



UNIVERSITI PUTRA MALAYSIA

**TAXONOMIC REVISION OF FERN (*Pteris* L.) IN PENINSULAR
MALAYSIA**

ROZILAWATI SHAHARI

FS 2008 55



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**MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA
2008**



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MALAYSIA**

By

ROZILAWATI SHAHARI

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Master of science**

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Abstract of the thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

TAXONOMIC REVISION OF FERN (*Pteris* L.) IN PENINSULAR

MALAYSIA

By

ROZILAWATI SHAHARI

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Chairman: Associate Professor Rusea Go, Ph.D.

Faculty: Science

A taxonomic revision of *Pteris* in Peninsular Malaysia was carried out from January 2006 to July 2007. Fifteen species of *Pteris* has been examined. This study was conducted to document all available taxa of *Pteris*, to investigate possible wrongly named or unnamed species of *Pteris*, and develop a dichotomous key from morphological, anatomical and spore ultrastructure characteristics. Materials for this study were obtained from both the field and herbarium collection. *Pteris* specimens deposited in Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKMB), Universiti Malaya (KLU), Forest Research Institute Malaysia (KEP), and Singapore Herbarium (SING) were identified and annotated for the morphological studies. Fern specimens were also collected from several states in Peninsular Malaysia such including N.Sembilan, Perak, and Johor for the anatomical studies using light microscope to observe the shape of vascular bundle. Spore of *Pteris* was



examined using scanning electron microscope to obtain the surface ornamentation. From this study, *P. multifida* Poir. was recorded as new record to Peninsular Malaysia, and two species were reported as rare and the rest of the species were common in Peninsular Malaysia. *Pteris* grows terrestrially in more or less shaded locations, open places and on all type of soils. *Pteris* also grow on old buildings such as *P. vittata* and in rock-crevices such as *P. multifida*. Morphological studies including frond architectures and study of anatomy stipe were conducted, as they are taxonomically significant for delimiting species within *Pteris*. Four types of frond architectures were observed. There are simple pinnate, bipinnate, bipinnatifid and tripinnatifid. Mainly two types of venation were encountered within the genus *Pteris* in Peninsular Malaysia. The two types of veins are free veins and simple anastomosing. The stipe anatomy reveals that *Pteris* has hipposcampus-shaped bundle in the stele. Sori of *Pteris* produced at the back side of the lamina and elongated along the margins of the pinnae, but not quite reaching the base of apex and covering by false indusium. The shape of the spores of the *Pteris* was recognized as the triangular type which could be seen both in the light microscope and scanning electron microscope. The spores of the genus *Pteris* can be segregated into five different groups based on the variations in the surface structure of the spore. The surface structure of the spore of the *Pteris* was baculate, costate, verrucate, rugulate, and tuberculate.



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memenuhi keperluan untuk Ijazah Sarjana Sains

SEMAKAN TAKSONOMI BAGI PAKU PAKIS (*Pteris* L.) DI

SEMENANJUNG MALAYSIA

OLEH

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OKTOBER 2008

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Semakan taksonomi untuk genus *Pteris* L. telah dijalankan di Semenanjung Malaysia antara Januari 2006 hingga Julai 2007. Daripada kajian ini, sejumlah 15 spesis daripada genus ini telah diteliti. Kajian ini dijalankan untuk menghimpunkan semua taxa bagi genus *Pteris*, mengenal pasti spesimen yang salah atau tidak bernama dan membina kekunci taksonomi berdasarkan ciri-ciri morfologi, anatomi dan corak perhiasan spora. Spesimen *Pteris* yang disimpan di Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKMB), Universiti Malaya (KLU), Institut Penyelidikan dan Perhutanan Malaysia (KEP), and Herbarium Singapore (SING) dikenalpasti untuk kajian morfologi. Sebahagian daripada spesis ini juga dikumpul daripada negeri-negeri di Semenanjung Malaysia seperti N.Sembilan, Perak dan



Johor untuk kajian anatomi menggunakan mikroskop cahaya bagi mengenal pasti bentuk berkas vascular. Corak perhiasan spora pula telah dikenal pasti menggunakan mikroskop elektron imbasan. *Pteris multifida* Poir telah dilaporkan sebagai rekod baru di Semenanjung Malaysia. Dua spesis direkodkan jarang ditemui dan lain-lain spesis adalah senang untuk ditemui. *Pteris* adalah paku-pakis daratan yang tumbuh dikawasan yang lembab, tempat terbuka dan dikebanyakan jenis tanah. *Pteris* juga tumbuh di atas bangunan lama seperti *P. vittata* dan di celah-celah batu seperti *P. multifida*. Kajian morfologi termasuk corak percabangan dan anatomi batang telah dijalankan dan adalah beerti secara taksanomi untuk membatasi atau membezakan spesis *Pteris*. Empat jenis corak percabangan telah dikenalpasti daripada kajian ini iaitu pinnat, bipinnat, bipinnatifid dan tripinnat. *Pteris* L. Juga mempunyai dua jenis urat daun iaitu urat daun jenis ringkas dan serabut. Kajian anatomi batang pula menunjukkan bahawa *Pteris* L. mempunyai berkas vascular bentuk hippocampus dalam stel. Sorus kepada genus ini pula tersusun lurus di bahagian belakang helaian daun tetapi tidak bercantum di hujung daun dan dilindungi dengan indusium palsu. Bentuk spore genus ini dikenalpasti sebagai bentuk tiga segi yang mana boleh dilihat di bawah mikroskop cahaya dan mikroskop elektron imbasan. Variasi permukaan spore genus ini boleh dibahagikan kepada lima kumpulan iaitu 'baculate', 'costate', 'rugulate', 'tuberculate' dan 'verrucate'.



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May Allah bless each one of you



DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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CHAPTER 1

1.0 INTRODUCTION

1.1 General Introduction

Pteridophytes are a group of plants that have special characteristics which cannot be seen in the other groups of plants. The most obvious characters that made it different from other plants are the young fronds. The new fronds are usually coiled like a fiddlehead and are called crozier. Other feature is that these plants produced spores inside a structure underneath the leaf called the sporangia (Bidin, 1986) which produced thousand of spores (Wee, 1997). Pteridophytes belong to a group of non flowering plants because they do not produce flowers and because their method of reproduction is not obvious (Jones, 1987).

Pteridaceae is a large diverse fern with a worldwide distribution. The family is scarcely known from the fossil record, being represented with certainty only in the Eocene by *Acrostichum preaureum* Arnold and Daughterty (Tryon & Tryon, 1982). The existence of this family in Peninsular Malaysia was first described by Beddome (1833) in the publication *Handbook of the Ferns of British India, Ceylon and The Malay Peninsular*. He classified Pteridaceae under tribe Pterideae and divided into



12 genera; *Adiantum*, *Cheilanthes*, *Onychium*, *Crytogramme*, *Pellea*, ***Pteris***, *Campteria*, *Doryopteris*, *Litobrochia*, *Ceratopteris*, *Lomaria* and *Plagiogyria*.

Pteris comprises of an estimated number of 240-300 species and is distributed worldwide in tropical and temperate moist areas (Winter & Amoroso, 2003). According to Holttum (1966), 14 species of *Pteris* can be found in Peninsular Malaysia and none of the species was endemic.

All species of *Pteris* have marginal fusion-sori of the same type as *Pteridium* and *Histiopteris* but, it differs from one to another as *Pteris* has an erect rhizome and scaly whereas rhizome of *Pteridium* and *Histiopteris* are creeping and hairy. Scales of *Pteris* always present on the rhizome or base of stipe. Frond is simple pinnate to bipinnate and sometimes tripinnate. Branch of the basiscopic side is similar in shape to the main part of the pinna but smaller. The leaves veins are free or can be simple anastomosing. Sori are linear, submarginal and cover when young by an indusium.

All of the *Pteris* species are considered as common plants of shady forest. *Pteris* grows terrestrially in more or less shaded locations, from sea-level up to high mountains, less open to open places and on all kinds of soils. The commoner ones are mostly found on rock-crevices, or in other particularly well-drained places not in ordinary earth (Holttum, 1966). *Pteris* can be found in many places of Peninsular Malaysia such as Selangor, Pahang, Johor and Perak.



According to Burkill (1966), species of *Pteris* has not much use compare to other ferns, but is has potential economical values in traditional uses. Burkill (1968), found that the juices of tender young leaves of *P. ensiformis* were used in Pahang as an astringent preparation for cleansing unhealthy tongues of children. Besides that, *Pteris* is also popular as an ornamental plant.

The systematic and taxonomy of the Pteridaceae has been controversial. Historically, the genus has been treated under tribe Pterideae (Beddome 1883) and more recent interpretations have changed the group of this genus. For example, Holttum (1966) has classified *Pteris* under sub-family Pteridioideae, while Eddie (1977) in *Ferns of Hong Kong* classified *Pteris* under family Thelypteridaceae.

Since Holttum did the last taxonomic revision in 1954, no comprehensive study has been carried out on *Pteris* from Peninsular Malaysia. In addition, the *Pteris* species are difficult to distinguish morphologically.

Thus the objectives of this study were;

1. To document all available taxa of *Pteris*.
2. To investigate possible wrongly named or unnamed species of *Pteris*.
3. To develop a dichotomous key from morphological, anatomical and spore ultrastructure characteristics.

