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Mass production of blue green algae under artificially controlld condition

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ABSTRACT : Cyanobacteria are the largest and morphologically diverse group of prokaryotes which occur in almost all habitats on the Earth. They are the only nitrogen fixing organisms that have on oxygen evolving Photosynthetic system. Cyanobacteria are also use as a biofertilizer to improve soil quality, productivity and yield components of paddy. Producing mass culture of BGA for industrial purposes represents novel Biotechnology. Blue green algal biomass has been considered since long as an alternative source of protein that could supplement conventional food and feed production. Producing mass culture of BGA for industrial purposes represents novel Biotechnology. It is well known that it is extremely difficult if not impossible to get pure growth of desired alga in nature. During this investigation four local filamentous strains were selected for cultural studies these stains are *Aulosira fertilissma, Sytonema simplex, Cylindrospermum musicola* and *Nostoc commune*. As all the members of blue green algae studies in above mentioned experiments belong to heterocystous group. Experiment was set up in order to study the growth of the above BGA separately as well as association. The mixed culture was prepared taking two member of BGA in different possible combination. Biomass cultured specimens has been expressed in dry weight in mg/l. Result indicate that the growth of all organisms follows an increasing trends with increase in time of incubation under *in vitro* culture. The maximum biomass founded in *Aulosira fertilissma* 48.7 mg/l and minimum 16 mg/l, *Nostoc commune* 20 mg/l, *Sytonema simplex* 18.5mg/l, respectively after 3o days growth. Present result on mix culture shown the maximum biomass weight founded in the combination of *Aulossira fertilissma* and *Nostoc commune* 64 mg /l after 30 days and minimum weight of biomass have been recorded in the combination of *Scytonema simplex* and *Nostoc commune*.

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Cyanobacteria are the largest and morphologically diverse group of prokaryotes which occur in almost all habitats on the Earth (Kulasooriya, 2011). They are the only nitrogen fixing organisms that have on oxygen evolving Photosynthetic system. Blue green algal biomass has been considered since long as an alternative source of protein that could supplement conventional food and feed production. There is historical evidence that blue green algae were harvested dried and eaten by the Aztecs of Tenochtitlan (Mexico city) at the time of Spanish conquest (Farrar, 1966). Besides cyanobacteria are also useful in the production of different bioactive compounds (Antibiotics, Enzymes cell growth promoters, toxins etc.).The interest in these organisms as generators of pharmacologically active compounds has been stimulated by recent results from a group of workers related

to anti cancer and immune- stimulation properties of phycobili proteins as well as to the inhibition by the blue green algal sulfolipids of cytopathic effects of the human immune deficiency virus (HIV) (Guerrero *et al.*, 1990). Cyanobacteria is also us as a biofertilizer to improve soil quality, productivity and yield components of paddy (Roger *et al.*, 1985). Producing mass culture of BGA for industrial purposes represents novel Biotechnology. It is well known that it is extremely difficult if not impossible to get pure growth of desired alga in nature hence it is necessary to study the algae for a number of processes like morphological study, life history, cytological studies like nutrition ,metabolism, photosynthesis and respiration etc.

Cultural studies of algae in India for its various uses have been done by several workers (Vankatraman, 1989, Prasad and Srivastava 1965). In Ranchi *in vitro* as well as tap water cultural studies of algal specimens has been done by some workers (Dhar and Pubbi, 1993, Sankaran, 2000 and Thakur, 2008). The methodology of BGA mass production has been reviewed by Watnabe and Yamamoto (1970) and Vankatraman (1969).

Experimental Methodology

During this investigation algal specimens were collected from different habitats. All samples were transferred to the bottles and brought to the Algal Biotechnology lab of post graduate department of Botany R.U., Ranchi. Specimens were thoroughly washed under tap water proper care was taken according to the type of specimens Identification was done. Four local filamentous strains were selected for cultural studies these stains are *Aulosira fertilissma, Sytonema simplex, Cylindrospermum musicola and Nostoc commune* (Table A).

As all the members of blue green algae studies in above mentioned experiments belong to heterocystous group. The non heterocyst forms were unable to grow in nitrogen free culture medium. Experiment was set up in order to study the growth of the above BGA separately as well as association. The mixed culture was prepared taking two member of BGA in different possible combination (Table A). Identified isolated filamentous algal forms transferred to the media with the help of inoculation loop. In the present study liquid medium (nitrogen free) was used for algal cultivation.

Table A : Showing the different combination of Unialgal and mixed culture

Sr. No.	Combination of Algae
1.	*Aulossira fertilissma*
2.	*Scytonema simplex*
3.	*Cylindrospermum musicola*
4.	*Nostoc commune*
5.	*Aulossira fertilissma + Scytonema simplex*
6.	*Aulossira fertilissma + Cylindrospemum musicola*
7.	*Aulossira fertilissma + Nostoc commune*
8.	*Scytonema simplex + Cylindrospermum musicola*
9.	*Scytonema simplex + Nostoc commune*
10.	*Cylindrospermum musicola + Nostoc commune*

Experimental Findings and Discussion

During present investigation biomass cultured specimens has been expressed in dry weight in mg/l. Result indicate that the growth of all organisms follows an increasing trends with increase in time of incubation under *in vitro* culture. The maximum biomass founded in *Aulossira fertilissma* 48.7 mg/l and minimum 16 mg/

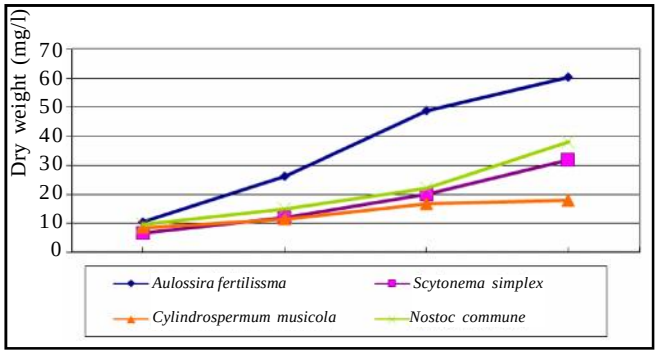

Fig. 1 : Unialgal biomass production *in vitro* culture mg/l

Table 1 : Showing the mass production of unialgal culture

Cultured Algae	Algal biomass production *in vitro* culture (mg/lit)			
	After 10 days	After 20 days	After 30 days	After 40 days
Aulossira fertilissma	10.5	26.2	48.7	60.2
Scytonema simplex	6.5	12	19.9	31.9
Cylindrospemum musicola	83.5	11.5	16.8	18
Nostoc commune	9.5	14.9	22	38

Table 2 : Showing the mass production of BGA

Combination of algae	Algal biomass production *in vitro* culture (mg/lit)			
	After 10 days	After 20 days	After 30 days	After 40 days
Aulossira fertilissma + Scytonema simplex	13.5	26.2	48.7	56.2
Aulossira fertilissma + Cylindrospermum musicola	12	19.9	39.9	48.5
Aulossira fertilissma + Nostoc commune	10.5	25	64	76
Scytonema simplex + Cylindrospemum musicola	11	21.9	34.5	32
Scytonema simplex + Nostoc commune	8.5	23.9	31.5	46
Cylindrospemum musicola + Nostoc commune	13	22.4	36.8	42

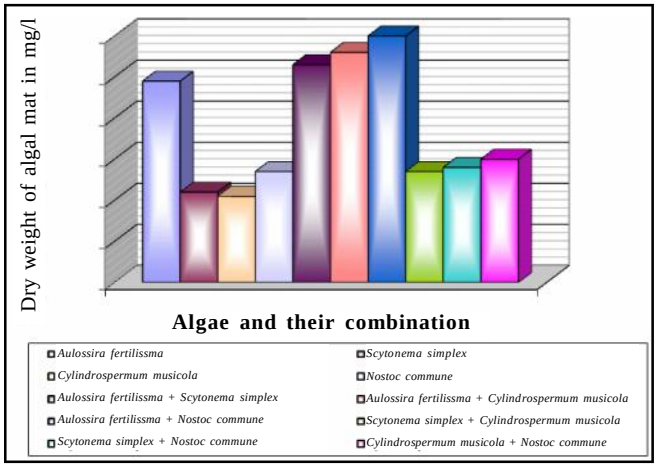

Fig. 2 : Growth of BGA when grown separately and in association with another

l, *Nostoc commune* 20 mg/l, *Sytonema simplex* 18.5mg/l, respectively after 30 days growth shown in (Table 2). Present result on mix culture shown the maximum biomass weight founded in the combination of *Aulossira fertilissma* and *Nostoc commune* 64 mg /l after 30 days and minimum weight of biomass have been recorded in the combination of *Scytonema simplex* and *Nostoc commune* (Table 2). Growth of *Nostoc commune* 9.5 mg /l after 15 days and 14.9 mg/l aftr 30 days. Hussain (2011) have estimated 700 mg/l and 744.32 mg/l after 30 days of inoculation. The growth of blue green algae affected high intensities light, low temperature, acidic pH and low level of nutrients. (Kulasooriya, 2011).

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