SURVEY OF CYANOBACTERIA AT THREE IMPORTANT POINTS OF SITAMARHI DISTRICT AND DETERMINATION OF REJUVENILE POTENCY AND RELATIVE SPECTRUM FREQUENCY OF THE MEMBERS ISOLATED

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ABSTRACT

Members of blue-green (Cyanobacteria) play an important role in the reduction of atmospheric Nitrogen. They also play an important role in aquatic ecosystem. Sitamarhi, Bairgini and Janakpur Road are important sites where different members of Cyanobacteria are dwelling, but not identified. In the present study, soil samples, colonies visible to naked eyes were collected and cultured in the laboratory conditions. Field survey was done in different season’s viz., March-May-July-Sept and November of the year. Based on the emergence of the colonies in the culture plates the genera were identified and accordingly the Rejuvenile potency and Relative Spectrum were determined. A great deal of variations have been observed for different genera at the above three sites. Out of the genera identified a few only revealed consistency at all the three places in all the periods of collections. This was correlated with the adaptive ability of the genera. Similarly, presence similar species indicated similarly of the soil and water with respect to nutrition composition.

KEYWORDS: Cyanobacteria, Rejuvenie Potency, Relative Spectrum Frequency, Colonies, Aquatic ecosystem

Different members of Cyanobacteria play an important role in the Nitrogen economy of the soil and water. Horne and Fogg (1970) indirectly estimated that benthic blue-green in fresh water may fix 0.8 t of Nitrogen annually. Fixation rates of 320 mg Nitrogen / meter square/ year have been measured for gelatinous Nostoc colonies living in the bottom of certain Californian Streams (Horne & Carmiggelt (1975)). Blue green algae have soil and sand binding capabilities. However, there is no report about the members present in different sites of Sitamarhi district which consists several water bodies as well as paddy fields where the members of blue green algae flourish. We get that general survey of a particular point has been done by few workers such as Goel 1982; Das 1989; and Jha and Kar Gupta 2001. But we have no report about the RP and RSF of the blue green taxa of the area. Therefore, in the present work seasonal collections of the samples, soil as well as the visible colonies was done and they were cultured in the laboratory. The colonies were identified and RP and RSF were calculated by applying the formula as mentioned in the chapter Materials and Methods. Information regarding the presence of the above genera is of great significance both with respect to further studies and for its conservation.

MATERIALS AND METHODS

For the determination of the spectrum, Rejuvenie potency and Relative Spectrum Frequency two sites of the districts were selected. The soil samples of these sites were collected; from a depth not exceeding 5 cm. Soil was collected from the cultivated as well as non cultivated land. After proper mixing 10 g of soil was placed in a pre-sterilized petri plates and was gently irrigated with Bristol’s inorganic solution, whose pH was adjusted at 6.5. (Nichols and Bold, 1965). Above Petri plates were incubated in the culture room at 26±2°C and 14 h cycle of light and 10 h darkness. Well grown colonies were selected for identification with the help fo standard literature as described by Desikachari (1959). Samples from the water logged fields were also collected and studied for identification. Some species where district morphological features are known such as Nostoc, Rivularia, Gloeotrichis were collected from the water bodies and studied for the identification and population densely, distribution and occurrence. Based on the above studies, the spectrum, (S), Rejuvenie Potency (RP) and Relative Spectrum Frequency (RSF) were determined.

Rejuvenie Potency (RP)

The identified genus was inoculated in the Petri plates containing culture modicum. These plates were incubated in the culture room under controlled temperature and light. Observation was made weekly for the emergence of the genus inoculated. After four weeks the RP of each genus was calculated by the following formula.

\[ \text{Rejuvenie Potency RP} = \frac{R_X}{K} \times 100 \]
Where,

\[ Rx = \text{Sum total of the genus that emerged in the culture.} \]

\[ K = \text{No. of replica of weekly observations.} \]

**Relative Spectrum Frequency (RSF)**

This was determined by the emerged genus in the culture. Here inoculation was made for dormant species, the sample taken from different areas viz., Sitamarhi, Bairgania, and Janakpur Road.

\[
\text{RSF} = \frac{R_n}{R} \times \frac{1}{S} \times 100.
\]

Where,

\[ R_n = \text{Sum total of replicate in which a taxon under consideration emerged.} \]

\[ S = \text{Number of taxea observed in the respective month.} \]

\[ R = \text{Sum total of Replicates taken for respective sampling zone.} \]

**RESULT**

Periodical observations on the Rejuvenile Potency (RP) of Cyanobacterial taxa recorded at each of the three sampling fields were made and the data scored have been summarized in the table 1a, b and C.

**Table 1: Sitamarhi**

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<thead>
<tr>
<th>S.N.</th>
<th>Name of the Taxa</th>
<th>Jan 10</th>
<th>March 10</th>
<th>May 10</th>
<th>July 10</th>
<th>Sept 10</th>
<th>Nov 10</th>
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<tbody>
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**Table 2: Bairgania**

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<td>75.70</td>
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<td>0.00</td>
<td>50.00</td>
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Table 3: Janakpur Road
Periodical values of Rejuvenate Potency

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<th>May 10</th>
<th>July 10</th>
<th>Sept 10</th>
<th>Nov 10</th>
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<td>2</td>
<td>Anabaena oryzae</td>
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<td>0.00</td>
<td>0.00</td>
<td>66.70</td>
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<tr>
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<td>0.00</td>
<td>83.30</td>
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<tr>
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<tr>
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<tr>
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<tr>
<td>12</td>
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<td>100.00</td>
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<tr>
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<td>Synechocystis aquatilis</td>
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</table>

From the tables it is apparent from the tables that the RP of each taxa varied with respect to the months of observations and sampling fields both. It may be noted from the above tables that Oscillatoria willei and Nostoc linckia were constant at all the three sampling fields, where as Anabaena oryzae was consistent at Bairgania only. Rest of the taxa were inconsistent wherever they were present. Similarly O. willei and N. linckia were consistently high in all the sampling fields. Synechocystis aquatilis was inconsistent at Sitamarhi, Consistently high at Bairgania and moderately high at Janakpur Road. On the other hand A. oryzae was found in consistent at Sitamarhi and Janakpur Road but consistently high at Bairginia.

Oscillatoria willei, Anabaena oryzae at all the three sampling zones; Anabaena laxa at Sitamarhi, Nostoc ellipsosporum at Bairgania, Nostoc linckia and Scytonema simplex at Sitamarhi and Bairagia; Anabaena variabilis at Bairgania and Janakpur Road were found with RP inflated during July- September and November-March either in the form of two discrete peaks or as contiguous broad peak if it is read in sequence starting from May being stack month physiologically for Cyanobacteria. Thus Oscillatoria tenuis, Nostoc calicola, Plectonema tomasianum and Goloeocapsa longicauda at all the three sampling zones, Nostoc linckia, N. ellipsosporum, Anabaena laxa at Janakpur Road; have been noted with November-March peak relatively more pronounced than that of July-September. Reverse to above be noted for Nostoc ellipsosporum and Anabaena variabilis at Sitamarhi; Anabaena laxa at Sitamarhi and Scytonema simplex at Janakpur, which were relatively more dominant during July-September.

Relative Spectrum Frequency

Along with RP, RSP of each taxa were also ascertained. The data obtained for RSF have been presented in the tables 4-6.

Table 4: Sitamarhi
Periodical values of Relative Spectrum Frequency

<table>
<thead>
<tr>
<th>S.N.</th>
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<th>May 10</th>
<th>July 10</th>
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### Table 5: Bairgania
Periodical values of Relative Spectrum Frequency

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<th>May 10</th>
<th>July 10</th>
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<td>5.95</td>
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### Table 6: Janakpur Road
Periodical values of Relative Spectrum Frequency

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<th>Jan 10</th>
<th>March 10</th>
<th>May 10</th>
<th>July 10</th>
<th>Sept 10</th>
<th>Nov 10</th>
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<td>12.50</td>
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</table>

Amongst the 14 taxa recorded, the RSF of Oscillatoria willei and Nostoc linckia were noted consistently high at all the three sampling fields; It was noted moderately high of Synechocystis aquatilis at Bairgania and Janakpur Road, while moderately low of Anabaena oryzae at Janakpur Road and Bairgania respectively.

Like RP, RSF of each taxa varied during the months of observations and amongst the different sampling fields. Thus, while the taxa Synechocystis aquatilis, Anabaena laxa at Sitamarhi; Anabaena variabilis at Bairgania; Chlorogloea fritschiz, Anabaena oryzae, Scytonema simplex at Sitamarhi and Bairgania were observed with two descrete or a broad contiguous peak during July-September and November-March; Oscillatoria willei, O. tenuis, Nostoc linckia, N. ellipsosporum, N. calcicola, Plectonema tomasinianum, Gloeotrichia longicauda at all the three sampling zones; Synechocystis aquatilis at Bairgania, Anabaena laxa at Janakpur Road, had much RP.

**DISCUSSION**

Present study was aimed to explore the members of Cyanobacteria at Sitamarhi district with reference to RP and RSP. The explorations of soil algae has also been made by (Marthe, 1960, Aiyer 1965; Kamat and Patel 1973; Bharti nad Bongale 1975; Sinha and Mukherjee (1975a, 1975b; Prasad and Mehrotra 1976; Thirukkanasan et al; 1977; Kanniyan 1978; Sarma et al; 1978; Anand 1980; Bongale 1981; Mukhopadhyay and Chatterjee 1981; Sardesh pande nad Goyal 1981; Goyal et al; 1984) but only with reference to the simple spectrum at a given time.
The methods have been evolved for ascertaining population density as well as distribution pattern of algal taxa in the aquatic environment. (Anand 1976, 1979, Mohanti 1984) Verma and Dattamumshi, 1987. In the present studies, an attempt has been made for computing physiological status (RD) nad level of distribution RSF of soil algal. All the taxa collected from three different zones in different months, but all the taxa were never seen constituting spectrum of any one of the sampling fields.

It is further evident from the tables that *Anabaena laxa*, *A. oryzea*, *A. variabilis*, *Chlorogloea fritschii*, *Gloeotrichia longicauda*, *Nostoc linckia*, *N. ellipsosporum*, *N. calcicola*, *Plectonema tomasinianum*, *Scytonema simplex* were most common forms being constituents of the spectra acertained for all the three fields under study. Presence of all the above genera at all the sampling sites suggests some sort of similarities in the physio-chemical conditions of the soil developed at nutritional level.

*Oscillatoria willei* and *Nostoc linckia* revealed consistently high RP and RSF, at all the three sampling zones during each sampling months. Therefore, either they have high adaptability or the existing conditions were conegenent for them at the year round so they were dominating species. Taxa showing in consistent RP and RSF may be regarded as less adaptive. Similarly taxa having equal peak during Rabi and Kharif season, may be regarded to have a wide range of adaptability against those having either Rabi peak or Kharif peak relatively more pronounced. RP and RSF have been noted to vary concomitantly during different months of a year in general, but in case of *Oscillatoria willei*, *Nostoc linckia* while RP was recorded very high, RSP was very low during July – September. Showing thereby that the prevailing factors were favourable for the emergence or rejuvenation of the protoplasts but not for its furtherance. Reverse to it may be concluded for *Synechocystis aquatitis* in which case RP came down very low and RSF increased appreciably in May.

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REFERENCES


