Thaiszia - J. Bot., Košice, 5: 27-30, 1995

THAISZIA
Journal of Botany

Microsporogenesis in a mangrove plant *Rhizophora mucronata* LAM.

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SUDHAKARAN S., VAIDYANATHAN R. & GANAPATHI A. (1995): Microsporogenesis in a mangrove plant *Rhizophora mucronata* LAM. - Thaiszia -J. Bot., Košice, 5: 27-30. - ISSN 1210-0420.

Abstract: Microsporogenesis of *Rhizophora mucronata* LAM. has been studied. Even though developmental aspects are of conventional type, there are some specific characters like the multisporangiate anther, discontinuous archesporial cells, common multilayered endothecium, triplet origin of the tapetum and the lateral dehiscence of anther. The liberation of tri-colporate, uninucleate, subprolate pollen grains in a large number through the lateral openings is also noticed.

Keywords: *Rhizophora*, microsporogenesis, endothecium, tapetum, subprolate pollen grains.

Introduction

Mangroves are special and specific type of vegetation found in the backwater regions of the Global coastal line. The Pitchavaram mangroves is in Tamil Nadu with great diversity of plants in which four species of the genus *Rhizophora* dominatee (LAKSHMANAN 1983): *Rhizophora mucronata* LAM., *R. apicculata* BL., *R. lamarkii* MONTRE. and *R. stylosa* GRIFFITH.

R. mucronata LAM. has been selected for the study of microsporogenesis. Special attention has been given to the formation of archesporium and its derivatives. Wall layer formation, tapetal nature, endothecium and the microspore liberation were also investigated.

Material and methods

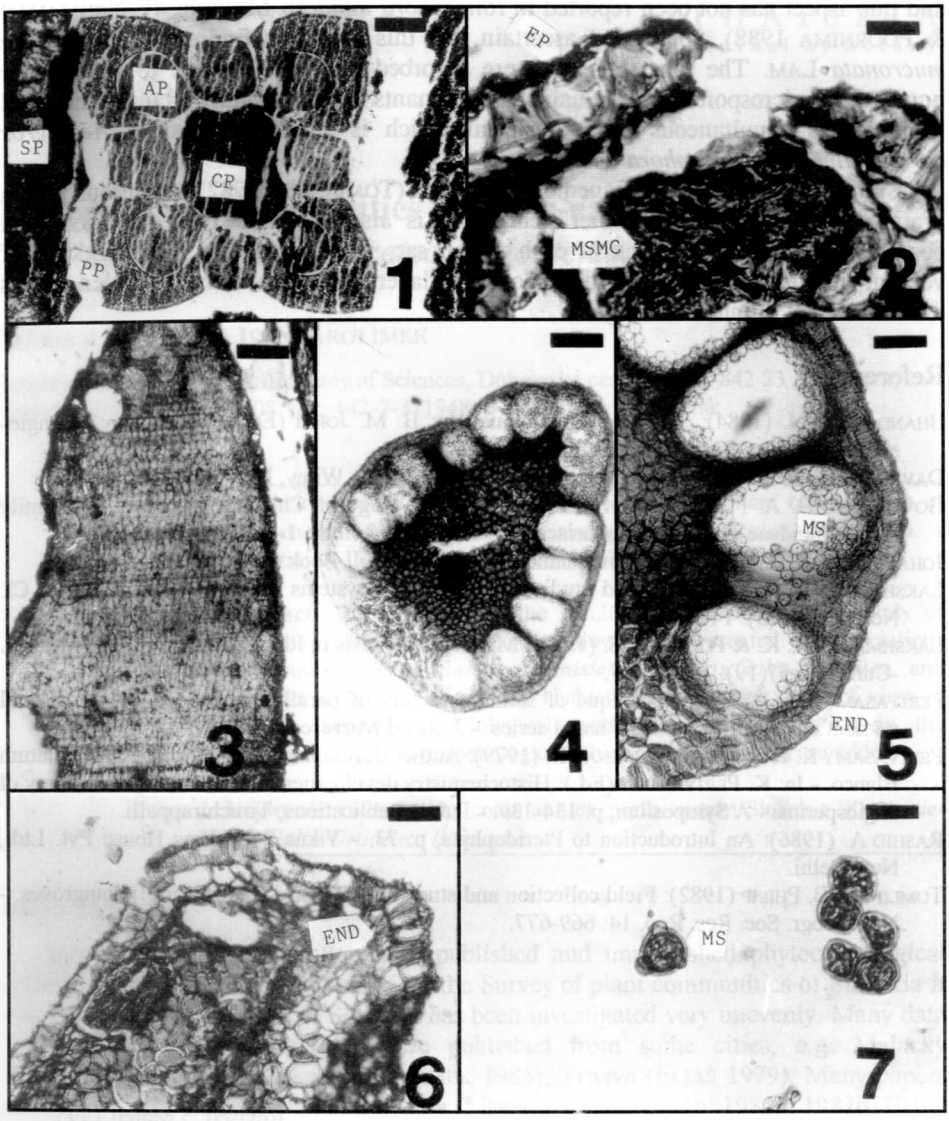
The *R. mucronata* Lam. flowers of different sizes (from young to old) were regularly collected from the Pitchavaram mangroves by the month of July. The entire buds and dissected anthers from the old flowers were fixed in the Formalin, acetic acid and alcohol (F.A.A.) mixture. The fixed materials were dehydrated with alcohol, cleared with xylene, infilterated with paraffin wax and the wax blocks were made following the method of JOHANSON (1940), with usual microtomy procedures ribbons were prepared. To avoid the dislodging and floating of the materials due to the presence of abundant tanninfilled cells, dry technique of PERIYASAMY (1967) was followed. The sections were dewaxed and stained with hematoxylin and erythrosin combination.

Results and discussion

Dissection of the flower showed 8 conical shaped stamens with very short filaments. The young anther in transection is oval to rectangular in outline, showing a uniform mass of homogeneous tissue enclosed by a distinct epidermis (Fig. 1). In slightly matured anthers, discontinuous linear rows of archesporial cells are differentiated in the hypodermal layer. The discountinuity is due to the presence of 3-4 layers of sterile cells in between the archesporial groups.

The tapetum is triplet in origin, formed by inner secondary parietal, connective and the lateral sterile cells. The endothecium is specific, arranged in 2-3 layers (Fig. 6) and common (i.e. it covers all the sporangial sacs as a ring [Fig. 5]). There are 2-3 middle wall layers and they are ephemeral.

The inner primary sporogeneous cells divide mitotically to form spore mother cells, which are polygonal in shape and closely arranged in young (Fig. 2). In the course of development the microspore mother cells are disconnected and are freely arranged in the sporangial sacs. The diploid microspore mother cells undergo meiotic division. The wall formation is simultaneous and centripetal. At maturity the anther showed outer epidermis, endothecial covering and the remnants of the tapetum. There were about 8-17 pollen sacs in transection (Fig. 4) and 10-21 pollen sacs in longitudinal section (Fig. 3). Through the breakage in the lateral sides of the pollen sacs due to the shrinkage of vertical fibrous thickenings in the endothecium, pollen grains were liberated in uninucleate condition. Each microspore is of 19 μm in diameter, subprolate with two wall layers and three germ pores (Fig. 7). The occurrence of multilocular sporangia derived from distinct units of archesporium in an anther is unique to angiosperm embryology. The multisporangiate condition is already reported in dicotyledonous families like *Gentianaceae* and *Loranthaceae* (BHANDARI 1984). The archesporium is organised hypodermally, and archesporial groups are intervened by fertile and sterile cells. The microsporangium in regular rows can be compared to the sporangia organised in eusporangiate pteridophyte *Ophioglossum* (RASHID 1986), but the developmental pattern is similar to that of *Aegiceros corniculatum* BLANCO (PERIYASAMY & SIVARAMAKRISHNAN 1979). The way of wall formation is of dicotyledonous type (DAVIS 1966). There are 2-3 layers of endothecium found at the sporangial part. This type of multilayered endothecium has been observed in *Cleome*,



Figs. 1-7.: 1. T. S. of young bud showing anther primordium. - 2. T. S. of young anther showing homogeneous cells. - 3. L. S. of anther showing the lateral arrangement of pollen sacs. - 4. T. S. of anther showing multilocular arrangement. - 5. T. S. of anther showing microspores. - 6. T. S. of anther showing endothecium. - 7. Tricolporate microspores.
[PP = petal primordium, EP = epidermis, SP = sepal primordium, MSMC = microspore mother cells, AP = anther primordium, END = endothecium, CP = carpellary primordium, MS = microspores]. Scale bars: Figs. 1, 3, 4 = 4 μm, Figs. 5, 6 = 12μm, Figs. 2, 7 = 20 μm.

and this aspect has not been reported in *Rhizophora lamarkii* MONTRE. (LAKSHMANAN & POORNIMA 1988). So we can ascertain that this is a new finding in *Rhizophora mucronata* LAM. The tapetal layers were absorbed very quickly due to the greater number of microspores and remains as remnants at the mature stage. The wall formation is simultaneous and centripetal which is similar to that of *Aegiceros corniculatum* and *Rhizophora lamarkii*.

Since the pollination is of anemophilous type (TOMLINSON 1982), numerous pollen grains are produced. The anther dehiscence is also peculiar. There is one crack observed at the middle region of each pollen sac, which is due to the shrinkage of vertical fibrous thickenings in the endothecial layer, through which the pollen grains are liberated at uninucleate stage.

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Received: 19 October 1993
Revised: 5 March 1995
Accepted: 15 March 1995