The cyanobacterial samples were collected from various agricultural fields in and around Tiruchirappalli region Tamilnadu, India.

 Totally 46 cyanobacterial species were recorded and isolated using BG11 medium.

 Among them 10 cyanobacterial species (belonging to different genera and unique characteristics) were selected for further plant growth promotion and bioremediation studies.

 Amplification of 16S rRNA gene of 10 isolates was carried out.

 The sequence of the amplified gene was submitted in the Genbank (NCBI) and accession numbers were obtained.

 Phylogenetic tree was constructed to demonstrate the relationship of the amplified sequences with the existing sequences in NCBI.

 Cyanobacteria Extracellular Product (CEP) enhances the seed germination and plant morphometric and biochemical changes which was highest at 1% *Calothrix fusca* NTMS08 CEP.

 HPLC analysis confirmed the presence of plant growth promoting hormone GA3 in cyanobacterial extracellular product.

 IAA quantified by Salkowski method, Higher IAA was found in *Calothrix fusca* NTMS08 CEP on comparing to other cyanobacteria and microalgae.

 Plant growth promoting hormone IAA in CEP was extracted by TLC and confirmed by FTIR and HPLC.

 Callus induction from cotyledon explants of tomato was found to be 68.7% in the medium containing 2, 4 D (1mg/L) and BAP (0.2 mg/L) which was inoculated with 20 explants.

 Root induction from callus was tested with different CEP’s. Among which *Calothrix fusca* NTMS08 CEP found higher induction in 35 days, at regular supply of 12% of CEP.

 Multiple shoot induction from callus was found high in 45 days, on providing 16% of *Scytonema hofmanni* NTMS05CEP.
Root and shoot induction from nodal explant was found in 25 days, on providing 20% *Oscillatoria acuminata* NTMS02 CEP.

This showed the potential use of cyanobacteria in agriculture by promoting plant growth.

Chromium metal removal was found to be 99.6% under pH 7, at metal ion concentration of 2.5mg/L, in contact time 2 days at 26°C.

Tested organisms were found to fit better with Langmuir isotherm than comparing to Freundlich isotherm. Langmuir isotherm adsorption capacity was found to be 0.9999 for *Chroococcus minutus* NTMS09 which is higher than other cyanobacteria.

Unicellular organism showed better accumulation of metal when compared to filamentous form.

This investigation shows that the cyanobacteria can be employed as an effective adsorbent for the removal of Cr (VI) from aqueous solution.

Both SOD and CAT enzymes activity in all organisms were found to be higher when subjected to metal stress. Therefore, the SOD and CAT induction found may be related to an adaptative response to an increase of reactive oxygen species produced by metal stress.

Among all the organisms tested *Oscillatoria acuminata* NTMS02 showed high production of SOD and CAT as 15mg/L and 9mg/L respectively.

By the good production of these enzymes organisms finds a first line defense against chromium metal stress.

In order to find out the variation in fatty acid profile, FAME was studied. Chromium (VI) induced the changes in fatty acid profile of studied organism compared to control. Lipids are rich in membrane, which is made up of fatty acids. The membrane is the primary contact of the cell with its environment result in significant disruption. Considering the fatty acid profile results indicate that *Chroococcus minutus* NTMS09, *Dolichospermum flos-aquae* NTMS07 and *Scytonema hafmanni* NTMS05 readily undergo adaptive changes in their fatty acid profile to lower the level of unsaturated fatty acid.

This might be resulted through decreasing activities of fatty acid desaturases.

The changes in the fatty acid profile indicate the reaction involved in bioaccumulation of metal.