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DEVELOPMENT OF POLLEN AND OVULE IN *PTEROCARPUS MACROCARPUS* KURZ.,

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บทคัดย่อ

คณประจุไในดอกสมบูรณ์เพศ ซึ่งเจริญอยู่บนฐานรองดอกประกอบด้วยเกสรตัวผู้ และเกสรตัวเมียอยู่ในดอกเดียวกัน การพัฒนาของอับละอองเกสรตัวผู้ในระยะเริ่มแรกจะประกอบด้วยผนังชั้นนอก และ sporogenous cells เมื่อดอกและละอองเกสรตัวเจริญไปที่ ระยะสุดท้าย ผนังชั้นกลางจะสลายไปและละอองเกสรตัวผู้ลดจำนวน ส่วน sporogenous cells ที่ยังคงทำการแบ่งเซลล์ขึ้นมาอีกต่อไป และพัฒนาไปเป็นละอองเกสรตัวผู้ ในขณะเดียวกัน embryo sac ซึ่งอยู่ภายใน ovule ก็มีการพัฒนาของ ovule ที่สมบูรณ์ซึ่งประกอบด้วย ๒ integuments, antipodal cells, two endosperm mother cells และ egg apparatus พร้อมที่จะผสมพันธุ์ การพัฒนาของละอองเกสรตัวผู้และ ovule ที่สมบูรณ์ใช้เวลาประมาณ ๑ เดือน

ABSTRACT

Pterocarpus macrocarpus Kurz, has a perfect flower which is borne upon the peduncle. During the early stage of flower development, the anther consisted of anther wall and sporogenous cells. Later stage, the middle layers regenerated but the sporogenous cells still underwent cell division and formed pollen. As the later stage of flowering, the ovule contained one embryo sac covered with 2 integuments, outer and inner integuments. Each embryo sac consisted of three antipodal cells, two endosperm mother cells and egg apparatus. The development of pollen and ovule completed within one month.

INTRODUCTION

The flower of *Pterocarpus macrocarpus* is a small inconspicuous structure borne on the peduncle produced in the axils of the leaves. The perfect yellow tubular flower consists of calyx, corolla, androecium and pistil. The androecium comprises sixteen stamens. The single pistil comkposes of stigma, style and a small ovary. In the ovary, there are two or three ovules, there are two or three ovules. The mature ovules are campylotropous type of arrangement.

The information regarding flower and seed development of *P. macrocarpus* is inadequate by documented. Only general description of the genera was stated by Troup (1921) and Rojo (1977).

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This study is conducted in order to descript the phenological phenomena of this species beside is an important commercial timber of Thailand.

METERIALS AND METHODS

A speciment of flower of **P. macrocarpus** was collected twice weekly from February until middle March 1987 at the ASEAN-Canada Forest Tree Seed Centre, Muak-Lek, Sariburi, Thailand. The specimens were fixed in FAA, dehydrated by tertiary butyl alcohol series and embedded in paraffin wax heated to 54-56 °C as recommended by Johansen (1940). Longitudinal sections, 10-15 microns thickness, were obtained from rotary microtome.

The sections later were stained in 1% safranin "O" and 1% aniline blue for different periods of time as recommended by Sass (1958).

RESULTS

In the early developmental stage of stamen, an anther consists of a layer of epidermis ground tissue and sporogenous tissue. The ground tissue is developed into wall layers of pollen sac (Figure 1) while the sporogenous tissue is developed into microspore mother cells (2n). Each microspore mother cell divides to form four microspores. After formation, the microspores are aligened in tetrahedral configuration. In this stage, the microspore nucleus divided to two nuclei and formed a small generative cell and a large vegetative cell. These two cells are enclosed within a mature pollen grain (Figure 2.).

At the early stage of flower, development two or three ovule primordia arised on placentae. When each ovule primordium enlarged and integument primordia appeared, one hypodermal cell at the apex of the ovule primordium became conspicuous by increasing in size, larger nuclei and dense cytoplasm. This cell formed an archesporium cell. Soon after formation, the archesporium cell functioned as the megaspore mother cell (Figure 3). This cell divided to form dyad cells by meiotic division. Similar division in the dyads formed the tetrad of spore. In the formation of the dyads and of the tetrad of spores walls were formed separating the individual cells. One of the four megaspores enlaraged and became the embryo sac mother cell. The other three megaspores degenerated. On the other hand, the integument primordia formed the inner integument and outer integument (Figure 3) then became completely enveloped which enclosed within the embryo sac.

At anthesis, the embryo sac increased in size of the nucleus and contented of cytoplasm.

Its nucleus underwent mitotic division forming 8 nuclei in the mature embryo sac (Figure 4).

The organized embryo sac has an egg apparatus, three antipodal cells and two endosperm mother cells

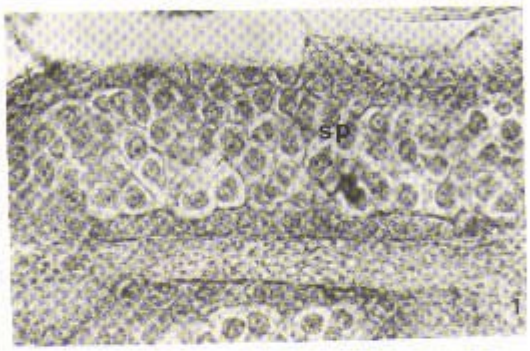

Figure 1. Longitudinal section of anther showing the sporogenous tissue. (Sp).

Figure 2. Longitudinal section of anther showing (1) anther wall, epidermis (epi) and endothermis (end), (2) pollen grain (pg) and (3) pollen sac (psl).

Figure 3. Longitudinal section of ovule primordium showing outer integument (oi), inner integument (ii) and functional megaspore mother cell (mmc).

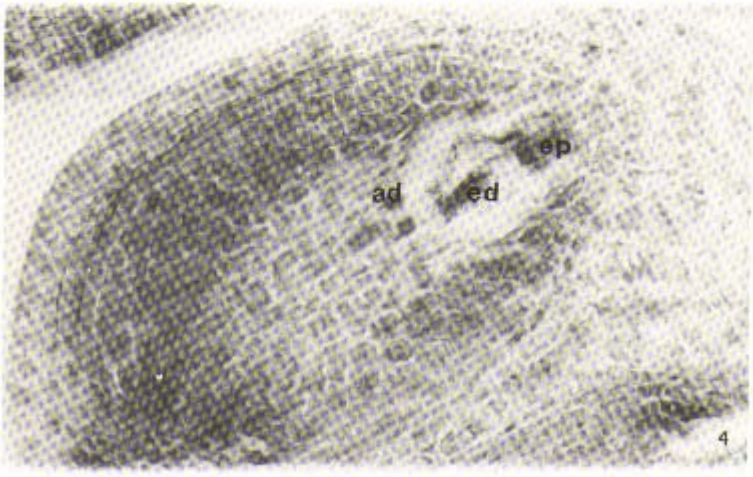

Figure 4. Longitudinal section of ovule showing mature embryo sac which consists of egg apparatus (ep), antipodal (ad) and endosperm mother cell.

DISCUSSION

According to Norman (1949) cells which are surrounded by a hypodermal layer of the stamen of **Vinca rosea** are derived from the floral apex and produced the sporangium wall, part of tapetum and the sporogenous cells. As the microsporangium grows, the tapetum degenerates but the sporogeneous cells develop and form tetrad pollens during the later developmental stage. The tetrad pollens separate into individual grains as was reported for teak *(Tectona grandis, Linn.)* by Siripatanadilox (1974). The individual pollen of **P.macrocarpus** showed semilar development as teak. But a shape of pollen is different. In the early developmental stage of **P.macrocarpus** ovule, the nucellus with archesporial cell functions as the megaspore mother cell. It is enveloped by two layers of integument. Later, the megaspore mother cell develops and forms an embryo sac. This embryo sac consists of three antipodal cells at the chalazal end, the egg apparatus and the endosperm mother cell at micropylar end. The development of the **P.macrocarpus** ovule is as same as the teak (Siripatanadilox, 1974) and **Oxybajphus nyctagineus** (Cooper 1949).

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