

HETEROSPORY AND SEED HABIT IN PTERIDOPHYTES

The occurrence of two kinds of spores in the same plant is called the **heterospory**. Of the two kinds of spores, the smaller are called the *microspores*, and the larger are termed as *megaspores*, and are produced within the *microsporangia* and *megasporangia* respectively.

The production of two kinds of spores in heterosporous plants is definitely related with a differentiation in sex, for from a microspore develops a *male gametophyte*, and from a megaspore, a *female gametophyte*. The heterospory, thus is associated with the sexual differentiation of gametophyte. The phenomenon of heterospory is common in eight genera of pteridophytes. These are, *Selaginella*, *Isoetes*, *Stylites*, *Marsilea*, *Pilularia*, *Regnellidium*, *Salvinia*, and *Azolla*.¹

Advantage of Heterospory

In a homosporous pteridophyte, the spores germinate on the soil to produce gametophytes that are independent of the sporophytic plant. In doing so, the gametophyte of the homosporous pteridophyte with much vegetative tissue has to manufacture not only its own food but also for the developing embryo which is dependent upon it. In a heterosporous pteridophyte, each spore germinates within the sporangium and gives rise to a prothallus. The gametophyte which is greatly reduced is retained wholly or largely within the spore wall, depending entirely upon the food deposited in the spores. As the gametophytes of heterosporous pteridophyte obtain their nourishment from the parent sporophyte, they are independent of external conditions than are the free living gametophytes of homosporous pteridophytes.

Heterospory and Seed habit

The differentiation of spores into *microspores* and *megaspores*, and their dependence on the parent sporophyte for the nutrition, are the certain features in the life cycle of *Selaginella*, which have been considered as the essential pre-requisites for the formation of seeds, characteristic of Spermatophytes. It is generally agreed, that the seed plants arose from the heterosporous vascular plants that instead of discharging the megaspore acquired the habit of retaining it within the megasporangium.

In the seed bearing plants, there are two kinds of spores: microspores and megaspores, which grow to form male and female gametophytes respectively. In these plants, the single

megaspore (embryo sac) is not shed from the megasporangium but is retained within it while still attached to the mother plant. It germinates inside the megasporangium (nucellus) producing the much reduced female gametophyte bearing the archegonia. Later, the nucellus and the gametophyte are protected by a covering or integument and the whole structure is known as an *ovule*. The female gametophyte gets nutrition for its development from the parent plant and thus does not need to produce by its own effort. After fertilisation, the zygote within the ovule gives rise to an *embryo*, the rest of the gametophytic tissue to the *nutritive tissue* or *endosperm* and the integument thickens to form a *seed coat*. This entire structure, i.e., the integumented ovule is known as seed. It is detached from the parent plant and germinates to form a new plant.

Thus we find that for the production of seeds the following pre-requisites are essential.

1. Production of two types of spores (heterospory).
2. Megasporangium (nucellus) does not open and the single megaspore within it germinates to form the female gametophyte.
3. Nucellus becomes invested by a covering or integument which later forms a seed-coat.
4. Within the nucellus, is formed a linear tetrad of four haploid megaspores as a result of the reduction division of the functional megaspore mother cell. Out of these four megaspores, the lowermost gives rise to the female gametophyte whereas the rest degenerate.
5. The male gametes reach the egg by means of a tubular outgrowth of the male gametophyte known as the pollen-tube.

Sellaginella exhibits a remarkable approach to the seed habit characteristic of the spermatophytes because of the following features:

1. The heterospory occurs in almost all the species of *Sellaginella*.
2. In most species, only one functional megaspore mother cell is produced which by reduction division produces four haploid megaspores. In some species, e.g., *S. rupestris* and *S. monospora*, only one megaspore is formed in each megasporangium and this single megaspore is not shed but germinates to form the female gametophyte.
3. The fertilisation and development of embryo in both the species take place while the megaspore is enclosed within the megasporangium.

Therefore, it becomes evident that *Sellaginella* has considerably advanced towards the seed habit in a few species but its approach to the true seed is not complete due to the following features:

- (a) The megasporangium lacks an integument or covering.
- (b) The retention of the megaspore permanently within the megasporangium has not become established.
- (c) After the development of the embryo there is lack of resting period.