Role of Nitrogen Source in the Development of Heterocyst

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Abstract **- In the present study two local strains of Blue-green algae Nostoc linkia and Anabaena macrospora were selected to observe the effect of nitrogen sources on the development of Heterocyst. Heterocyst frequency was calculated on 7th day, 14th day and 21st day in Allen-Amon medium supplemented with potassium nitrate, sodium nitrate and Ammonium Nitrate. It was observed that Ammonium Nitrate totally inhibited development of heterocyst while very slow development of Heterocyst occurred in medium supplemented with Potassium Nitrate and Sodium Nitrate in comparison to absence of nitrogen source in medium.**

Index Terms- Potassium Nitrate, Sodium Nitrate, Ammonium Nitrate

INTRODUCTION

Several members of Blue green algae are nitrogen fixer. Their filament contains three different type of cells. Vegetative cell, Reproductive spore, and Heterocyst. Heterocyst is the specialized cell which fixes dinitrogen using the enzyme nitrogenase. Heterocyst differentiates from vegetative cell. They are larger in sized and a multi envelope structure in which only PS I system of light reaction takes place, but PS II remain absent. The activity of enzyme nitrogenase is dependent of absence of oxygen and presence of ATP. In heterocyst only PS I take place. So, ATP is generated but photolysis of water does not occur. Thus, Hetrocyst fulfill all required condition for the activity of enzyme nitrogenase.

Heterocysts are of two different types. Intercalary Heterocyst and Basal Heterocyst. Intercalary heterocyst consists of two polar modules on each end and remain in between two vegetative cells as in Nostoc, Anabaena, Nodularia etc. Basal Heterocyst has only one polar nodue of one end only. It remains present at the terminal of the filament as in Rivalaria, cylindrospermum, gloeotrichia etc. Nitrogen source supplemented in culture media inhibit the differentiation of Heterocyst. In the present work effect of three nitrogen sources KNO3, NaNo3and NH4NO3 was tested for the development of Heterocyst in two local strains of Blue green algae.

METHODOLOGY

Two local strains Nostoc linkia and Anabaena macrospora were selected for this study. Both strains were culture in BG11 medium. By repeated culture in the same medium pure culture was obtained from pure culture Axenic culture was prepared. Separately axenic culture was transfer in Allen Arnon media. One supplemented with KNO_3 other with $NaNO_3$ and next with NH4NO3 and Heterocyst frequency was tested on 7^{th} day, 18^{th} day and 21^{st} day. Heterocyst frequency was determined by light microscopic observations at 400x. Using one drop of each sample a wet mount was created and placed under the light microscope. Heterocyst frequencies were counted per set of one hundred cells. This count was repeated 3 times for each sample. Counts were taken every 7 days. The entire experiment was repeated three times.

RESULT: L

One ml Axenic culture was inoculated in Allen Arnon medium. Supplemented with Potassium Nitrate, Sodium Nitrate and Ammonium Nitrate in different flasks after counting % frequency of Heterocysts. After 7^{th} day, 14^{th} day and 21^{st} day % frequency of Heterocyst was calculated. 1ml Axenic culture was also inoculated in Nitrogen free Allen Arnon medium after count % frequency of Heterocyst and after 7^{th} day, 14^{th} day and 21^{st} day % frequency of Heterocyst was calculated.

Table- 1 % frequency of Heterocyst in Allen Arnon medium supplemented with Potassium nitrate

Organism	% frequency

	Initial	7th day	14th day	21st day
Nostoc Linkia	8	8	10	11
Anabaena Macrospora	7	11	13	16

Table- 2 % frequency of Heterocyst in Allen Arnon medium supplemented with Sodium Nitrate

Organism	% frequency			
	Initial	7th day	14th day	21st day
Nostoc Linkia	8	10	12	14
Anabaena Macrospora	7	13	15	18

Table- 3 % frequency of Heterocyst in Allen Arnon medium supplemented with Ammonium Nitrate

Organism	% frequency			
	Initial	7th day	14th day	21st day
Nostoc Linkia	8	8	8	8
Anabaena Macrospora	7	7	7	7

Table- 4 % frequency of Heterocyst in Allen Arnon medium without nitrogen sources

Organism	% frequency			
	Initial	7th day	14th day	21st day
Nostoc Linkia	8	13	18	24
Anabaena Macrospora	7	10	14	19

CONCLUSION

Effect of nitrogen sources was studied in the development of Heterocyst in two local strains of Blue-green Algae. Organisms selected for study were *Nostoc linkia* and *Anabaena macrospora*. Effect of three nitrogen sources potassium nitrate, sodium nitrate and Ammonium nitrate was observed on 7th day, 14th day and 21st day. In medium supplemented with Ammonium nitrate Heterocyst development was totally inhibit in both organisms. While potassium nitrate and sodium nitrate slow down the frequency of Heterocyst development.

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