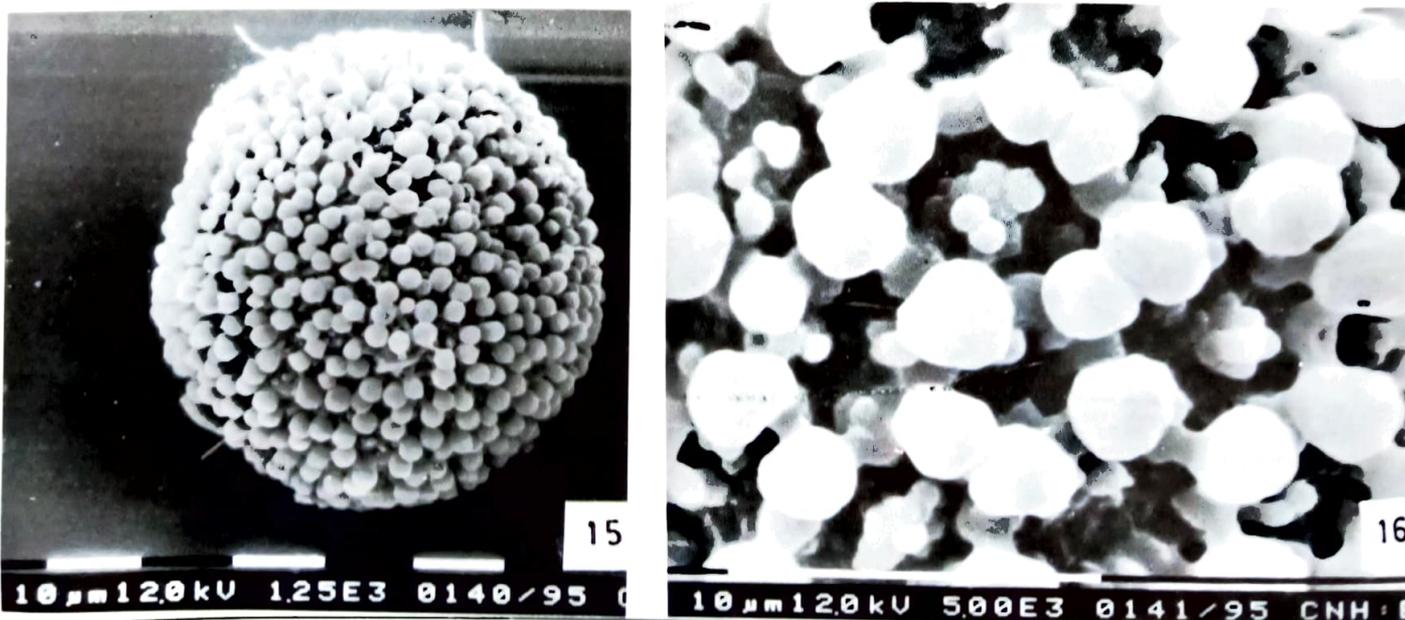
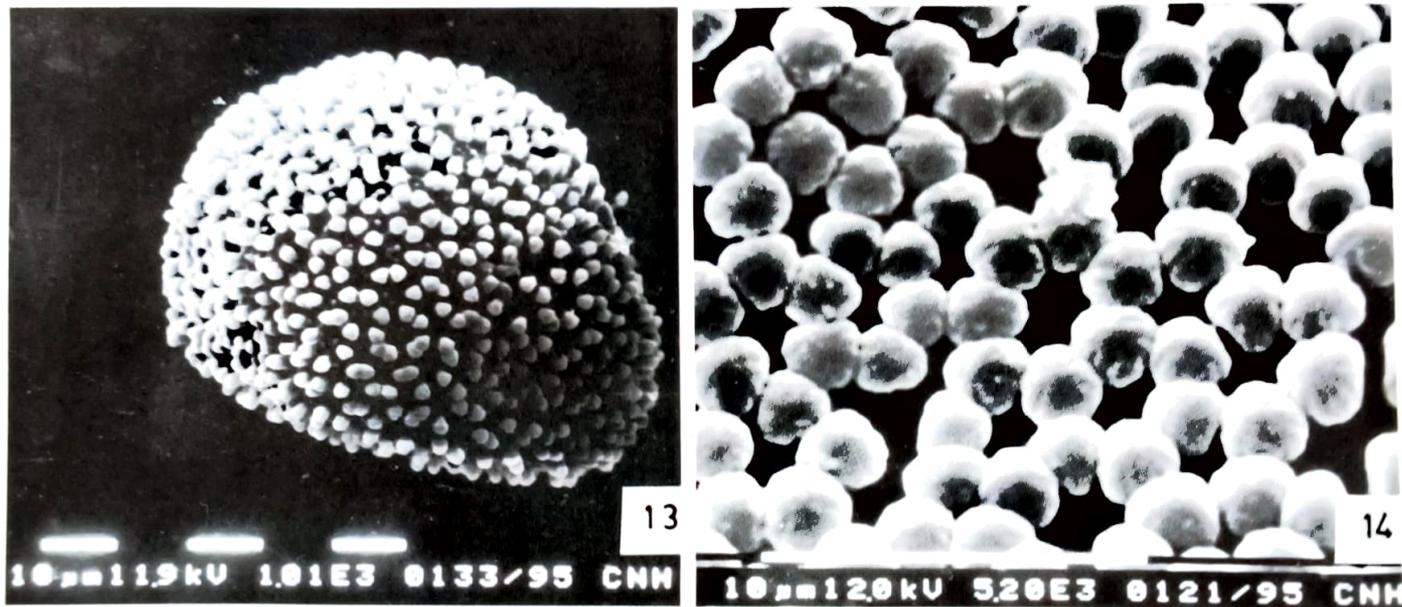


PLATE 2

Pollen of *Jatropha* under SEM

11,12. *Jatropha tanjorensis*—Note prominently, striate heads of pila; 13, 14. *J. glandulifera*; 15,16 *J. curcas*—Note free pila in lumina

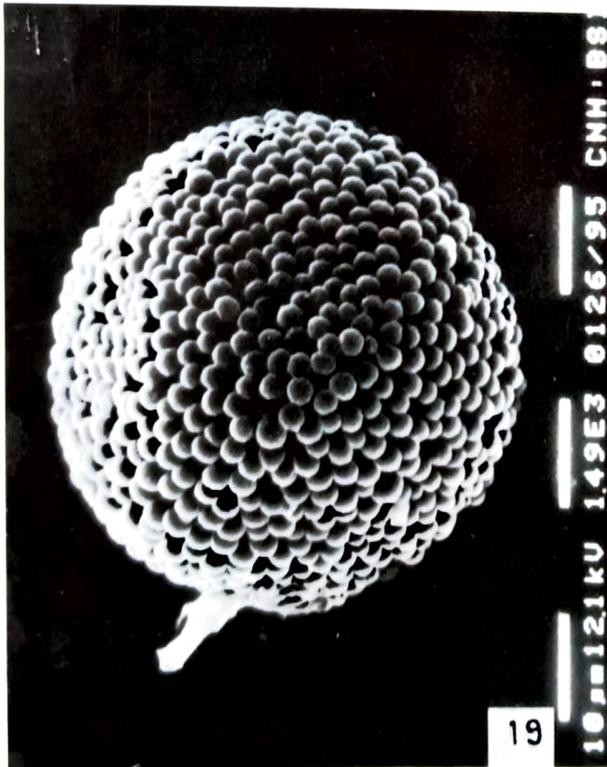
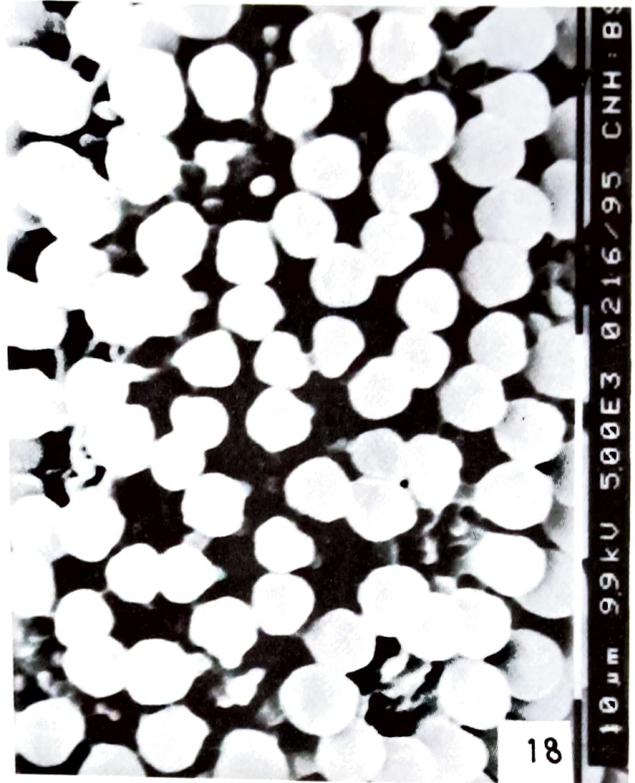
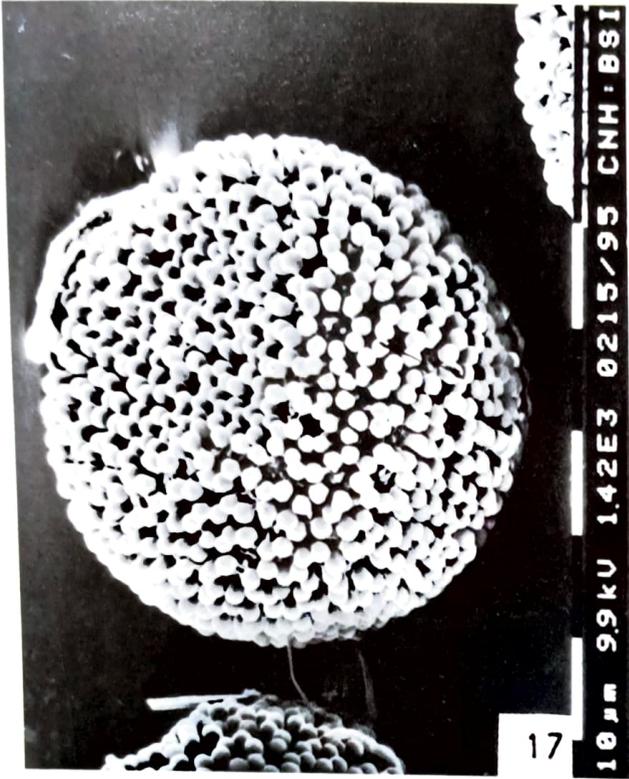


PLATE 3

Pollen of *Jatropha* under SEM

17,18. *J. panduracifolia*, 19,20. *J. integrerrima*

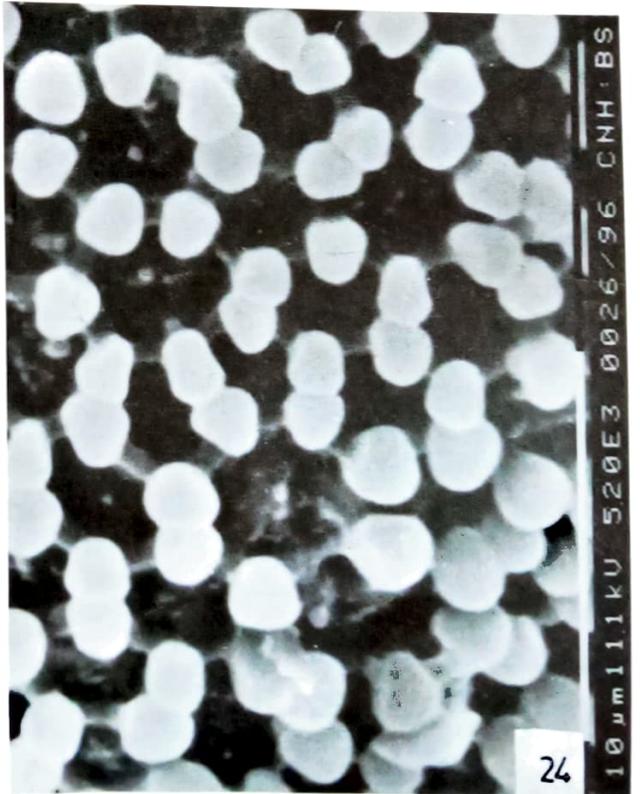
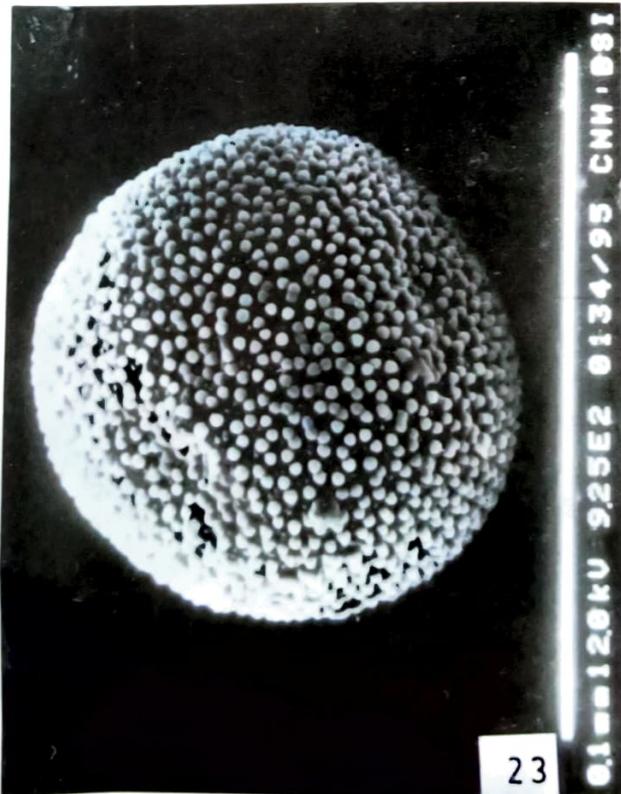
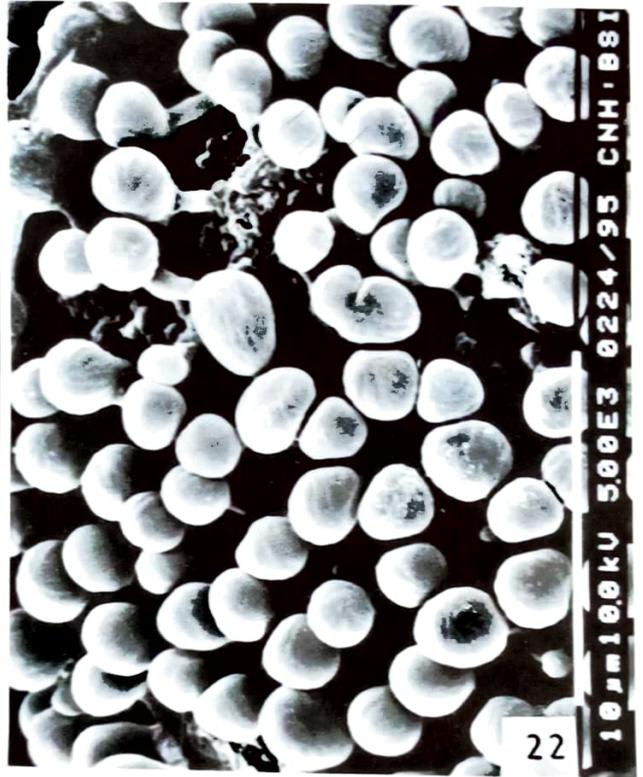
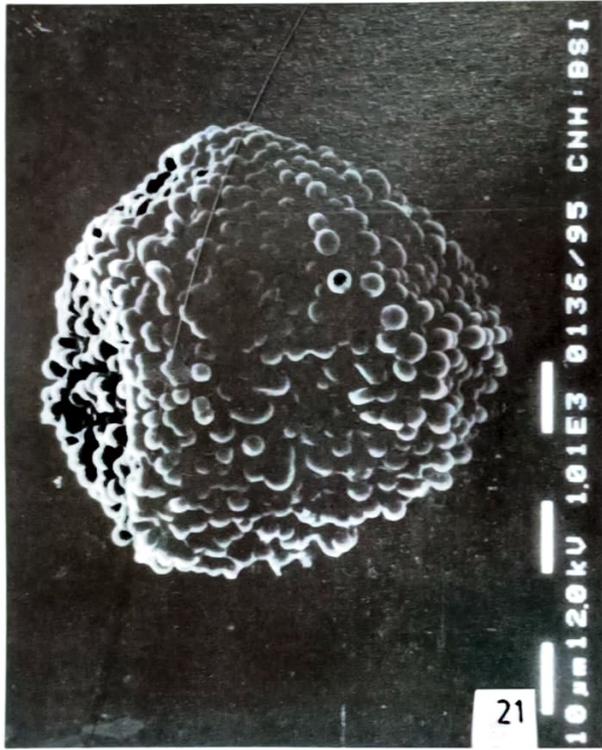


PLATE 4

Pollen of *Jatropha* under SEM

21,22. *J. multifida* 23,24. *J. podagrica*

Table 1 : Showing important finer features of sporoderm in *Jatropha* under LM & SEM.

Species	Clava/pila processes length; shape, diam. in $\mu\text{m}$ & nature of clava/pila heads	Crotonoid pattern	Luminal processes	Muri
<i>J. glandulifera</i>	3.0, rounded to subtriangular, 2.3, faintly striate	moderately dense	absent	faint
<i>J. tanzorensis</i>	3.8-5.4, triangular, 3.6, prominently striate	moderately dense	present 1-3	faint
<i>J. curcas</i>	3.0-4.5, rounded 3.75-5.25, faintly striate	lax	present 3-6	fairly thick, distinct
<i>J. panduraefolia</i>	1.8-3.0, mostly triangular, 1.5-2.3, smooth	moderately dense	occasional, 1-3	locally clear
<i>J. integerrim</i>	3.8, rounded to subtriangular, 2.3, smooth	moderately dense	seen locally 2-6	locally clear
<i>J. multifida</i>	3.8 triangular, 1.8, smooth	lax	seen locally 2-4	distinct
<i>J. podagrica</i>	2.3-3.0, triangular, 1.5-2.3, smooth	lax	present 1-4	distinct

those of *Cnidoscolus* in size and sculpturing pattern. However, the pollen grains of *Jatropha* are invariably inaperturate (Omniaperturate), whereas those of *Cnidoscolus* are 6-10 forate (Miller & Webster 1962). According to Miller and Webster (1962), the pollen of *Cnidoscolus* is less specialized than that of *Jatropha*.

*Jatropha* is represented by 165 to 175 species distributed under two subgenera, *Jatropha* (with six sections) and *Curcas* (with four sections), and many subdivisions (Dehgan & Webster 1979). Therefore, a comprehensive palynological study of species representative of all sections is desirable before suitable conclusions can be drawn on the relevance of palynology to the subgeneric and sectional classification of *Jatropha*, comparable to that based upon epidermal features of 37 species representing all the ten sections (Dehgan 1980).

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