

Karnataka State Akkamahadevi Women's University, Vijayapura



Department of Botany
HCT-1.2 Bryophytes and Pteridophytes

TOPIC- HETEROSPORY

Dr. Arati Laddimath

HETEROSPORY

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes are primarily located on the right side of the frame, creating a modern, layered effect. The rest of the background is plain white.

INTRODUCTION

- ▶ Heterospory is a condition that interprets the production of spores of two different sizes and two different developmental patterns.
- ▶ The smaller spores are called as microspores and larger spores are called as megaspores .
- ▶ They have differential development patterns because the microspores germinate to produce the male gametophytes that bear male sex organs called antheridia, and megaspores germinate to produce the female gametophytes that bear archegonia.
- ▶ The two kinds of spores are produced in two kinds of sporangia .The microspores in microsporangia and the megaspores in megasporangia.

Origin of heterospory

The origin of heterospory can be studied by the evidences from

- I. Paleobotany
- II. Developmental evidences
- III. Experimental evidences

Evidence from Paleobotany

- ▶ The available fossil record suggest that there was an early occurrence of heterospory in almost all the major plants groups.
- ▶ Williamson and Scott in 1894 discovered and described the two species of *Calamostachys* that indicate the initial steps that led to heterospory.
- ▶ *C.casheana* showed heterospory as there were microspores and megaspores produced in separate sporangia .
- ▶ Scott in 1901 reported that in *lepidocarpon* three megaspores out of each tetrad had aborted and only one matured.

Developmental evidence

- ▶ The living representative of major divisions of vascular cryptogams (Lycopodiophyta, Sphenophyta, Pteridophyta) include a number of heterosporous genera (Selaginella, Isoetes, Marsilea, Pilularia, Regnellidium, Salvinia, Azolla, Stylites). They help in morphological, developmental and comparative studies that can throw much light on origin of heterospory.
- ▶ In homosporous genera like Lycopodium the sex determinants exert their effect in the gametophytes during the formation of the antheridia and the archegonia. Whereas in heterosporous like Selaginella the sex determinants exert their influence during sporogenesis.

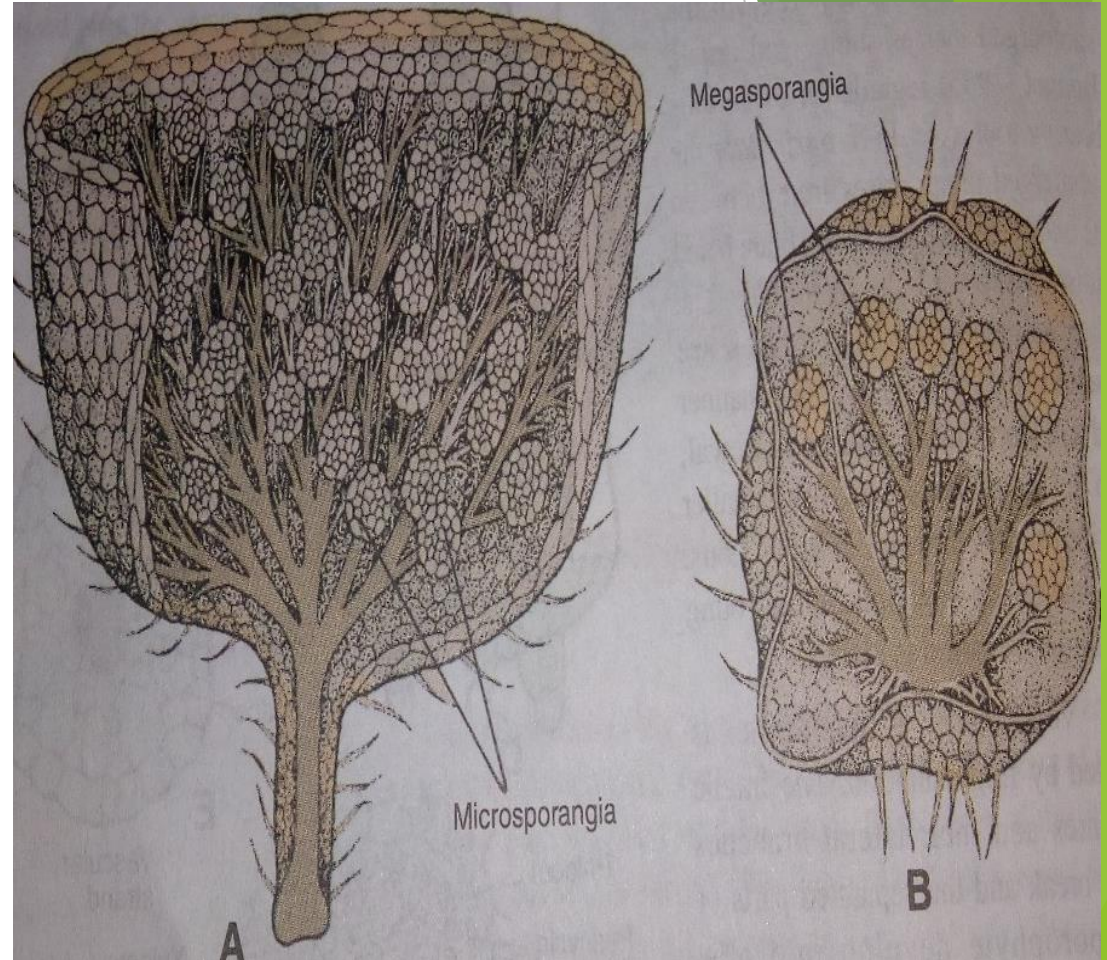
Experimental evidence

- ▶ The origin of heterospory can be studied by performing various experiments .
- ▶ Shattuck in 1910 performed series of experiments on marsilea and tested the effect of nutrition on spore size.
- ▶ He was able to alter the spore size by growing plants in favourable conditions of light ,temperature and nutrition
- ▶ He found that in plants growing under favourable condition the microsporangia contain number of aborted microspores .The functional spores enlarged grew in larger in size.
- ▶ The spore enlargement is proportional to abortion .

Salvinia

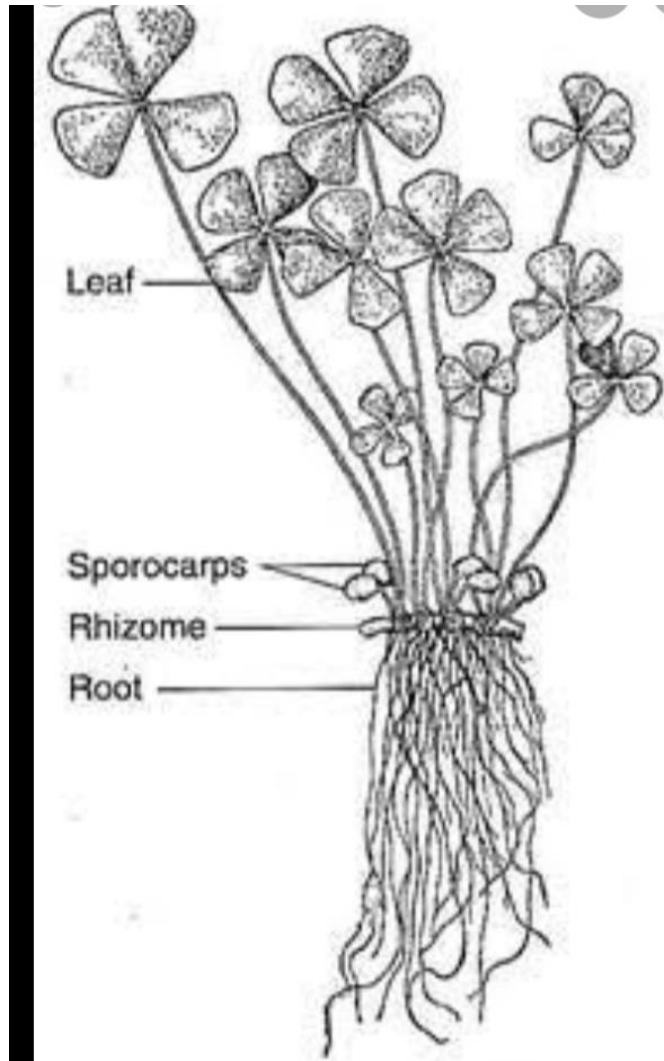


Thallus

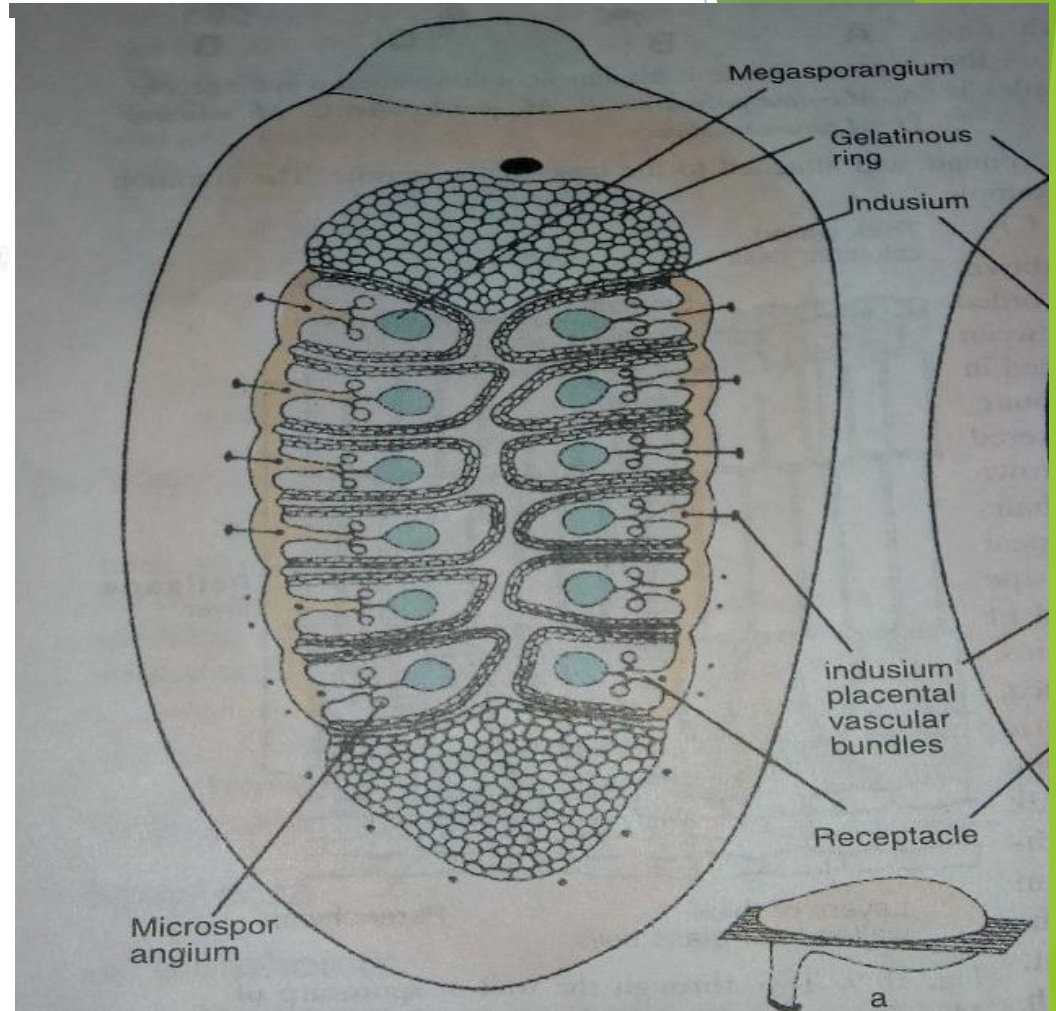


Sporophyte

Marselia



Thallus

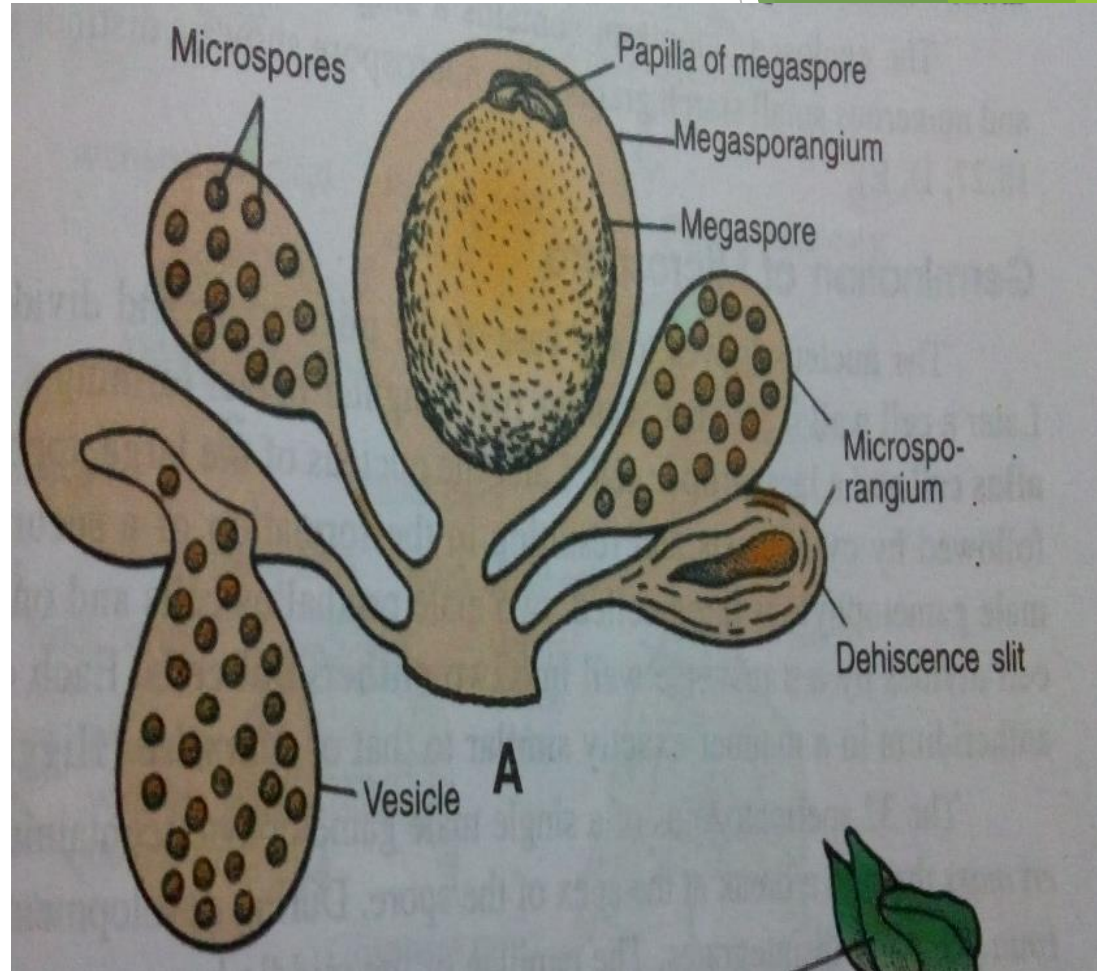


Sporophyte

Regnellidium



Thallus

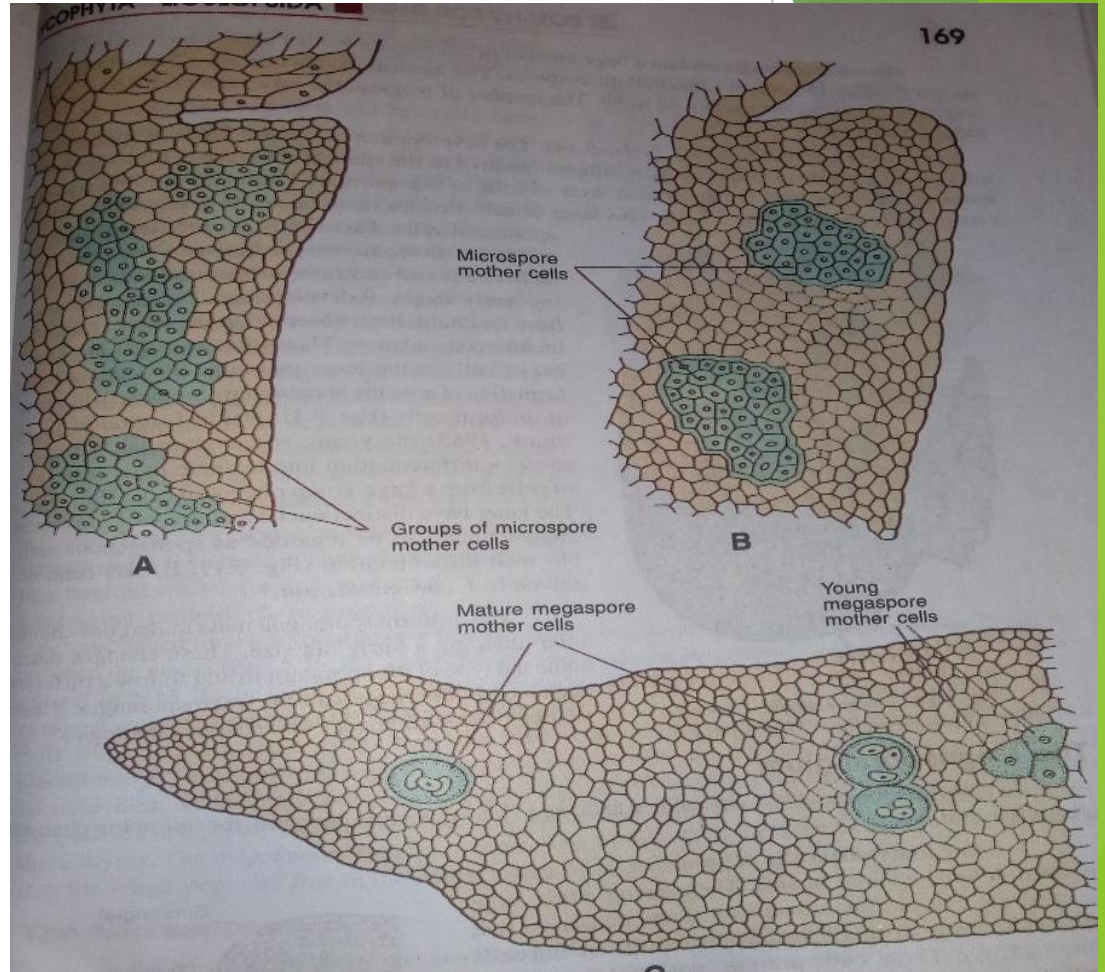


Sporophyte

Isoetes



Thallus

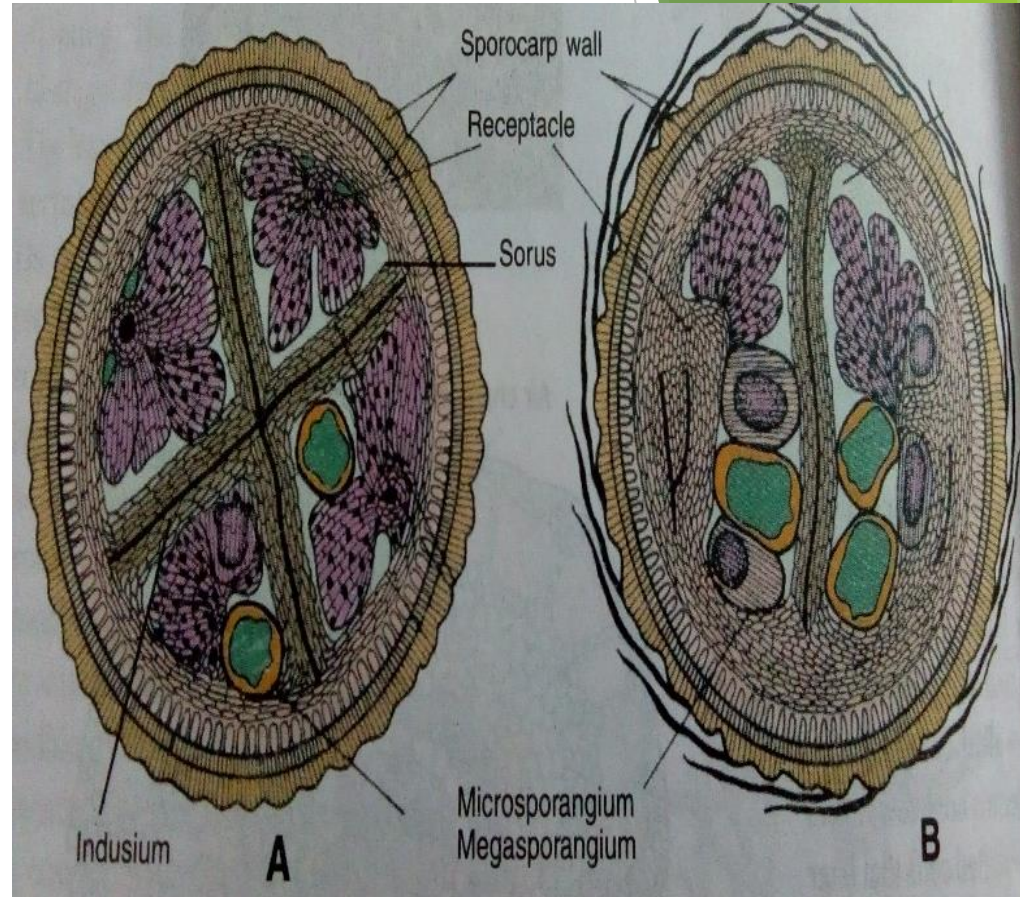


Sporophyte

Pilularia



Thallus

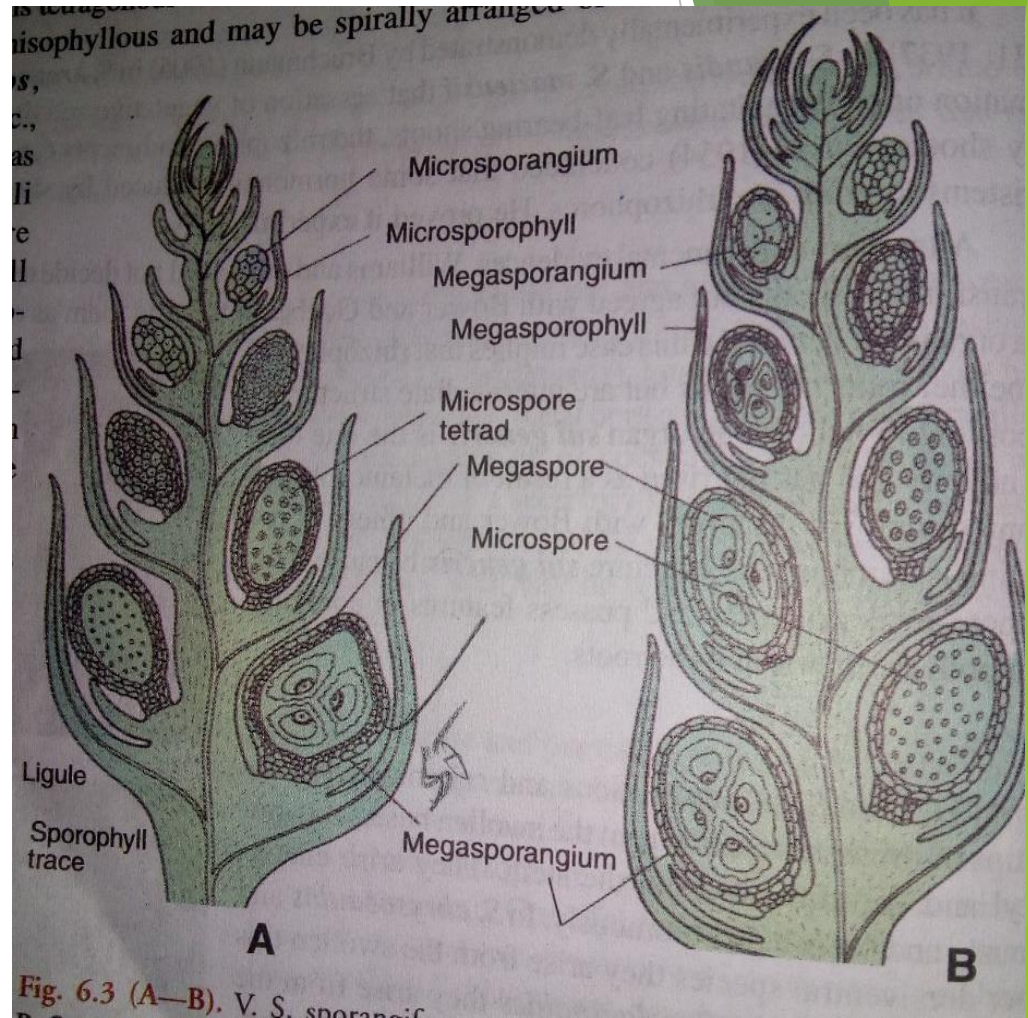


Sporophyte

Selaginella



Thallus



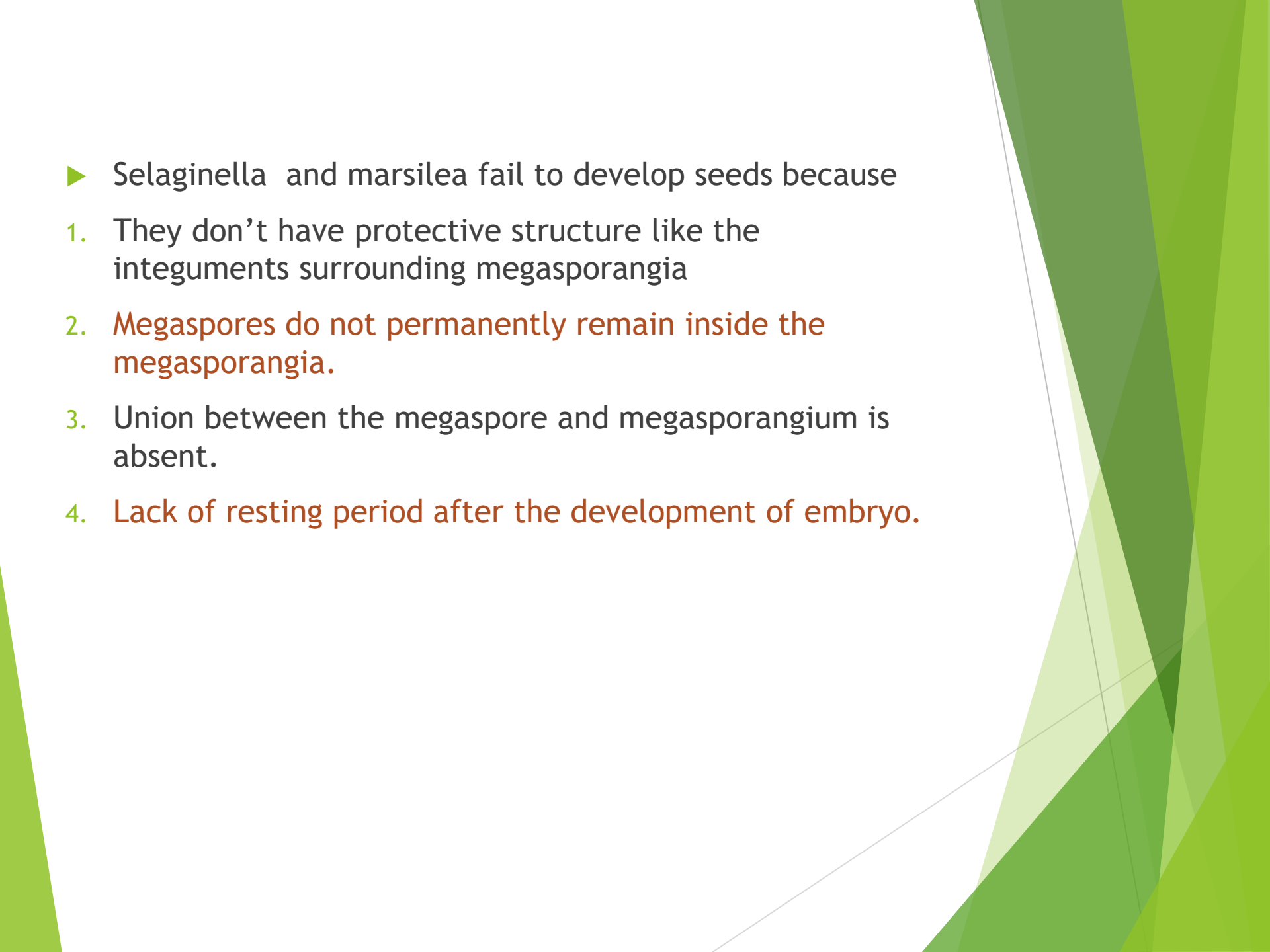
Sporophyte

Importance of heterospory

- ▶ The most important aspect of heterospory is that it is an expression of sex determining process of the plants.
- ▶ Heterospory is the most important evolutionary development in vascular plants because it led to seed development.
- ▶ Reduction in the number of megaspores to one.
- ▶ Loss of mobility of male gametes in angiosperms.

SEED HABIT

- ▶ Heterospory is considered to be a pre-requisite to seed formation .
- ▶ Reduction in size of the male gametophyte.
- ▶ Formation of one megaspore within a megasporangia or the nucellus .
- ▶ The megasporangium is surrounded by an additional protective coat called the integument.
- ▶ The megaspore is never shed and permanently retained within the megasporangium .fertilization and formation of embryo takes place in situ.

- 
- ▶ Selaginella and Marsilea fail to develop seeds because
 1. They don't have protective structure like the integuments surrounding megasporangia
 2. Megaspores do not permanently remain inside the megasporangia.
 3. Union between the megaspore and megasporangium is absent.
 4. Lack of resting period after the development of embryo.

THANK YOU