GTRP
GAYATHRI TEKNOLOGICAL RESEARCH & PUBLICATION
Pteridological Research

Identification of developmental stages of *Actiniopteris radiata* Swartz) Link.,

M. Maridass[#], G. Raju[#], R. Mahesh*, K. Muthuchelian* and K.Dharmar[**]

[#]Department of Advanced Zoology and Biotechnology, Pioneer Kumaraswamy College, Nagercoil – 629 003, Tamil Nadu, South India.

*Centre for Biodiversity and Forest Studies, Madurai Kamaraj University, Madurai – 625 021,

[**]Pasumpon Thiru Muthuramalinga Thevar Memorial College, Kamuthi, Ramnathpuram-623 604, Tamil Nadu

Published: 15 June, 2012; Vol.1(1):13-16;

Abstract
The fern gametophyte is a small plant that exists as an intermediate in the fern life cycle, between the germination of a spore and the mature sporophyte. The gametophytic generation of *Actiniopteris radiata* was observed in spore morphology, spore germination and also development stages of the gametophytes. The spores of *A. radiata* were trilete in shape, 50x50µm size and characteristics of apogamous type gametophytes observed.

Keywords: Pteridophytes; *Actiniopteris radiate;* gametophytes;spores;

Introduction

Pteridophytes are commonly to be found as particularly rare in arid environments (Aldasoro *et al*., 2004; Christ, 1910; Ozenda, 2004), especially in the Sahara (Quézel, 1965; Tardieu Blot, 1953; White,1983). Many traits are used to infer the reproductive biology of ferns, such as the mating system, the number of spores in each sporangium, sporogenesis, spore size, and in some ferns, the lifespan of the gametophyte generation are reported earlier workers (Manton, 1950, Masuyama, 1979, 1986, Walker, 1979, Haufler *et al*., 1985, Lin *et al*., 1990, Kawakami *et al*., 1996, Huang *et al*., 2006).

Actiniopteris radiata Swartz) Link., is belonging to the family Actiniopteridaceae which is a small terrestrial fern, found in India, Burma, Sri Lanka, Afghanistan, Persia, Arabia, Yemen, South Eastern Egypt, Tropical Africa, Australia and Madagascar. It is of limited distribution, and in areas where it occurs, is restricted to depleted walls and rocky crevices of steep slops of exposed hilly areas, up to the altitude of 1200m. It is used as styptic and anthelmintic; fronds are chewed for sore throat and rhizome is boiled to cure dandruff in West Indies (Dixit and Vohra, 1984). The Wealth of India, (2006) reported that this plant has been used for various biological activities such as antifertility, styptic, anthelmintic, antitubercular etc. Taneja and Tiwari, (1974) studied in phytochemical analysis of stems and leaves to be found in hentriacontane, hentriacontanol, *β*-sitosterol palmitate, *β*-sitosterol, *β*-sitosterol-*D*-glucoside and quarcetin-3-rutinoside. The present study is focused on the growth and development of gametophytes of *A. radiata* on natural environments.

Materials and Methods

Field collections

Field collections and observation of *A. radiata* was conducted from December 2010 to March 2011 at Sivagiri forest range of Southern Western Ghats region, Tirunelveli District, Tamil Nadu, South India. The spore germination, growth of gametophytes and differentiation and sex ontogeny were observed periodically. Photomicrographs were taken of spore morphology, germination of spores and gametophytes by compound microscope and optic microscope with Digital Camera Nickon, 3100.

This article is PR direct Email Submission. Freely available on online through the PR open access www.gbtrp.com.

Received: January, 17, 2012
Accepted: February, 18, 2012

*****To whom correspondence may be addressed.
Email: maridassugcpdf@yahoo.co.in

Results and Discussion

The structure of spores and gametophytes of *A. radiata* are observed under compound microscope. The spores were trilete in shape and 50x50µm size (Plate-1, Fig. B). The sporangium was produced very low spores which are deposited in the parent plants of *A. radiata*. The majority of some fern spores were deposited in the vicinity of parent plants (Ramirez-Trejo *et al*., 2004), but transport of spores into opposing habitats can occur by wind (Dassler and Farrar, 2001). Spores are incredibly resistant to extremes temperature, moisture, altitude, and irradiation (Page, 2002), and reportedly many have the ability to remain viable for decades (Ramirez-Trejo *et al*., 2004).

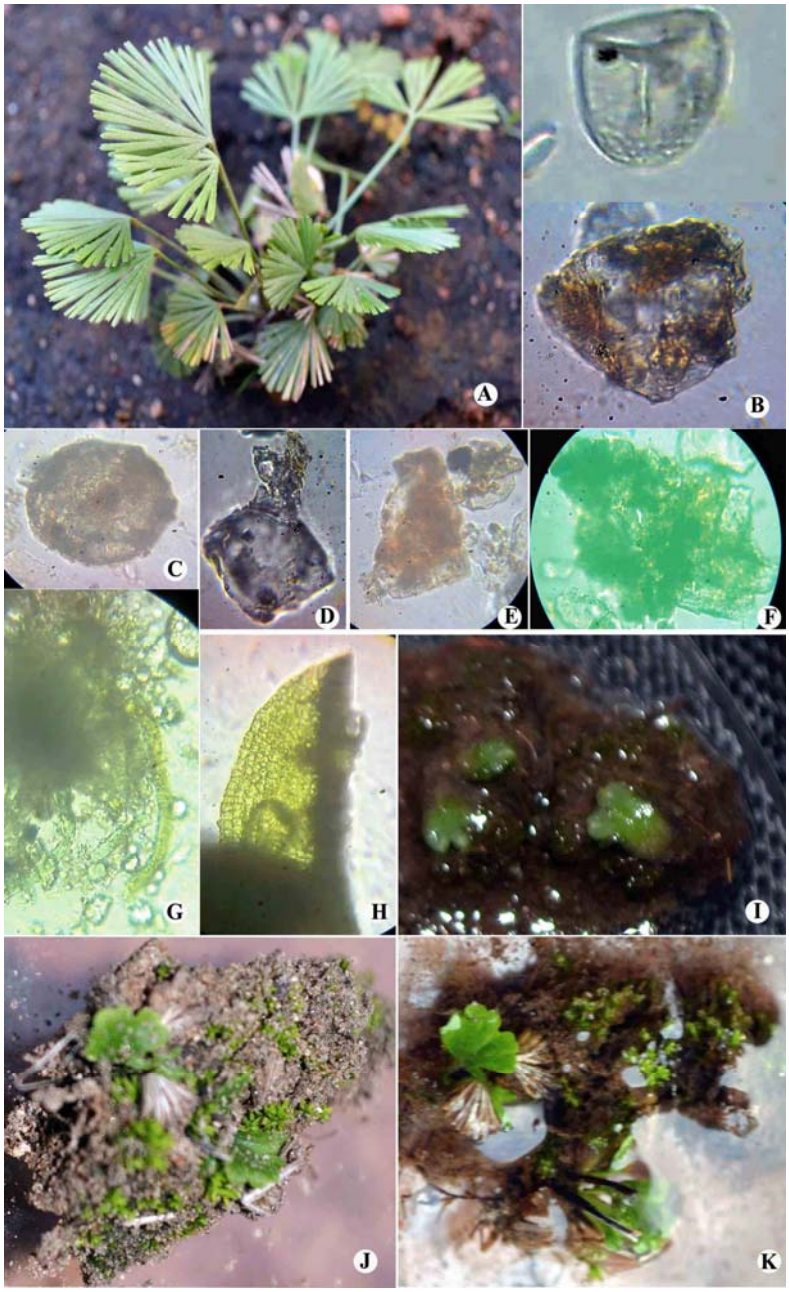

Fig.1: Gametophytes developmental stages on *A. radiata*

Gametophytes of *A. radiata* stages were more likely to develop 0-3 stages (Fig 3-6). A total of 15-65 gametophytes of each plant were examined. Most gametophytes were cordate, and all had a midrib, two wings, and an entire margin (Fig. 4). The observed results showed that the apogamous characteristics of gametophytes formed in *A. radiata* (Plate-1 D-I). Earlier reports of *A. radiata* growth on epiphytic soils may be limited by water accessibility, gametophyte morphology, epiphytic pathogens, and biochemical influences by natural conditions (Chiou and Farrar, 1997; Chiou *et al*., 1998; 2002; Onyilagha and Grotewold, 2004; Watkins *et al*., 2005).The conclusion of the present study of *A. radiata*, was agamospory characteristic of the production of a sporophyte without fertilization and formation of gametophytes, which is grown in under dry conditions and also propagation through vegetatively via their rhizomes.

Acknowledgements

The work was supported by Dr. D. S. Kothari Postdoctoral Program, University Grants Commission, New Delhi, India.

References

Aldasoro, J.J., Cabezas, F. and Aedo, C. 2004. Diversity and distribution of ferns in sub-Saharan Africa, Madagascar and some islands of the South Atlantic. *Journal of Biogeography*, 31:1579-1604.

Christ, H. 1910. Die Geographie der Farne. G. Fischer, Jena.

Ozenda, P. 2004. Flore du Sahara, Third Ed.. CNRS, Paris.

Quézel, P. 1965. La Végétation du Sahara. Fischer, Stuttgart.

Tardieu Blot, M.L. 1953. Les Ptéridophytes de l'Afrique Intertropicale Française. IFAN, Dakar.

White, F. 1983. The Vegetation of Africa. UNESCO, Paris.

Manton, I. 1950. Problems of Cytology and Evolution in the Pteridophyta. Cambridge University Press, Cambridge.

Manton, I. 1950 Problems of cytology and evolution in the Pteridophyta (Cambridge University Press: Cambridge, UK).

Masuyama, S. 1979. Reproductive biology of the fern *Phegopteris decursive-pinnata*. I. The dissimilar mating systems of diploids and tetraploids, *Bot. Mag. Tokyo,* 92: 275-289.

Masuyama, S.1986. Reproductive biology of the fern *Phegopteris decursive-pinnata*. II. Genetic analysis of self-sterility in diploids, *Bot. Mag. Tokyo,* 99**:**107-121.

Haufler, C.H., Windham, M.D., Britton, D.M. and Robinson, S.J. 1985. Triploidy and its evolutionary significance in *Cystopteris protrusa*, *Can. J. Bot.,*63**:**1855-1863

Kawakami, S.M., Ito, M. and Kawakami, S. 1996. Induced apogamous sporophytes in *Pteris dispar* and *P. semipinnata*, and meiotic behavior in their sporophytes. *J. Plant Res*., 109**:**369-373.

Lin, S.J., Kato, M. and Iwatsuki, K. 1990 Sporogenesis, reproductive mode, and cytotaxonomy of some species of *Sphenomeris*, *Lindsaea*, and *Tapeinidium* (Lindsaeaceae). *Am. Fern J*., 80**:** 97-109.

Huang, Y.M,, Chou, H.M., Hsieh, T.H., Wang, J.C. and Chiou, W.L. 2006 Cryptic characteristics distinguish diploid and triploid varieties of *Pteris fauriei* (Pteridaceae). *Can. J. Bot.,* 84**:** 261-268

Taneja, S.C. and Tiwari, H.P.1974. Chemical constituents of *Actiniopteris radiata* (Sw) *Current Science*, 43(23): 749-750.

Dassler, C. and Farrar, D. 2001. Significance of gametophyte form in long distance colonization by tropical, epiphytic ferns. *Brittonia*,53:352-369.

Chiou, W. and Farrar, D. 1997. Comparative gametophyte morphology of selected species of the family Polypodiaceae. *American Fern Journal,* 87: 77-86.

Chiou, W., Farrar, D.R. and Ranker, T. 1998. Gametophyte morphology and reproductive biology in *Elaphoglossum*. *Canadian Journal of Botany*, 76: 1967-1977.

Chiou, W., Farrar, D. and Ranker, T. 2002. The mating systems of some epiphytic Polypodiaceae. *American Fern Journal*, 92: 65-79.

Onyilagha, J. and Grotewold, E. 2004. The biology and structural distribution of surface flavonoids. *Recent Research Developments in Plant Science,* 2: 2-19.

Watkins, J., Mack, M. and Mulkey, S. 2005. Comparative functional ecology of terrestrial and epiphytic gametophytes of tropical ferns. ESA Annual Meeting. Abstract. Montreal, Canada.

Walker, T.G. 1985. Some aspects of agamospory in ferns e the Braithwaite system. *Proceedings of the Royal Society of Edinburgh*, 86: 59-66.

The Wealth of India, 2006. Council for Scientific and industrial Research, New Delhi, Vol.1: 69-70.

Ramírez Trejo, M. R., Pérez García, B. and Orozco-Segovia, A. 2004. Analysis of fern spore banks from the soil of three vegetation types in the central region of Mexico. *American Journal of Botany*,91: 682-688.

Page, C.N. 2002. Ecological strategies in fern evolution: a neopteridological overview. *Review of Paleobotany and Palynology,*119: 1-33.

Dixit, R.D. and Vohra J.N.1984. A dictionary of the pteridophytes of India. Botanical survey of India.