

Psilotum

Mention the important features in the structure and life history of Psilotum on the basis of which it is considered as one of the earliest vascular plant.

The sporophyte of Psilotum is normally of terrestrial habit growing in hilly regions of India and is pendent epiphyte or lithophytes. It belongs to

Psilophyta

Psilotopsida

Psilotales

Psilotaceae.

Its sporophyte is regarded to be most 'simple and primitive' by virtue of the following salient features:-

(i) The plant is slender and shrubby rarely as much as a meter in height. The sporophyte is divisible into two parts - underground rhizome and aerial stem. (ii) The rhizome being cylindrical and dichotomously branched usually hidden under humus is densely covered with rhizoids. The rhizome serve both for absorption and anchorage.

(iii) Any branch of rhizome may give rise to a green aerial shoot which is usually erect but may be pendent in epiphytes. The aerial shoot is denoted by dichotomously-forked photosynthetic stems bearing bifid scaly leaves as lateral appendages and sporangia. Branches are lateral in P. nudum. The stem is almost cylindrical at base furrowed the upper parts but triangular (may be somewhat) flattened at

top. The general appearance of the plant is xerophyte although the plants can grow in very moist situation.

(iv) The T.S. of rhizome shows inconspicuous epidermis. The cortex is divisible into three parts - outer zone have amorphous mycorrhiza; middle zone storage zone, and the inner most zone frequently dark brown due to deposition of phlobaphene.

Endodermis and pericycle is uniseriate. The stele is haplostelic protostele.

(v) The T.S. of aerial stem shows cuticularized epidermis with stomata; cortex is divisible into chlorenchymatous, Sclerenchymatous and parenchymatous tissues representing the outer, middle and inner zones respectively; endodermis and pericycle uniseriate; vascular cylinder ectophloic siphonostele with star shaped cylinder, polyarch protoxylem exarch.

(vi) The vegetative reproduction takes place by means of gemmae which develops on rhizome (sporophyte) and according to Holloway (1939), Bierherst (1953), gemmae also develops on prothallus (gametophyte).

(vii) The homosporous sporophyte reproduces asexually by microspore produced in trilobed, trilocular sporangium/syngonium borne in the axil of bifid scaly leaf. The so called syngonium is generally interpreted. (Bower 1935, Earnes 1936) as a sporangiophore fused with a subtending bract. All the locules have their own multilayered jacket without tapetum. All the

apogamous cells, ~~rather~~ do ~~not~~ not transform into spore mother cells, rather a few of these disorganize to form plasmodial fluid of nutritive value. All the spore mother cell, being the last cell generation of sporophyte, transforms into tetrads of meiospores owing to sporogenesis. Later on the meiospores separate from the respective tetrads as individual structures. All the meiospores are similar, so the sporangium is homosporous. Dehiscence of mature sporangium is loculicidal. All the spores from dehiscent sporangia are dispersed by air-current. Its ontogeny is eusporangiate.

(viii) With the formation of haploid(x) meiospores, the first cell generation of gametophyte is initiated. The spore germinates to produce a prothallial gametophyte which is exosporic. The prothallus is minute subterranean saprophytic parenchymatous, cylindrical and somewhat dichotomously branched. It bears unicellular rhizoids, harbours symbiotic fungus hyphae and carries a haplostelic protostele.

(ix) The prothallus is monoecious & protandrous. The sexuality is oogamous. The sex organs are ~~sexuality~~ irregularly distributed on the prothallus. The number of archegonia is lesser than that of antheridia. Both the antheridia and the archegonia arise from superficial cells but the antheridium develops earlier.

(x) The antheridium is spherical, sessile and partly sunken. The uniseriate jacket

encircles several spermatocytes being polygonal. The dehiscence of mature antheridium is porous, liberating the mucilaginous mass of spermatocytes which in the film of water metamorphose into spermatozooids.

The spermatozooids are spirally coiled multi-flagellate. flagella are available throughout unilaterally.

(XI) The venter of flask-shaped sessile archegonium is sunken while its straight neck is projected of the prothallial tissue. The neck is composed of four vertical rows,

each row being of 4-6 cells, it contains two neck canal cell or a single binucleate

neck canal cell. The swollen venter carries a small venter canal cell and a large

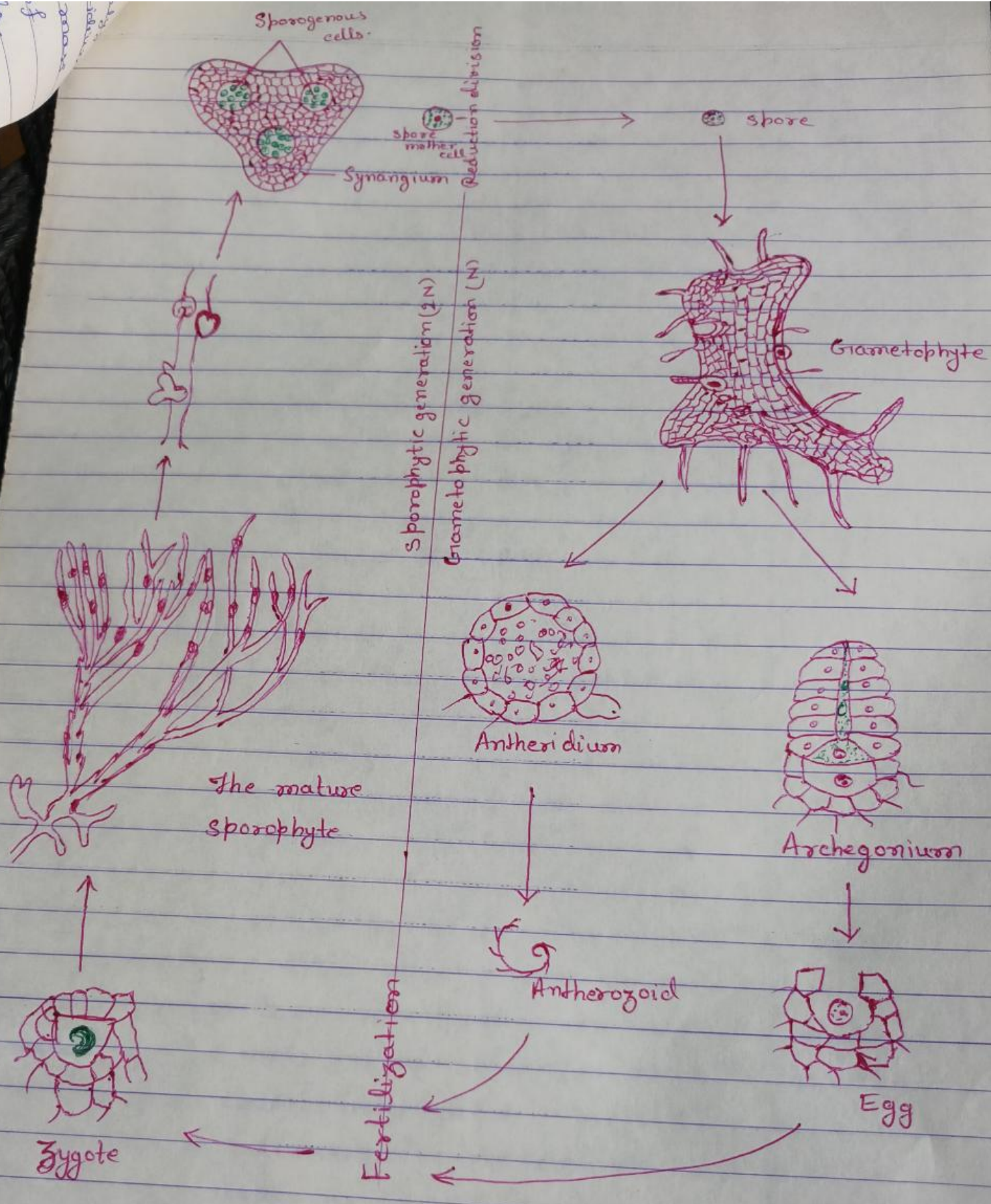
egg. On maturity, the venter canal cell and neck canal cell disintegrate, the cover cells of jacket separates in order to make a passage for the entry of spermatozoid.

(XII) The fertilization is internal.

(XIII) Zygote being cytologically diploid ($2n$) is the first-cell generation of sporophyte.

The embryogeny takes place in the archegonial venter. Protection of embryo is derived from hypobasal half of embryo. The formation of a primary root, a primary leaf & a suspensor, has perfectly been suppressed.

The embryonic sporophyte is parasitic upon the prothallial gametophyte till the emergence of photosynthetic shoot.



Diagrammatic representation of the life cycle of *Psilotum*.