

CHLAMYDOMONAS

CLASSIFICATION

CLASS :- Chlorophyceae

ORDER :- Volvocales

FAMILY :- Chlamydomonaceae

GENUS :- Chlamydomonas

1. Till now 350 sps. of Chlamydomonas have been reported from all over the world.

2. Some of the common species found in India are :-

C.grandistigma, C.yellowstonensis, C.ehrenbergi, C.snowiae, etc.

HABIT AND HABITAT

These are primitive, motile, unicellular, green algae found in fresh and stagnant water. Such as ponds, pools, lakes, etc.

STRUCTURE

1. It is uninucleate, unicellular, biflagellate algae.

2. It is oval, spherical, sub-cylindrical, ellipsoidal or pear shaped.

3. Its anterior part is somehow pointed.

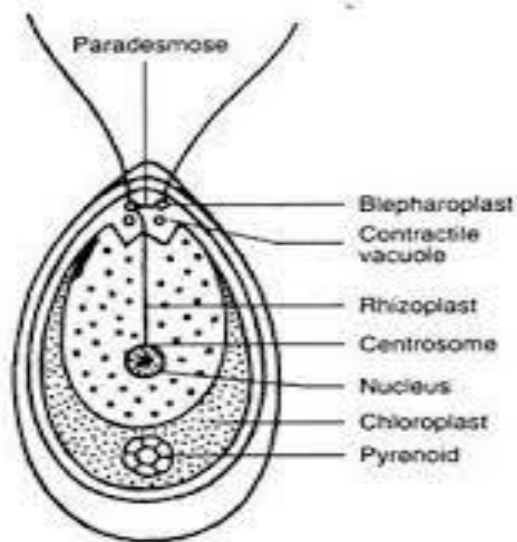


Fig. 3.42 : Chlamydomonas showing neuromotor apparatus

4. It has following parts:-

1. Papilla:- It is present at the anterior part of the Chlamydomonas.

2. Cell wall:- It is the outermost layer of Chlamydomonas, which provides a definite shape to cell. It is made up of cellulose. It is covered by mucilage envelope.

3. Flagella:- Its anterior end has two flagella of isokontae type. These flagella arise just close to basal granule.

4. Basal granule:- These are one pair, which lies near the flagella. The basal granule are connected by a thread like structure called Paradesmos.

5. Paradesmos:- It is a thread like structure, which connects the two basal granule.

6. Rhizoplast:- It is a thread like structure, which connects nucleus from one of the basal granule.

7. Contractile vacuole:- These are one pair. These lies just beneath the basal granule or flagella. These helps in respiration and excretion.

8. Chloroplast:- It is cup shaped structure found on the wider part. The shape of chloroplast varies according to species.

9. Eye spot/Stigma/Pigment spot:- A eye spot is found near the contractile vacuole. This is reddish or brownish in colour. It is a photoreceptor organ which is sensitive to light. It provides direction to the organism at the time of movement.

10. Pyrenoid:- It is found in chloroplast, made up of protein. This pyrenoid is surrounded by starch. The number of pyrenoid varies according to species.

11. Nucleus:- A nucleus is present in between the cell. It is found in the cytoplasm.

REPRODUCTION/LIFE-CYCLE

Chlamydomonas reproduces by both asexual and sexual method.

ASEXUAL REPRODUCTION

It takes place by following method:-

1. By Zoospore.
2. By Palmella stage.

1. By Zoospore:-

- (i). This takes place in unfavourable condition.
- (ii). The Chlamydomonas draws its flagella becomes non-motile and are in resting stage.
- (iii). The protoplast of the cell divides longitudinally into two daughter protoplast.
- (iv). These daughter protoplast again divides several time and forms 2-16 daughter protoplast.
- (v). The nucleus of cell also divides in this process.
- (vi). Now each daughter protoplast forms their wall, flagella, eyespot etc.
- (vii). These daughter protoplast are called zoospores.
- (viii). Likewise several zoospores are formed by a parent cell.
- (ix). As the parent cell wall bursts, all zoospores liberated.
- (x). These zoospores develops into a new Chlamydomonas plant.

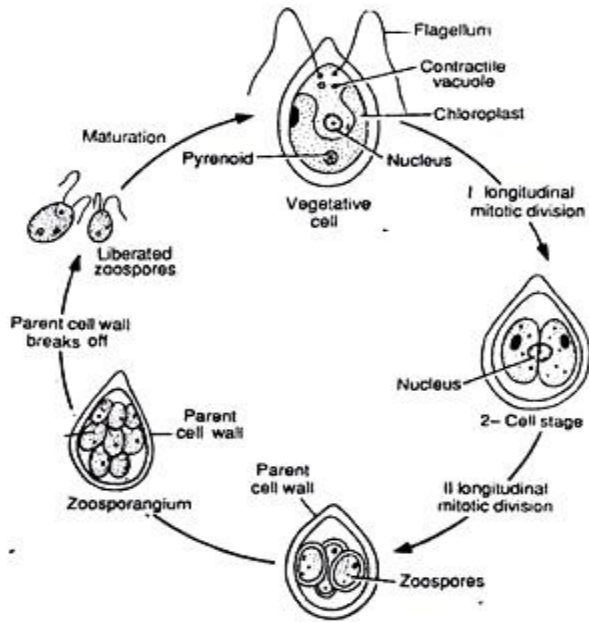


Fig. 6. Asexual reproduction in *Chlamydomonas*

Fig:- zoospore formation.

2. By Palmella stage:-

- (i). This takes place in unfavourable condition, when the pond starts to dry.
- (ii). The motile cell loses their flagella becomes non-motile and goes on resting stage.
- (iii). Its protoplast starts to divide inside the parent cell wall.
- (iv). The daughter protoplast divides inside in group and being covered by mucilage.
- (v). In each mucilage envelope have several cells which forms a colony. This stage is called Palmella stage.
- (vi). After sometime, In the approach condition these daughter cells becomes motile.
- (vii). As the parent cell wall burst all the cells form an independent plant.

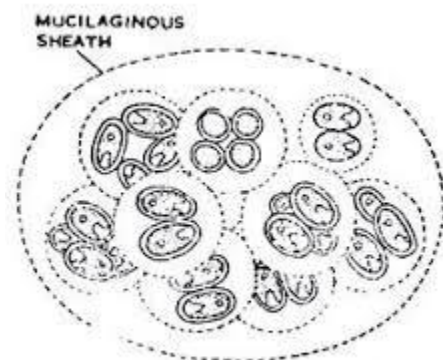


Fig. 8. *Chlamydomonas*. Palmella stage

Fig:- Palmella stage

SEXUAL REPRODUCTION

1. At the time of sexual reproduction the cells function as gametes.
2. Two gametes of opposite sex/strain fuses and forms a quadriflagellate or biflagellate zygote/zygospore(2n).
3. The flagellated zygote loses flagella becomes non-motile and goes on resting phase. A thick wall is formed around this cell.
4. The zygote undergoes meiosis division. As a result 4 zoospores(n) are formed which develops into a Chlamydomonas plant.

The sexual reproduction in Chlamydomonas occurs by three methods:-
Isogamous, Anisogamous, Oogamous.

Isogamous

- (i). Most species of Chlamydomonas reproduce by isogamous type.
- (ii). In this type of reproduction two identical gametes i.e gametes of same size, shape and structure of opposite sex fuse with each other and a zygote(2n) is formed.

Fig:- A-B. Two opposite gametes. C-D. Fusing gametes. E. Motile quadriflagellate zygote. F. Resting zygote without flagella. G. Zygote with thick wall. H-I. Germination of zoospores.

Anisogamous

- (i). The fusing gametes are motile but not identical.
- (ii). The shape, size and structure of both gametes varies.
- (iii). The larger size gamete is female gamete called macrogamete and the smaller is male gamete called microgamete.

Oogamy

(i). Here in fusing gametes, the female gamete is spherical and non-motile and the male gamete is motile.

Life Cycle of *Chlamydomonas*

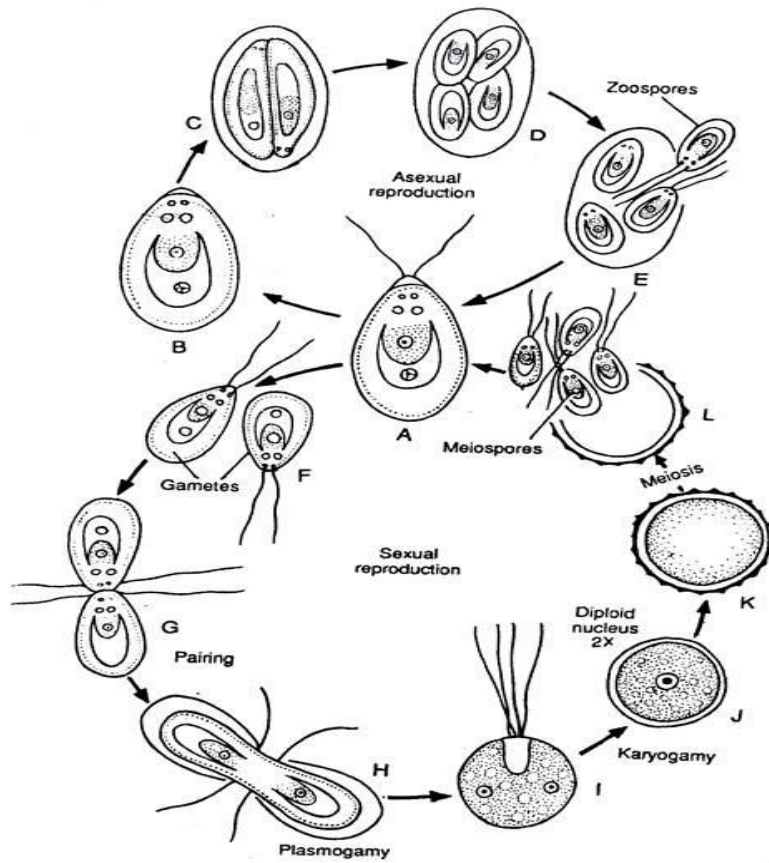


Fig. 14. *Chlamydomonas*. Diagrammatic life cycle