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REVIEW ARTICLE

MATING SYSTEMS IN FERNS

***Dr. Anurita Sharma**

Department of Botany, P.G. Government College for Girls -11, Chandigarh

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ABSTRACT

The present work aims to focus on the study of fern reproductive biology by raising the gametophyte population in the laboratory conditions and studying the form, sexuality, gametangial sequence, duration and percentage of male, female and bisexual gametophytes.

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INTRODUCTION

Ferns exhibit a distinct potentiality to produce homothallic prothalli along with the formation of two types of gametangia simultaneously in homosporous ferns. Because of the absence of any barrier to self-fertilization, it is expected that the occurrence of intra-gametophytic selfing will yield completely homozygous sporophytes (Wilkie, 1956). But Klekowski and Baker (1966) were the first to emphasize that the fern populations are characterized by greater homozygosity than that previously expected. They also correlated the presumed high frequency of haploid selfing in homosporous ferns to high chromosome numbers as well as high proportion of polyploidy in them. These authors also postulated that this polyploidy provided the means to maintain interlocus heterozygosity and release of variability.

Observations

The ferns produce reproductive fronds in early July to late August. These fertile fronds are collected and dried to release the spores. These spores are then kept separately for the study of gametophytic generations. These spores are sown on a suitable nutrient media in the month of November.The prothalli raised on sterilized nutrient media are then scrutinized in respect of form, sexuality, gametangial sequence, duration and percentage of male, female and bisexual gametophytes. On germination the spore at first cuts off a prothallial and a rhizoidal initial.

**Corresponding author: *Dr. Anurita Sharma,*
Department of Botany, P.G. Government College for Girls -11, Chandigarh.

The latter gives rise to the rhizoid whereas the prothallial initial at first forms a filament which later gives rise to a spatula – shaped prothallus ultimately leading to the formation of a cordate prothallus. In the mature prothalli the antheridia are mostly restricted to the posterior region, intermixed with rhizoids or may be present on the lower margin and lower wings of the prothallus. The archegonia develop invariably below the notch meristem after the formation of the cushion. In most of the studies it is found that antheridia are the first to appear.

Comments

From the reproductive biology point of view, the homosporus ferns are unique in four respects. *Firstly,* the two generations of the alternating sexual cycle are independent as well as morphologically distinct. *Secondly,* the gametophytes are potentially homothallic and frequently hermaphroditic. In the general absence of self- incompatibility mechanism the hermaphroditic gametophytes are likely to undergo intragametophytic selfing giving rise to completely homozygous sporophytes. *Thirdly*, a large number of fern species are obligatorily agamosporous which retain the semblance of alternation of generation without the accompanying change in chromosome numbers achieved through the production of spores with the unreduced sporophytic chromosome numbers and apogamy (Manton 1950, Verma 1979, 2013). *Fourthly*, in sharp contrast to the heterosporous pteridophytes, the basic chromosome numbers in homosporous ferns are usually high and nearly 50-60% of the cytotypes are neopolyploids (Walker, 1979).

The features in homosporous ferns that tend to favour intergametophytic mating to varying degree are:

- Developmental variations in gametophyte frequency of ameristic and meristic prothalli: It is now well known that all the fern spores never mature into heart-shaped prothalli bearing both the sex organs which may have a genetic basis.
- Sexuality and hermaphroditism of meristic prothalli: At the onset of sexuality on the cordate prothalli two principal patterns are revealed – formation of either antheridia or archegonia or formation of both types of gametangia at about the same time but on separate prothalli.

As a result of above such investigations it is being realized that not all homosporous ferns can undergo intra gametophytic selfing habitually. There are several adaptations that tend to favour the probability of intergametophytic mating.

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