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PRODUCTION OF GIANT FORM IN *WESTIELLOPSIS PROLIFICA* JANET UNDER HETEROTROPHIC CULTURE CONDITIONS

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THE effect of different light intensities on the growth and morphology of *Westiellopsis prolifica* Janet on a liquid medium with organic carbon sources was investigated and the present report embodies the results of the investigation. The procedure for the determination of growth was described earlier[1]. Allen and Arnon's nitrogen free, growth medium was used[2]. Sugars and sodium salts of organic acids to the final concentration of 15 mM were added and the pH adjusted to 7.5. The experiments had three variants: the first contained conical flasks exposed to full illumination with 2,200 lux, the second had flasks wrapped in wax paper and received approximately 1,100 lux (i.e. 50% of maximum) and the third contained flasks covered with black paper so that they received no light. All the culture flasks were incubated at 24–26°C after inoculation with equal amounts of exponentially growing material (equivalent to 1 mg dry weight) into 25 ml of culture medium and harvested after 20 days of growth.

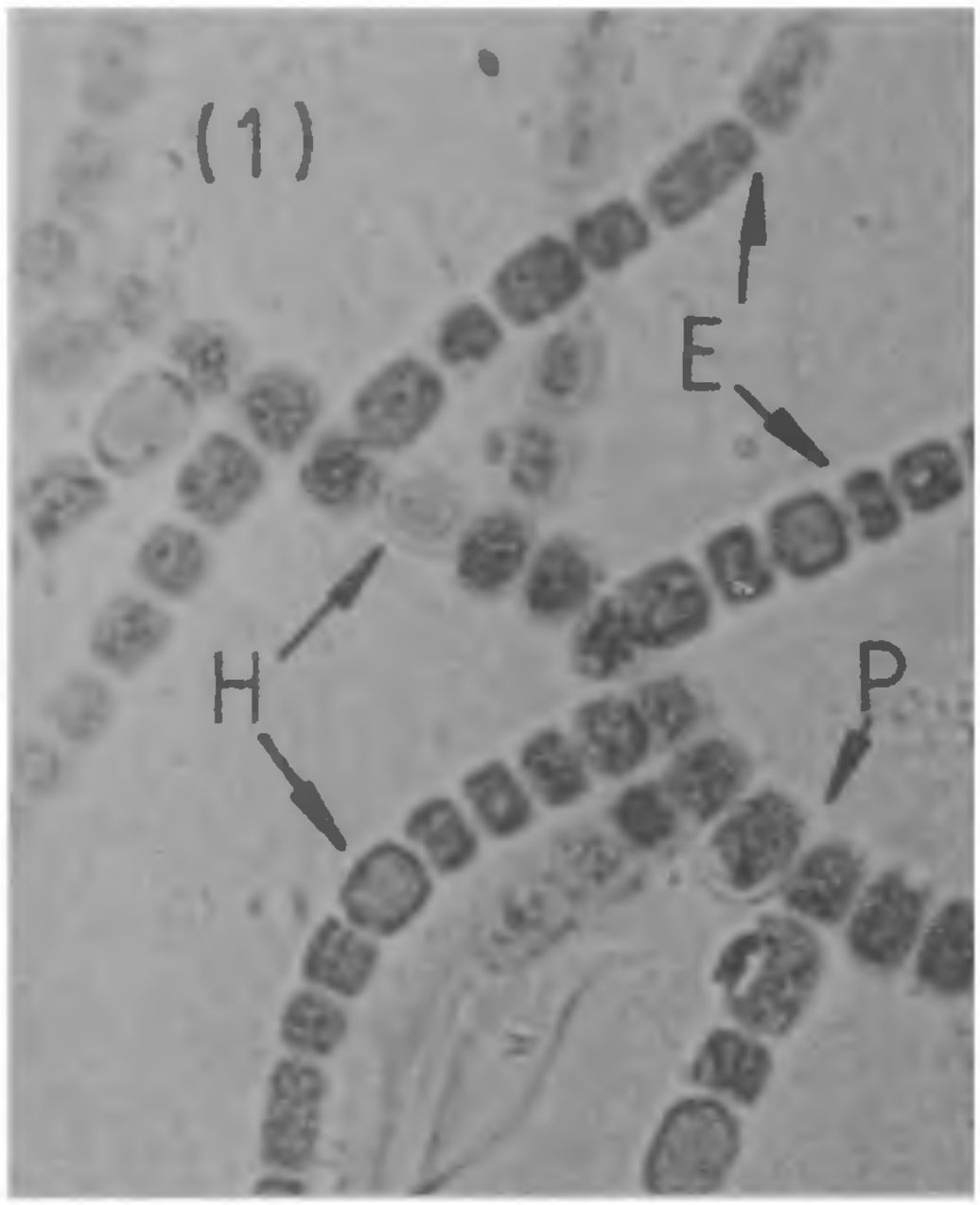
Of the various carbohydrates tested, glucose, galactose, fructose, lactose and sucrose were superior because they supported better growth of *Westiellopsis* (table 1). The highest growth increase in different light intensities and in dark was obtained when the cultures were supplemented with fructose. This agrees with earlier work on *Chlorogloea fritschii*[3], *Tolypothrix tenuis*[4] and *Anabaena* sp[5–6], where carbohydrates were shown to be the best substrates for heterotrophic growth. Although in the present study, various organic substrates supported the heterotrophic growth of the organism, the induced growth of the substrate in dark was only a fraction of the autotrophic growth of the cyanobacterium. Light was highly stimulatory for the utilization of organic substrates and at low light intensity there was almost no autotrophic growth. While it is difficult to precisely explain the reasons for this differential growth response it is possible that light and dark treatments produce alterations in the membrane permeability and transport properties for assimilation of exogenous substrates. The sugars viz mannose, the pentose and the organic acids were practically ineffective to support the growth of *Westiellopsis* in dark as well as under various conditions of illumination. The inability of various strains of cyanobacteria to grow in mannose and various pentose sugar-supplemented cultures has been reported earlier[7]. The failure of *W. prolifica* to grow on the organic compounds which are probably intermediates or products of metabolic cycles may be due to their inability to penetrate the cell membrane for assimilation[8, 9].

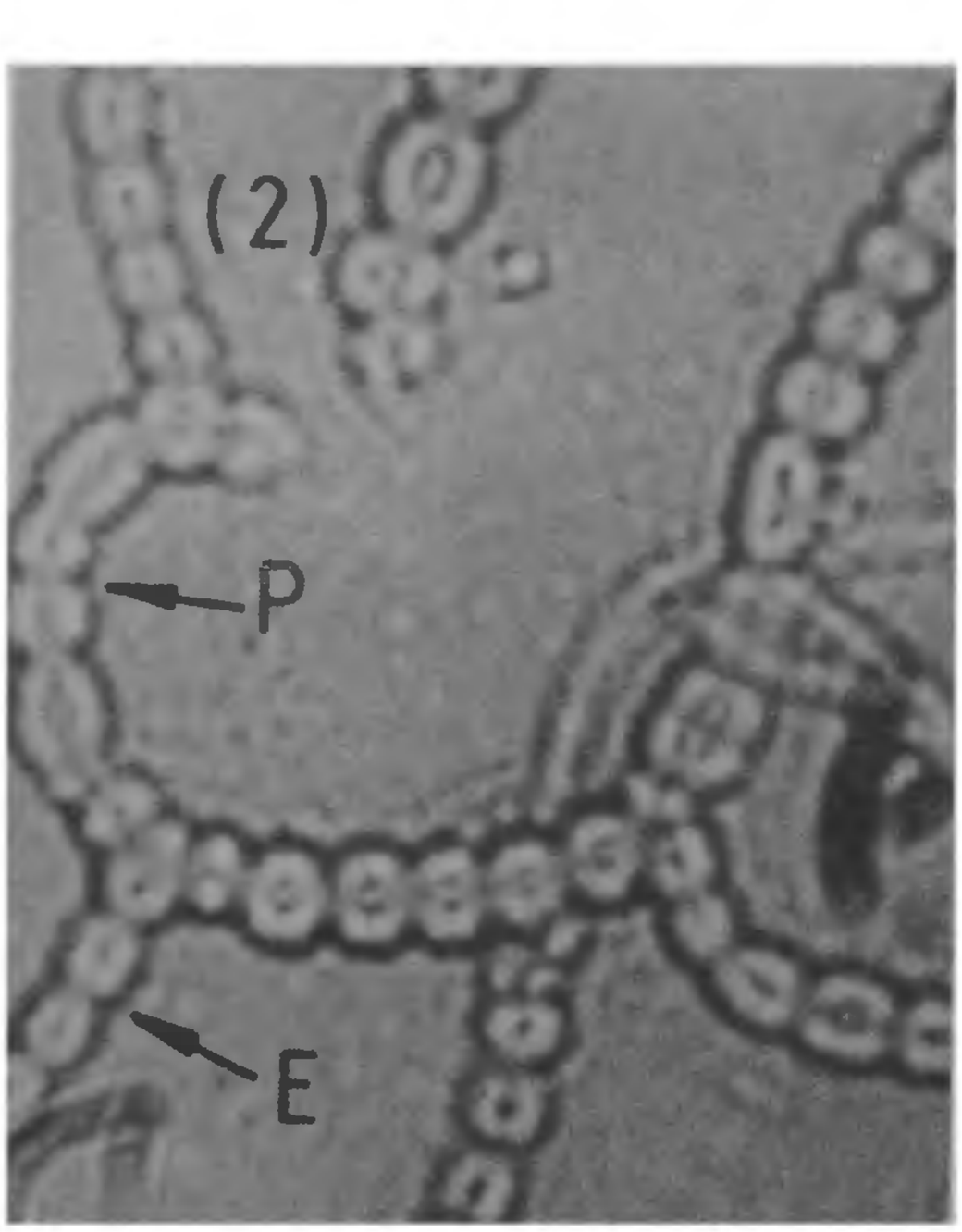
In the mineral medium incubated in darkness, *Westiellopsis* did not show profuse branching. However, when the medium was supplemented with glucose, galactose, fructose, lactose or sucrose and grown in dark, giant form of the organism was produced. In the giant form, the heterocysts were not observed and the cells of the prostrate and the erect

Table 1 *Growth (dry weight in mg) of W. prolifica under various conditions in a mineral medium with the addition of 15 mM concentration of a sugar (each value represents the mean of three closely concordant determinations).*

	Illumination intensity		
Sugar added	0%	50%	100%
AA medium (control)	1.5	2.4	18.1
Glucose	3.9 (+)	14.4	36.5
Galactose	4.87(+)	9.96	22.9
Fructose	5.4 (+)	16.2	39.9
Mannose	2.19	2.2	15.5
Xylose	1.8	2.65	14.7
Ribose	1.93	2.21	15.8
Arabinose	1.88	3.99	17.0
Rhamnose	2.5	4.15	17.5
Sorbose	3.0	9.32	24.0
Lactose	3.36(+)	12.49	37.6
Sucrose	3.99(+)	14.0	37.6
Maltose	2.41	13.87	28.4
Acetate	2.61	3.82	17.97
Pyruvate	1.53	2.75	14.42
Succinate	2.19	2.88	17.3

(+) = Giant form of the cyanobacteria produced in cultures supplemented with glucose, galactose, fructose, lactose or sucrose in the dark (0% illumination).





Figures 1 and 2. (× 280). *W. prolifica.* **1.** Characteristic prostrate and erect filaments. **2.** Giant form produced in certain exogenous sugar-supplemented cultures in dark. P. prostrate filament; E. erect filament; H. heterocyst.

filaments look alike (figures 1, 2). The prostrate portion of the normal filaments made up of short barrel-shaped cells which were almost as long as broad (8.6–16.1 μ long and 8–13.5 μ broad) and the erect portion consisting of elongated cylindrical cells which were about twice as long as broad (8–15 μ long and 5.2–7.8 μ broad). But the cells of the creeping as well as the projecting portions of the filaments of the giant form of *Westiellopsis* had almost similar dimensions (the cells of the prostrate filaments were 18–22.8 μ long and 18.6–23 μ broad; the cells of the erect filaments were 16.5–22 μ long and 16–21 μ broad). Production of giant forms of a green alga *Chlorella* in the sugar-supplemented media in light as well as in dark was reported earlier where it was suggested that consumption of sugar by *Chlorella pyrenoidosa* leads to inhibition of cell division and consequent increase in dry weight and significant gigantism of the cells[10].

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