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A Study on the Gametophytic Germination (Prothallial Stages) of *Pityrogramma calomelanos* L. Link in Kerala, South India

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Abstract:- *Pityrogramma* belonging to the pteridaceae commonly known as Dixie silverback fern is characterised as the terrestrial herb with erect, densely scaly rhizome 4×2 cm. scales 2.6×0.2- 0.5mm, brownish, linear, entire. Fronds 80-100×20-22cm, bipinnate, stipe 40-50cm, dark pinkish brown, polished, lamina triangular in outline, pinnae 11×2.5cm, lanceolate, acuminate, in outline, pinnules 1.5×0.7cm, rhomboid to lanceolate, acute. Lobed to serrate, pinnae and pinnules progressively reduced to apex, rachis and costa grooved above, raised below, lower surface of the pinnules were white crusted. Sori acrostichoid, sporangial capsule 275-312.5×250 µm, globose, stalk 250µm long. Spores are 50×50µm triangular in outline, yellowish with pinkish thickening (Easa 2003).

Prothallus of the fern is an essential part in their life. Spores with proper care and maintenance, the various stages of prothallial germination can be noticed.

Keywords:- *Pityrogramma calomelanos, Prothallus, Gametophyte, Spore.*

I. INTRODUCTION

Pteridophytes are considered to be the primitive vascular plant group which are scattered all over the world. Ferns belonging to Polypodiopsida are the most diverse group of pteridophytes. Recent morphological and molecular phylogenetic analysis indicates that ferns are the sister group of seed plants (Pryer et al; 2001).

Pteridophytes plays an important part of the world flora, first appeared on the planet's vegetation approximately 360 million years ago, at the beginning of the Mesozoic era (Vashishta et al, 2012). They are the seedless vascular plants that exhibit self-regulating heteromorphic alternation of generation. They are paraphyletic group of seed-bearing plants that thrive in open, dry environments, particularly in xeric conditions or aquatic and epiphytic habitats. India has around 1000 species of ferns, distributed among 191 genera and 70 families according to the pteridophytic flora of India (Dixit, 1984).

Pityrogramma calomelanos L. Link belonging to the pteridaceae commonly known as Dixie silverback fern is characterised as the terrestrial herb with erect, densely scaly rhizome, brownish, linear, entire. Fronds are bipinnate, stipe-dark pinkish brown, polished, lamina triangular in outline, pinnae -lanceolate, acuminate in outline, pinnules- rhomboid to lanceolate, acute. Lobed to serrate, pinnae and pinnules progressively reduced to apex, rachis and costa grooved above, raised below, lower surface of the pinnules were white crusted. Sori acrostichoid, sporangial capsule, globose with stalk long. Spores are triangular in outline, yellowish with pinkish thickening (Easa 2003).

Gametophytic generation of the species is represented by the prothallus. Which in turn dark green in colour and with bears the archegonium and antheridium, male and female gametophyte respectively. With the presence of water and maintaining the sterile external environment with proper moisture content, and noticed the germination of spores into prothallus.

Initial stage of prothallus is represented by the globose stage and then the torpedo stage and finally the heart shaped structure. From which the sporophyte is get germinated.

II. MATERIALS AND METHODS

- **Sample collection:** The sample collection of *P. calomelanos* L. Link the entire plant body with both fertile and sterile fronds collected from the Trivandrum locality, Kerala, south India.
- **Morphological analysis:** morphometric analysis was used to examine the vegetative and reproductive traits of *P. calomelanos* L. Link And here 10 qualitative characters were considered for the analysis.

Table 1 Qualitative Analysis

CHARACTERS	CHARACTERISTIC ATTRIBUTES
Nature of rhizome	Creeping
Colour of rhizome	Dark Brown
Scale colour	Brown
Colour of lamina	Dark green
Nature of lamina	Coriaceous
Stipe	Present and lengthy
Colour of spore	Pinkish brown
Type of sori	Acrostichoid
Position of sori	Entire, adaxial
Type of spore	Trilete

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III. IDENTIFICATION OF FERN

Identification of the ferns were done based on the characters such as rhizome type, stipe, lamina, venation and sori. The collected specimens were critically studied and identified with the help of authentic taxonomic literature, The Ferns of Southern India (Beddome, 1864); Fern Flora of South India (Nampy &Madhusoodanan, 1998).

- **Sporophytic observation:** The mature plant body were taken and the sporophytes were analysed. Sporophytes are represented by the acrostichoid sporangia arranged on the adaxial surface of the sporophyll. The Young sporophyll is covered with white/ silvery spores. When the sporophyll became mature it will appear as the baby pink to brown in colour. Spores are globose and trilete.

- **Gametophytic observation:** Gametophytic generation is generally represented by the prothallus. Prothallus is germinated from the spores with the maintaining of proper moisture and environment conditions, through consistent monitoring over the spore displaced area and the developmental stages of the prothallus or the gametophyte is noticed and photographed separately.

IV. RESULT AND DISCUSSION

P. calomelanos L. Link species were collected from the region around Trivandrum district and their sporophytic plant body were analysed thoroughly. Morphological characters of the pteridophytes were analysed. The major part of the plant body includes the megasporophyll with acrostichoid spores arranged on the adaxial sides of the leaves and is representing the sporophytic generation of the plant life.

As the microscopic analysis of the sporophylls shows the foliar sporangia. It is globose in nature and the spores are arranged in the sporangial clusters.

While maintaining the proper moisture and environment, the stomial walls of the spore breaks and there arises the initiation of the gametophytic generation.

Each stage of the gametophytic prothallial germination were analysed and photographed and properly maintained and sporophytic evolution is noticed

V. GAMETOPHYTE (PROTHALLUS DEVELOPMENTAL STAGES)

Heart shaped prothallus

Developing gametophytes

SPOROPHYTE

PLANT BODY

SPOROPHYLL

CIRCINATE VERNATION

VI. CONCLUSION

Pityrogramma calomelanos L. Link is the pteridophyte belonging to the pteridaceae commonly known as the Dixie silverback fern is characterised by its white powdery sporophyll. The fern has morphologically creeping dark brown coloured rhizome, with an erect, long stipe. Scales are prominent in the rhizome, stipe and shows circinate vernation. In deviation with the other ferns the powdery white achrostichoid sporophyll makes this species unique.

The species were collected from different accessions around Thiruvananthapuram district, Kerala, South India. The whole plant body were collected, and provided proper care and through proper observation and provided the environment for the germination of the spores and through careful investigation the prothalli were obtained and through the further more observation we have got the sporophytic plant body developed from these gametophyte.

The plant shows alternation of generation with immediate gametophytic germination, which were represented by prothallial stages.

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