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SUMMARIES OF DOCTOR'S THESES
and of other Dutch papers which might escape attention because of their mode of publication

C. L. M. STEENBERGEN (1974): *The role of light in the life cycle of Scenedesmus obliquus (Turp.) Kütz.* Thesis, Utrecht, 56 pages.

SUMMARY

The photoautotrophic life cycle of the green alga *Scenedesmus obliquus* consists of (1) a light-dependent growth period and (2) a period during which, independently of direct illumination, 2–4 doublings of the nuclear DNA take place. Then the cells form 4–16 daughter cells.

The relation between the trophic function of light and the specific reproduction process of DNA replication is studied. This problem is approached by using synchronized cultures of *S. obliquus*. In synchronized cultures all cells pass through the same stages of the life cycle more or less simultaneously and the entire cell population shows division only within a limited period. The cultures of S. *obliquus* are synchronized in light-dark cycles consisting of 14 hours of light and 10 hours of darkness.

Growth, i.e. increase of cell mass, is exponential. The growth rate depends on the light intensity. A minimum growth, i.e. a 4 times increase of the initial cell mass, is required for division to take place. At light intensities ranging from 0.37×10^5 erg cm^{-2} sec^{-1} to 1.48×10^5 erg cm^{-2} sec^{-1} and at temperatures of 20°–30 °C the shortest possible life cycle (c. 21 hours) of *S. obliquus* cells is attained.

The mean DNA content of a daughter cell of *S. obliquus* is 1.15×10^{-13} g. In the shortest possible life cycle initiation of DNA replication occurs at c. 8 hours after the beginning of the photoperiod, when a minimum amount of 23×10^{-13} g RNA per cell is exceeded. The time of the initiation and the rate of the DNA formation are unaffected by the light intensity.

The overall relation between light energy and formation of DNA is simple. In synchronized cultures of *S. obliquus* the amount of DNA formed depends on the total amount of light energy (light intensity × photoperiod = L × I) administered after an initial induction period of ca. 4 hours. Evidence is obtained that the yield of DNA (DNA in μ g ml^- L × I^{-1}) in long photoperiods (12–16 hours) is much greater than the yield of DNA in short photoperiods (8–10 hours). So at long photoperiods relatively low light intensities (e.g. 0.15×10^5 erg cm^{-2} sec^{-1}) are effectively used for DNA formation i.e. for reproduction of *S. obliquus* cells.

Finally, it is argued that this latter finding may have ecological significance. It may partly explain the abundance of *Scenedesmus* and certain other Chlorococcales in temperate lakes during the early summer.

The thesis is available on request at the author's adress:
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