Course- M.Sc. Botany Part -I ,Paper -I

Topic - Post-fertilization changes in Rhodophyceae (RED ALGAE)

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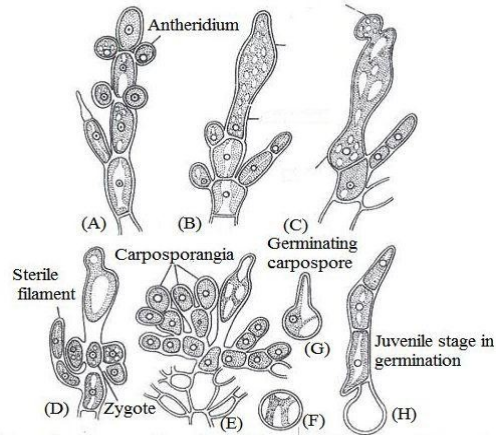
In red algae, a number of elaborate changes occur to complete the life cycle. In Batrachospermaceae typified by *Batrachospermum,* the diploid zygote undergoes division in the carpogonium to form 4 nuclei by meiosis. Lateral outgrowths develop from the base of the carpogonium where haploid nuclei migrate after multiplication. These are gonimoblast initials. They form a mass of gonimoblast filaments. The apical cell of each of these develops into a carposporangium.

Each carposporangium produces a single carpospore. Several sterile threads develop from the base of the structure to enclose the carpogonia and gonimoblast filaments and form a body called cystocarp or carposporophyte.

After some time going through maturity, the carpospores are released through wall rupture, rest for a while with a thick wall and finally germinate into septate creeping filaments. Prostrate and erect systems of branches develop gradually giving rise to microscopic juvenile heterotrichy. This stage may sometimes multiply by forming monospores in favourable circumstances.

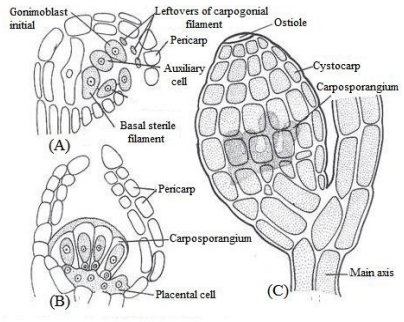
New plants are finally produced from the juvenile filaments as lateral outgrowths.



***Batrachospermum*: (A) Antheridial branch (B) Carpogonial branch (C) Fusion of Spermatium with trichogyne (D) and (E) Germination of zygote and formation of carposporangia (F)Carpospore (G) Carpospore germination (G) Juvenile *Chantransia* stage**

In Ceramiales typified by dioecious *Polysiphonia,* female thallus bears the female sex organ carpogonium. Carpogonia are flask-shaped structures with a tubular trichogyne and located on carpogonial filaments. Antheridia are borne in clusters on short branches of the male plants. They form spermatia which are carried out to the trichogynes of the female plants for sexual fusion. After fertilization, following changes do occur –

1. The two-celled lateral sterile filament becomes 4-10 celled.
2. The basal sterile filament initial divides to form a 2-celled filament. These are nutritive in role.
3. An auxiliary cell is developed from the supporting cell situated just below the basal region of the carpogonium. It has a single haploid nucleus.
4. A tubular connection is then developed between the auxiliary cell and the carpogonium.
5. The carpogonial nucleus (2n) divides mitotically into two nuclei. One is transported to the auxiliary cell and the other remains in the carpogonium. The auxiliary cell now contains one haploid and one migrated diploid nuclei. The haploid nucleus (n) degenerates and the trichogyne withers.
6. Several vegetative filaments develop from the adjacent vegetative pericentral cells forming a protective covering. The diploid nucleus of the auxiliary cell divides mitotically to form two nuclei. One migrates into the outgrowth on the auxiliary cell. Gonimoblast initials develop on the auxiliary cell. Each initial forms a gonimoblast filament by repeated mitotic divisions. The terminal cell of the gonimoblast filament develops into carposporangium. Single diploid carpospore develops inside the carposporangium.

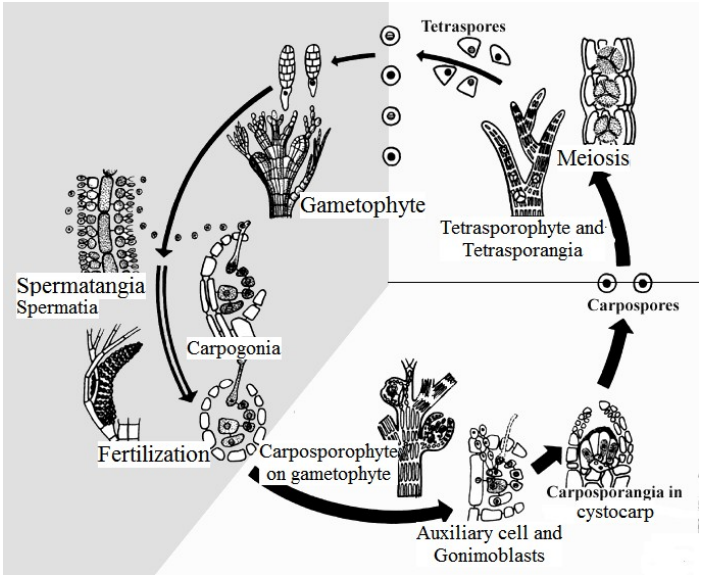


Post fertilization stages in *Polysiphonia* of Ceramiales
(A) Procarp in the beginning (B) Carposporophyte with carposporangia (C) Cystocarp

7. The auxiliary cell, supporting cell, carpogonium and some cells of the basal and sterile filaments fuse together and form an irregular placental cell. The haploid nuclei (n) of the placental cell gradually degenerate and supply nutrition.
8. The placental cell, gonimoblast filament and carpogonia are covered by the vegetative filaments to form the cystocarp which is an urn-shaped structure. The outer covering of the cystocarp is called pericarp. The diploid part of the cystocarp represents the carposporophyte.
9. Some cells of basal and sterile filament along with some cells of carpogonial filament gradually degenerate.
10. A carposporangium develops single diploid carpospore. After release, the carpospores come out through the ostiole of the cystocarp.

On a solid surface, the diploid carpospore undergoes first mitotic division and forms large upper and small lower cells. Both the cells undergo mitotic division and form 4 celled stage. The lowermost cell forms the rhizoid, the upper one functions as apical cell and the rest cells undergo further development and form the polysiphonous body. This plant body is diploid tetrasporophytic plant. It produces tetraspores to complete the life cycle further.

Red algae are haplo-diplonts with a life cycle that usually involves three phases. No motile stage is produced however.



Life cycle of *Polysiphonia*