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THE LIFE HISTORY OF *CLADOPHORA CRISPATA* (ROTH) Kg.

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Abstract

The life cycle of *Cladophora crispata* (Roth) Kg. is different from the rest of the species of the genus. The plant is haploid and the diploid phase is represented by zygote only. The haploid plant reproduces asexually by means of quadriflagellate planospores and sexually by biflagellate isogametes. The zygote is transformed into a resting zygospore which produces eight aplanospores. The aplanospores germinate to form haplophase. The species is heterothallic and shows vernal reproductive periodicity.

Cladophora, amongst all algae, is perhaps the only genus where all the three major types of life-cycles are met with.

Introduction

Cladophora crispata (Roth) Kg. (=*C. fracta* (Dillw.) Kg.) is a fresh-water alga. Two types of life-cycles have been reported in *Cladophra*. In the fresh-water species, *C. glomerata* Kg. it was reported by List (vide Smith, 1950: Shameel, 1974) that the zygote developed into a diploid adult plant and the aplanospores produced by such plants were also diploid. However meiosis took place prior to gamete formation and the gametes were haploid.

Another type of life-cycle has been reported in marine *C. suhriana* Kg. by Schussnig in 1930, in which there was an isomorphic alternation of haploid and diploid phases (generations), and the meiosis took place during planospore formation in the (sporophyte). (vide Smith, 1950).

In the present paper the life cycle of another species, *Cladophora crispata* (Roth) Kg. is reported.

Materials and Methods

Plants were obtained from a fresh-water pond situated in the Department of Botany, University of Peshawar. These were cultured in soil-extract (Faridi, 1964, 1971). Two methods were applied to study the swarmers and their behaviour.

1. Slides method: Glass slides were vertically placed in the vial containing cultured plants. The swarmers got themselves attached to the slides. These slides were examined and placed back in the orginal place and position

2. Cover-glass method: Cover-glasses were placed in the Petri-dishes having plants in culture. The swarmers settled on the cover-glasses and started

germination. These cover-glasses were placed on the slides and examined. After examination, the cover-glasses were again placed in the original Petri-dishes in the same position. The cover-glass method was found more convenient and efficient.

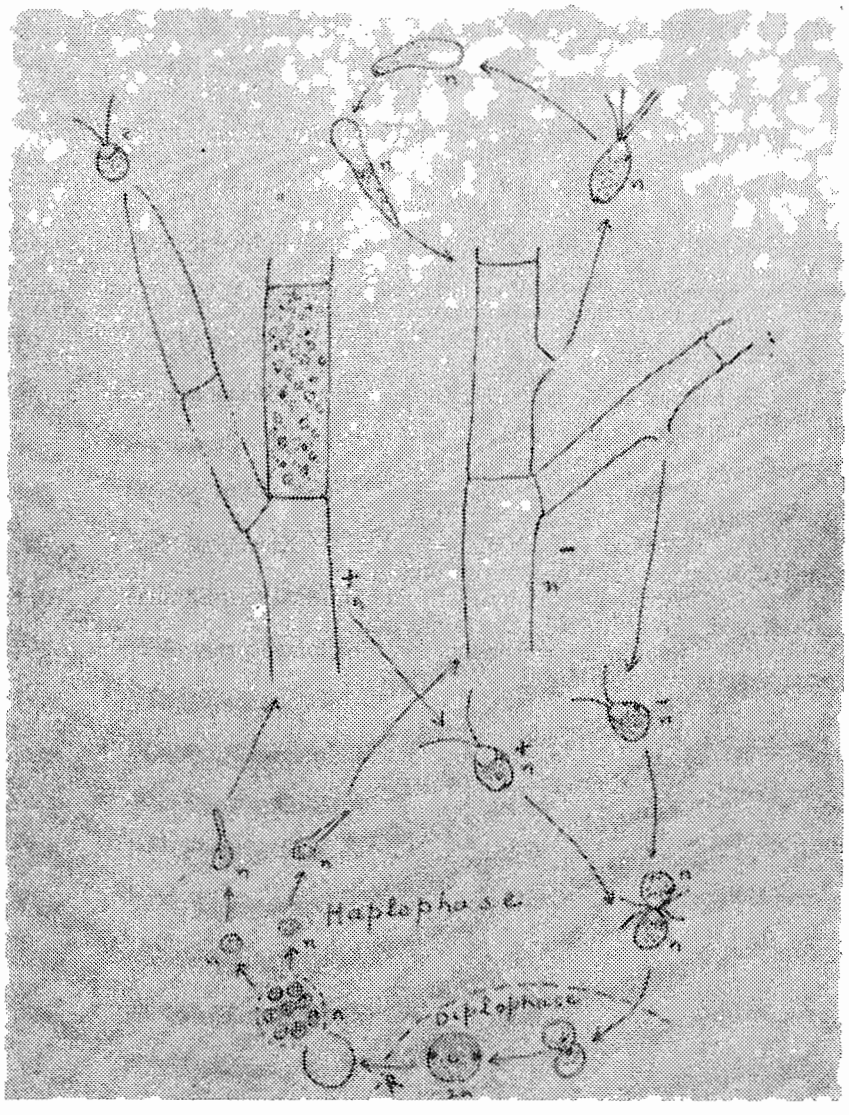

Fig. 1. Life cycle of *Cladophora Crispata*.

To slow down the movement of swarmers, the plants were mounted on slides in glycerine. India-ink was applied to the slides to observe the flagella, as they became clearly visible in the dark background.

Observation and Results

The plants started reproducing by planospores (zoospores) soon after culturing. At first, a papillate outgrowth on the cell-wall was observed in the morning which developed into an opening. The contents of the sporangia changed colour and became dark-grey. The contents then turned into a large number of quadriflagellate planospores. These came out immediately through the lateral opening and settled down by their flagellar ends on cover-glasses and walls of filaments. Rarely the planospores were seen germinating within the sporangium, and they did not come out of the mother-cell. It took 5-20 minutes for the moving planospores to settle down.

The planospores were lanceolate with one stigma, a cup-like chloroplast, a nucleus and four equal whiplash-type flagella. The planospores were about 4 μm long. The planospore produced a germ-tube carrying chloroplast which soon became reticulate. The germ-tube developed septation and a branched filament was formed.

The gametes were oval, smaller in size (2-3 μm long) than the planospores and had two similar, equally long flagella. In other respects the gametes and the planospores both were identical. Like planospores, the number of gametes was large, and hundreds of gametes were produced from each gametangium. The production and the liberation of gametes from the mother-cell was similar to planospores. The gametes of one cell failed to fuse with one another and only those from different filaments did so after remaining active for a few seconds. From this it could be construted that the species is heterothallic. It took about 10 days for the zygote to maure.

The young zygote had four flagella, two stigmas and two nuclei in young condition, while the mature had only a single nucleus. These flagella got detached from the zygote, which became rounded and developed slightly thicker wall. The zygospore, thus formed, remained dormant and after 10 days it produced eight small aplanospores probably as a result of meiosis. The zygospore enlarged to about 6 μm and produced a small opening through which a vesicle was formed carrying the aplanospores. The aplanospores were less than one μm long, and lacked flagella. Each aplanospore germinated soon after it was liberated from the vesicle. It produced a germ-tube which became elongated and developed septation.

The gamete formation was restricted to the end of January and the first week of February. Filaments stopped producing gametes as soon as the temperature rose by a few degrees i.e. from 10°C to 15° C. It appeared that the plants had a vernal reproductive periodicity. The species has n = 24 chromosomes (Fardi, 1961; Sinha, 1958).

Conclusion

Cladophora crispata is hetrothallic and showed vernal reproductive periodicity. Meiosis probably takes place at the time of germination of zygospore during aplanospore formation. The life cycle is of *Chlamydomonas* type. It is interesting to note that of all algae probably *Cladophora* is the only genus which shows the three basic types of life-cycles.

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