J. Indian bot. Soc. Vol. 69 (1990) 39-41

EFFECT OF DIFFERENT NUTRIENT MEDIA AND QUALITIES OF LIGHT ON THE INDUCTION OF OOGONIUM IN *OEDOGONIUM HATEI*

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The response of five different culture media and qualities of visible light on the induction of oogonium in *Oedogonium hatei* Kam. (Oedogoniales, Chlorophyceae) were investigated. Chu 10 medium was found to effectively control the development of oogonium in the macrandrous heterothallic strain. Oogonium initiation could not be encountered either in the Waris or Bristol medium even after 30 days of inoculation. Quality of light did not show any marked influence on oogonial differentiation. However, green light was least favourable as it delayed the initiation of oogonium formation and reduced the percentage of oogonia developed. Maximum oogonium formation resulted in white light followed by yellow, red and blue light.

Key words: *Oedogonium hatei*, oogonium induction, nutrients, spectral irradiance

Members of Oedogoniales are characterised by oogamy. Hill and Machlis (1970) showed that in *Oedogonium cardiacum,* low or non-nitrate containing medium was inducive for sexual structures in significant numbers. O'Kelley (1983) tested the response of four media on the growth and zygospore production of *Chlorococcum echinozygotum.* Recently, Singh (1987) and Chaudhary and Singh (1988) studied the environmental and nutritional control on oogonium formation in O. *hatei.* Singh and Chaudhary (1988) investigated the response of growth harmones (GA_3 and IAA) on oogonium induction.

In this study, a comparative assessment on the effect of nutrient media containing different nutrients and different spectral irradiance on the growth and oogonium formation in the green alga *O. hatei* was made.

MATERIALS AND METHODS

Macrandrous, heterothallic *O. hatei* was collected from freshwater pond inside the Banaras Hindu University campus. Cultures were raised from single female filament in Godward's medium (Godward, 1942) at 22±1°C, with an illumination of 0.2 K lux for 16 h/day from cool-white fluorescent tube lamps. The alga was maintained for its ready availability for experimental purposes in the Godward medium both on agar plates and in liquid culture as it favoured massive vegetative growth and prevented the formation of oogonia up to one month.

In order to investigate the best suited medium for oogonium formation and also to ascertain the control on the development of sexual structures the following media were used: Godward medium (Godward, 1942), Chu 10 medium (Chu, 1942), Bold Basal medium (Cox and Bold, 1966), Bristol medium (as modified by Bold, 1949) and Waris medium (Waris, 1950). Among the five media only in Chu 10 the alga showed oogonia formation within 10 days after inoculation, hence the above medium was chosen for further light experiments. Samples were exposed to differernt spectral irradiance: blue, green, yellow and red and incubated under cultural conditions.

Exponentially grown cultures were used as initial inoculum. To each sample 5 mg of fresh weight of *O. hatei* was inoculated into 50 ml of medium and sufficient replicates were maintained. Daily observations were made to determine the time necessary for the initiation of oogonium induction, percentage of oogonium formation and percentage of mature oogonia developed. For percentage oogonium formation, nearly 600-700 cells including oogonial structures from arbitarily selected microscopic fields were screened. Percentage of mature oogonia was calculated on the basis of total number of oogonia recorded.

RESULTS AND DISCUSSION

Oogonial mother cells were found to occur throughout filament, singly or in chain between 2 to 10 vegetative cells. They were readily recognised by larger size and globose shape. They were initially dark green in colour and without pores, and later on turned reddish and thick-walled and developed pores on maturation.

Nutrient Media

Different media exerted differntial response on the growth and development of oogonia in the macrandrous, heterothallic female strain of *O. hatei*. Of various culture media tested, the modified Chu 10 medium proved to be most suitable for vegetative growth as well as formation of sexual structures. Bold Basal medium and the Godward medium supported sustained vegetative growth and prevented oogonium formation till one month. The filaments remained healthy and green even in one month old cultures in either of these media. The percentage of oogonia formed in the latter two media after one month was also found to be very poor. The growth of the alga was much faster in Chu 10 medium as a consequence of which the filaments started yellowing with concomitant development of oogonia in 10 day old cultures, presumably due to depletion of nutrient status in the medium. Neither healthy growth occurred nor the differentiation of oogonia resulted in the Bristol and Waris media (Table 1), the filaments remaining clumped and stunted in growth.

Table 1: Effect of different nutrient media on oogonium formation in *O. hatei*

Medium	Initiation of oogonia (days)	Oogonia on 15th day of inoculation (%)	Oogonia on 31st day of inoculation (%)
Chu 10	10	19	21
Godward	30	-	8
Bold Basal	30	-	7
Bristol	-	-	-
Waris	-	-	-

Table 2: Effect of light quality on oogonium formation in *O. hatei*

Quality of light	Initiation of oogonia	Oogonia on 15th day of inoculation	Mature oogonia on 15th day of inoculation
nm	(days)	(%)	(%)
White	10	19	31
Yellow	10	18	29
Red	10	18	20
Blue	10	16	10
Green	12	14	

The present findings that the Godward and Bold Basal media supported massive vegetative growth and prevented sex differentiation, while Chu 10 nutrient medium, on the other hand, favoured oogonium formation (Table 1), in macrandrous heterothallic *O. hatei* can be attributed to the presence of significantly higher nitrogen content in the former media than in latter one (Chaudhary and Singh, 1988). O'Kelley (1983) also tested the effect of four different media on growth and zygospore production in *Chlorococcum echinozygotum* and reported that zygospore production was sighnificantly higher in the modified FW_1 medium containing nitrate (1 nm) as the source of nitrogen. It is, thus, evident that the preference of one particular medium for the formation of sexual structures over others seems to be genus dependent.

Quality of Light

Initiation of oogonium formation was encountered on 10th day of inoculation in the white, yellow, red and blue lights. Green light, however, was found to cause delay in the initiation of oogonium by 2 days. Percentage of oogonium formation was optimum (19.0%) in the white and minimum (14.0%) in the green light, yellow, red and blue lights falling next to white light (Table 2). No mature oogonia could be scored in the green light on 15th day of inoculation.

The present findings of maximum oogonium formation in the white light and minimum in green light are well in conformity with those of Agrawal (1980) in *Stigeoclonium pascheri* and Chaudhary and Singh (1987) in *Pithophora oedogonia*, who made similar studies on sporulation in these algae. Pantastico and Zenaida (1973) observed no akinete formation in blue light in *Cldophora* sp. Agrawal and Sarma (1983) reported significant decrease of percentage sporulation in yellow light followed by red light in *P. oedogonia*. In this study, however, the yellow light was found more akin to white light in its response on the induction of oogonial structures. It can, therefore, be concluded that oogonium formation and sporulation are analogous processes which are largely controlled by similar environmental factors.

The authors thank the Head, Department of Botany, B.H.U. for providing necessary facilities. One of us (HVS) is thankful to the Council of Scientific and

Industrial Research, New Delhi for award of Senior Research Fellowship.

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