

## BIO-DATA Prof. J. I. S. Khattar

1. Name : DR. JASVIRINDER SINGH KHATTAR  
2. Designation : PROFESSOR and DEAN LIFE SCIENCES  
3. Department : BOTANY  
4. Date of Birth : 04.04.1962  
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[jiskhattar@gmail.com](mailto:jiskhattar@gmail.com)

- 6 Areas of Specialization : Physiology and Biochemistry of Cyanobacteria, Environmental Microbiology, Cyanobacterial Biotechnology

### 7. Academic Qualifications:

Sr. No.	Degree Held	Year	Board/Univ./ Inst.	% of marks	Div./ Rank	Subjects Taken
1	M.Sc.	1983	Punjabi Univ. Patiala	67.5	1 <sup>st</sup> /3rd	Botany
2	M.Phil.	1985	Punjabi Univ. Patiala	'A' Grade		Botany
3	Ph.D.	1989	Punjabi Univ. Patiala			Botany

### 8. Membership of Professional Bodies/Organisations

- i) Life Member – Indian Botanical Society
- ii) Life Member- Indian Science Congress Association
- iii) Life Member- Association of Microbiologists of India
- iv) Life Member- Biotech Research Society of India

### 9. Medals/Awards/Honours/Received

- 1) Member Senate, Punjabi University, Patiala
- 2) Member Syndicate, Punjabi University, Patiala (2018-2019)
- 3) Member Finance Committee, Punjabi University, Patiala
- 4) Dean Life Sciences, Punjabi University, Patiala

- 5) Head, Department of Botany, Punjabi University, Patiala (July 2015 to June 2018)
- 6) Attended Leadership for Academicains Programme (LEAP) of MHRD during 13-24 May, 2019 at IIT Kharagpur and 3-7 June, 2019 at IFM Cambridge University, Cambridge.
- 7) Chairman, Institutional Ethical Committee, Punjabi University, Patiala
- 8) Fellow Indian Botanical Society
- 9) Councillor Indian Botanical Society (2014-2017)
- 10) Vice-President Indian Botanical Society (2107-2018)
- 11) Member Editorial Board, Journal of Indian Botanical Society (2017-2020 )
- 12) Member Organizing Committee, 3<sup>rd</sup> GoGreen Summit, Manila, Philippines, March 23-24, 2018
- 13) Member, Board of Post Graduate Studies in Botany, Kurukshetra University, Kurukshetra
- 14) Member, Post Graduate Board of Studies in Microbiology, Mata Gujri College, Fateh Garh Sahib (Session 2018-2019 and 2019-2020)
- 15) Member Board of Studies in Undergraduate and Post Graduate Studies in Agriculture, Khalsa College, Patiala (June 2018-May, 2021)

**10. Scholarships:**

- i) Junior Research Fellow (CSIR, New Delhi)
- ii) Senior Research Fellow (CSIR, New Delhi)
- iii) Research Associate (CSIR, New Delhi)

**11. Details of Experience:**

S. No.	Name of the Inst./Employer	Position Held	Duration	Major Job Responsibilities and Nature of Experience
1.	Punjabi Univ. Patiala	Lecturer	17.5.90 to 16.5.99	Teaching and Research
2.	Punjabi Univ. Patiala	Reader	17.5.99 to 16.5.07	Teaching and Research
3.	Punjabi Univ. Patiala	Professor	17.5.07 till date	Teaching and Research

**12. Published Work (Please specify numbers only) :**

- a. Research Papers
  - i) National = 15
  - ii) International = 43
- b. Conference/Seminar Presentation = 65
- c. Books
  - i) Original:
  - ii) Edited: 01

**13. R & D Projects:**

**Completed:**

- i) To evaluate the potential of immobilized algae to scavenge heavy metal ions from the polluted aquatic systems  
**CSIR, New Delhi**
- ii) To screen blue-green algal germplasm from paddy fields of Patiala district with biofertilizer potentialities  
**UGC, New Delhi**
- iii) Evaluation of cyanobacterial strains from paddy fields for pesticide degradation  
**CSIR, New Delhi**
- (iv) A search for cyanobacterial strains producing novel exopolysachharides,  
**CSIR, New Delhi**
- (v) Exploitation of extremophilic cyanobacteria for the production of phycobiliproteins as natural colours  
**UGC, New Delhi**
- (vi) Diversity Analysis and Bioprospecting of Thermophilic Cyanobacteria from the North Western Himalayas for Industrial Value Addition.  
**SERB-DST, New Delhi**

**Ongoing:**

- (i) Optimization and lab scale production of carotenoids from microalgae  
**CSIR, New Delhi.**

**14. Invited Talks : 26**

**15. Ph.D. Students guided/under guidance (Details):**

<b>S. No.</b>	<b>Name of the Student</b>	<b>Title of Thesis</b>	<b>Year of Completion</b>
1.	Gurpreet Kaur	Factors regulating carbon and nitrogen metabolism and akinete differentiation in the cyanobacterium <i>Anabaena torulosa</i> (Co-supervisor)	2000

2.	Anuradha Sharma	Isolation and characterization of chromium, cadmium and nickel resistant mutants of the cyanobacterium <i>Anacystis nidulans</i>	2003
3.	Namita Jindal	Isolation, screening and evaluation of exopolysaccharides producing strains of cyanobacteria	2008
4.	Shailza	Evaluation of heavy metal bioremediation potential of algae growing in polluted water	2011
5.	Yadvinder Singh	Cyanobacterial diversity of cold desert and hot water springs of North Western Himalayas	2014
6.	Harjinder Singh	Cellular differentiation in a rice field cyanobacterium with special reference to akinetes	2015
7.	Rajni	Evaluation of selected green algae as a potential feed stock for biodiesel production	2016
8.	Shahnaz	Studies on mechanism of chromium resistance in the cyanobacterium <i>Synechocystis</i> sp. Strain PUPCCC 62	2016
9.	Meenu Gupta	Responses of the cyanobacterium <i>Leptolyngbya foveolarium</i> to cartap hydrochloride insecticide	2016
10.	Gurdeep Kaur	Interaction of retilachlor herbicide with carbon and nitrogen metabolism of the cyanobacterium <i>Nostoc muscorum</i>	2016
11.	Sandeep Kaur	Isolation, optimization and characterization of phycobiliproteins from selected cyanobacteria	2017
12.	Jeevesh Nadda	Characterization and optimization of chlorpyrifos removal and tolerance mechanism in the cyanobacterium <i>Synechocystis</i> sp. Strain PUPCCC 64	2017
13.	Manpreet	Temperature tolerance and level of antioxidants in selected cyanobacteria in the presence of sodium sulphide	2017
14.	Shveta	Evaluation of cyanobacteria from diverse habitats for production and stability of phycobiliproteins	2019
14.	Lata	Physiological, Biochemical and Cultivation studies on <i>Lentinus sajor-caju</i> (FR.) FR.	2019
15.	Jeevan Jyoti	Purification and characterization of cyanophycin synthetase from selected thermophilic cyanobacteria	Registered
16.	Alka	Optimization, quantification and purification of carotenoids from selected microalgae	Registered
17.	Manpreet Kaur	Mechanism of monocrotophos tolerance in <i>Synechocystis</i> sp. PUPCCC64	Registered
18.	Manzoor	Characterization of pendimethalin tolerance mechanism in the diazotrophic cyanobacteria <i>Desmonostoc muscorum</i> PUP405.10	Registered

19.	Yodha Singh	Mechanism of degradation of chlorpyrifos by <i>Synechocystis</i> sp. PUPCCC 64	Registered
20.	Minakshi	Mechanism of lead tolerance in the cyanobacterium <i>Desmonostoc muscorum</i> PUPCCC 405.10	Registered

**16. M.Phil. Students guided:**

S. No.	Name of the Student	Title of Thesis	Year of Completion
1.	Kanwaldeep Kaur	Effect of anilofos on photosynthesis, respiration and nitrogen assimilation of <i>Oscillatoria simplicissima</i> and <i>Anabena torulosa</i>	2009
2.	Harjinder Singh	Akinete differentiation in the cyanobacterium <i>Anabaena naviculoides</i> in response to carbon and nitrogen sources	2010
3.	Navdeep Kaur	Isolation and characterization of exopolysaccharides produced by <i>Nostoc spongiaeforme</i> and <i>Nostoc muscorum</i>	2011
4.	Preeti Bansal	Characterization of exopolysaccharides produced by <i>Nostoc spongiaeforme</i> and <i>Phormidium molle</i> in response to heavy metal stress	2012
5.	Jeevan Jyoti	Characterization of pretilachlor tolerant strain of the cyanobacterium <i>Nostoc spongiaeforme</i>	2013
6.	Shamabhvi	Screening of Cyanobacteria from diverse habitats for antimicrobial activity	2015
7.	Anjana Sasramta	Screening of cyanobacterial strains from diverse habitats for mycosporine-like amino acids	2016

**17. List of Papers/Courses taught at P.G. and U.G. Level**

S. No.	Paper	Class
1.	Phycology	M. Sc. I
2.	Bryology	M. Sc. I
3.	Molecular Biology	M. Sc. II
4.	Plant Physiology, Morphogenesis and Biochemistry	M. Sc. II
5.	Pteridology	M. Sc. II
6.	Plant Biotechnology	M. Sc. II
7.	Genetic Engineering and Biotechnology	M. Sc. II
8.	Microbiology	M. Sc. I
9.	Plant Metabolism	M. Sc. I
10.	Plant Physiology	M. Sc. I
11.	Cell Biology	M. Sc. I

12.	Basics of Biochemistry	M.Sc. I (Five Year Integrated Course)
13.	Basic Research Techniques	M.Sc. V ((Five Year Integrated Course)
14.	Advanced Phycology	M.Sc. V ((Five Year Integrated Course)
15.	Biology for chemists	M. Sc. I (Chemistry)
16.	Research Techniques	M. Phil/ Ph.D. Course work
17.	Phycology (Special Paper)	M. Sc., M. Phil.
18.	Advances in Botany I	M. Phil./Ph.D. Course work
19.	Research Techniques	M. Phil/Ph.D. course work

## 18. Technical Proficiency

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| <ol style="list-style-type: none"> <li>1. Tissue culture techniques</li> <li>2. Biotechnology techniques</li> <li>3. Microbiological Techniques</li> <li>4. Biochemical Techniques</li> <li>5. Molecular Biology Techniques</li> </ol> |
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## 19. List of Papers Published

### (A) Books

1. Algal Biology and Biotechnology (2009) (Eds. J. I. S. Khattar, D. P. Singh and Gurpreet Kaur) I. K. International Publishers, New Delhi, India.

### (B) Research Papers:

1. Singh, D.P., **Khattar, J.I.S.**, Rajput. A., Chaudhary, R and Singh, R. S. (2019). High production of carotenoids by the green microalga *Asterarcys quadricellulare* PUMCC 5.1.1 under optimized culture conditions. PLoS ONE 14(9): e0221930. <https://doi.org/10.1371/journal.pone.0221930>
2. Kaur, S., **Khattar, J.I.S.**, Singh, Y., Singh, D.P. and Ahluwalia, A.S. (2019). Extraction, purification and characterisation of Phycocyanin from *Anabaena fertilissima* PUPCCC 410.5: as a natural and food grade stable pigment. J. Appl. Phycol. <http://doi.org/10.1007/s10811-018-1722-9>
3. Jyoti, J., **Khattar, J.I.S.**, Gulati, A. and Singh, D.P. (2019). Optimization of conditions and partial characterization of cyanophycin synthetase from a thermophilic cyanobacterium *Chlorogloeopsis fritschii*. Biocat. Agric. Biotechnol. 17:339-346. <https://doi.org/10.1016/j.bcab.2018.12.011>

4. Thakar, M.K., Luthra, D. and Khattar, J.I.S. (2018). Developing paradigms of drowning deaths in the state of Haryana, Punjab. *The Indian Police J.* 65(4): 48-57.
5. Thakar, M.K., Luthra, D. and **Khattar, J.I.S.** (2018). Forensic studies of phytoplankton ecology of two water bodies of Kurukshetra area of Haryana state in India. *Egyptian Journal of Forensic Science.* 8:38.  
<https://doi.org/10.1186/s41935-018-0068-4>
6. Jindal, N. and **Khattar, J.I.S.** (2018). Microbial polysaccharides in food industry. In: *Handbook of food bioengineering. Vol 20: Biopolymers for food design.* (Eds). A. M. Grumezescu and A.M. Hoban. Academic Press, U.K. pp. 95-123.  
<http://dx.doi.org/10.1016/B978-0-12-811449-0.00004-9>
7. Singh, Y., Gulati, A., Singh, D.P. and **Khattar, J.I.S.** (2018). Cyanobacterial community structure in hot water springs of Indian North-Western Hiamalayas: A Morphological, molecular and ecological approach. *Algal Research.* 29:179-192.  
[DOI: 10.1016/j.algal.2017.11.023.](https://doi.org/10.1016/j.algal.2017.11.023)
8. Chaudhary, R., **Khattar, J.I.S.** and Singh, D.P. (2017). Growth and lipid production by *Desmodesmus subspicatus* and potential of lipids for biodiesel production. *Journal of Energy and Environmental Sustainability.* 4:58-63.
9. Singh R. S., Walia A.K., Pratibha, **Khattar, J.I.S.** and Singh, D. P. (2017). New cell surface lectins with complex carbohydrate specificity. *Indian Journal of Experimental Biology.* 55: 514-522.
10. Singh, R.S., Walia, A.K., **Khattar, J.I.S.**, Singh, D.P. and Kennedy, J.F. (2017). Cyanobacterial lectins Characteristics and their role as antiviral agents. *Intr. J. Biological Macromolecules.* 102:475-496.
11. Kaushal, S., Singh, Y., **Khattar, J.I.S.** and Singh, D.P. (2017). Phycobiliprotein production by a novel cold desert cyanobacterium *Nodularia sphaerocarpa* PUPCCC 420.1. *J. Appl. Phycol.* [DOI: 10.1007/s10811-017-1093-7.](https://doi.org/10.1007/s10811-017-1093-7)
12. **Khattar, J.I.S.**, Singh, Y., Parveen, S. and Singh, D.P. (2017). Microalgal Biofuels: Flexible Bioenergies for Sustainable Development. In: *Biofuels: Production and Future Perspectives.* Singh, R.S., Pandey, A. and Gnansounou, E. (Eds). CRC Press, New York. 331-362.
13. **Khattar, J.I.S.**, Kaur, M. and Singh, D.P. (2016). Sulphide ameliorates thermal induced oxidative stress in a mesophilic cyanobacterium *Westiellopsis prolifica*. *J. Adv. Biol. Biotech.* 9(4): 1-12 [DOI: 10.9734/JABB/2016/27501](https://doi.org/10.9734/JABB/2016/27501)
14. Singh, D.P. and **Khattar J.I.S.** (2016). Impact of insecticides on cyanobacteria. *Seeweed Res. Utiln.* 38(1) 165-180.

15. Singh, D.P., **Khattar, J.I.S.**, Kaur, G. and Singh, Y. (2016). Toxicological impact of herbicides on cyanobacteria. *Ann. Res. Rev. Biol.* 9(4):1-39 [DOI: 10.9734/ARRB/2016/22614](https://doi.org/10.9734/ARRB/2016/22614)
16. Singh, D. P., **Khattar, J.I.S.**, Alka, Kaur, G. and Singh, Y. (2016). Toxicological effect of pretilachlor on some physiological processes of cyanobacterium *Synechocystis* sp. strain PUPCCC 64. *J. Appl. Biol. Biotech.* 4(01):012-019 [DOI: 10.7324/JABB.2016.40103](https://doi.org/10.7324/JABB.2016.40103)
17. **Khattar, J.I.S.**, Kaur, S., Kaushal, S., Singh, Y., Singh, D.P., Rana, S. and Gulati, A. (2015). Hyperproduction of phycobiliproteins by the cyanobacterium *Anabaena fertilissima* PUPCCC 410.5 under optimized culture conditions. *Algal Res.* 12:463-469.
18. Singh, D.P., **Khattar, J.I.S.**, Kaur, G., Gupta, M. and Singh, Y. (2015). Effect of pretilachlor on nitrogen uptake and assimilation by the cyanobacterium *Desmonostoc muscorum* PUPCCC 405.10. *Acta Physiol. Plant.* 37:177 [DOI 10.1007/s11738-015-1923-7](https://doi.org/10.1007/s11738-015-1923-7)
19. Shahnaz, P. **Khattar, J.I.S.** and Singh, D.P. (2015). The cyanobacterium *Synechocystis* sp. PUPCCC 62: a potential candidate for biotransformation of Cr (VI) to Cr (III) in the presence of sulphate. *Environ. Sci. Pollut. Res.* (22):10661-10668.
20. **Khattar, J.I.S.**, Shahnaz, P., Singh, D.P. and Gulati, A. (2015). Intracellular uptake and reduction of hexavalent chromium by the cyanobacterium *Synechocystis* sp. PUPCCC 62. *J. Appl. Phycol.* [DOI 10.1007/s10811-014-0374-7](https://doi.org/10.1007/s10811-014-0374-7)
21. Singh, H., **Khattar, J.I.S.** and Ahluwalia, A.S. (2014). Cyanobacteria and agriculture crops. *Vegetos* 27:37-44.
22. Singh, Y. **Khattar, J.I.S.**, Singh D.P. and Gulati, A. (2014). Limnology and cyanobacterial diversity of high altitude lakes of Lahaul-Spiti in Himachal Pradesh, India. *J. Biosci.* 39:643-657.
23. Choudhary, R., **Khattar, J.I.S.** and Singh, D.P. (2014). Microalgae as feedstock for biofuel: biomass yield, lipid content and fatty acid composition as selection criteria. *Internatl. J. Power Renew. Energ. Syst.* (1) : 62-71.
24. Singh, D.P., **Khattar, J.I.S.**, Gupta, M. and Kaur, G. (2014). Evaluation of toxicological impact of crtap hydrochloride on some physiological activities of a non-heterocystous cyanobacterium *Leptolyngbya foveolarum*. *Pestic. Biochem. Physiol.* 110:63-70. [DOI org/10.1016/j.pestbp.2014.03.002](https://doi.org/10.1016/j.pestbp.2014.03.002)



25. Singh, H., Ahluwalia, A.S. and Khattar, J.I.S. (2013). Induction of sporulation by selected carbon sources in *Anabaena naviculoides*, a diazotrophic strain capable of colonizing paddy fields of Punjab (India). *Phycos* 43(2): 18-25.
26. Singh, H., Ahluwalia, A.S. and **Khattar, J.I.S.** (2013) Induction of sporulation by different nitrogen sources in *Anabaena naviculoides*, a diazotrophic strain capable of colonizing paddy fields of Punjab, India. *Vegetos*. 26(1)283-292
27. Jindal, N., Singh, D.P. and **Khattar, J.I.S.** (2013). Optimization, characterization, and flow properties of exopolysaccharides produced by the cyanobacterium *Lyngbya stagnina*. *J. Basic Microbiol.* 53(11): 910-912. [DOI 10.1002/jobm.201200201](https://doi.org/10.1002/jobm.201200201)
28. Singh, D.P., **Khattar, J.I.S.**, Kaur, M., Kaur, G., Gupta, M. and Singh, Y. (2013). Anilofos tolerance and mineralization by the cyanobacterium *Synechocystis* sp. strain PUPCCC 64. *PLoS One* 8(1):e53445. [Doi:10.1371/journal.pone0053445](https://doi.org/10.1371/journal.pone0053445)
29. Singh, D.P., **Khattar, J.I.S.**, Kaur, K., Sandhu, B.S. and Singh, Y. (2012). Toxicological impacts of anilofos on some physiological processes of a rice field cyanobacterium *Anabaena torulosa*. *Toxicol. Environ. Chem.* 94(7):1304-1318. [DOI. Org/10.1080/02772248.2012.703203.](https://doi.org/10.1080/02772248.2012.703203)
30. Singh, D. P., **Khattar, J.I.S.**, Amita, Kaur, G. and Cheema, P. (2012). Toxicity of herbicides to diazotrophic cyanobacterium *Nostoc muscorum*. *J. Pb. Acad. Sci.* 9-10(1&2):67-71.
31. Singh, H., **Khattar, J.I.S.** and Ahluwalia, A.S. (2011). Cyanobacterial differentiation with special reference to akinetes. *J. Pb. Acad. Sc.* 7-8: 49-58.
32. Jindal, N., Singh, D.P. and **Khattar, J.I.S.** (2011). Kinetics and physico-chemical characterization of exopolysaccharides produced by the cyanobacterium *Oscillatoria formosa*. *World J Microbiol. Biotechnol.* 27: 2139-2146. [DOI 10.1007/s11274-011-0678-6](https://doi.org/10.1007/s11274-011-0678-6)
33. Singh, D.P., Khattar, J.I.S., Nadda, J., Singh, Y., Garg, N., and Gulati, A. (2011). Chlorpyrifos degradation by cyanobacterium *Synechocystis* sp. PUPCCC64. *Enviorn. Sci. Pollut. Res.* 18: 1351-1359.
34. **Khattar, J.I.S.**, Singh, D.P., Jindal, N., Kaur, N., Singh, Y., Rahi, P. and Gulati, A. (2010). Isolation and characterization of exopolysaccharides produced by the cyanobacterium *Limnothrix redekei* PUPCCC 116. *Appl. Biochem. Biotechnol.* 162:1327- 1338.

35. Jindal, N., Singh, D. P. and **Khattar, J.I.S.** (2010) Isolation and Screening of Exopolysaccharides Producing Strains of Cyanobacteria. *J. Pb. Acad. Sci.* 6-7: 52-58.
36. **Khattar, J.I.S.** and Shailza (2009) Optimization of copper removal by the cyanobacterium *Oscillatoria chlorina*. *J. Pb. Acad. Sci.* 5-6(1&2): 101-106.
37. Kaur, G., **Khattar, J.I.S.**, Singh, D.P., Singh, Y. and Nadda, J. (2009). Microalgae: A Source of Natural Colours. In : *Algal Biology and Biotechnology*. (J.I.S. Khattar, D.P. Singh and G. Kaur eds.), I.K. International Publishing House Pvt. Ltd., New Delhi. pp. 129-150.
38. Singh, D.P., **Khattar, J.I.S.** and Singh, Y. (2009). Effect of pesticides on the distribution pattern of cyanobacteria in a rice field ecosystem. *J. Indian Bot. Soc.* **88**: 163-169.
39. Singh, D.P., **J.I.S. Khattar**, G. Kaur & Y. Singh (2009). Cyanobacterial diversity in rice fields of Malwa region of Punjab and their tolerance to chlorpyrifos. *J. Pb. Acad. Sci.* 4 (1&2): 106-113.
40. **Khattar, J. I. S.** and Shailza (2009) Optimization of Cd<sup>2+</sup> removal by the cyanobacterium *Synechocystis pevalekii* using the response surface methodology. *Process Biochemistry* 44: 118-121.
41. **Khattar, J.I.S** and Jindal, N. (2008). Isolation and characterization of exopolysaccharides produced by the cyanobacterium *Phormidium valderianum*. *J. Biotechnol.* **113S** : S423- S424.
42. Ahuja, G., **Khattar, J.I.S.** and T.A. Sarma. (2008) Interaction between carbon and nitrogen metabolism during akinete development in the cyanobacterium *Anabaena torulosa*. *J. Basic Microbiol.* 48:125-129.
43. **Khattar, J.I.S.**, Sarma, T.A. & Sharma, A. (2007) Optimization of Chromium removal by the chromium resistant mutant of cyanobacterium *Anacystis nidulans* in a continuous flow bioreactor. *J. Chem. Technol. Biotechnol.* 82: 652-657.
44. Sarma, T.A., G. Ahuja & **J.I.S. Khattar** (2004). Nutrient stress causes akinete differentiation in cyanobacterium *Anabaena torulosa* with concomitant increase in nitrogen reserve substances. *Folia Microbiol.* 49: 557-562.

45. **Khattar, J.I.S.**, Sarma, T.A . & Sharma, A. (2004) Effect of Cr<sup>6+</sup> stress on photosynthetic pigments and certain physiological processes of *Anacystis nidulans* and its chromium resistant strain. *J. Microbiol. Biotechnol.* 1211-1216.
46. **Khattar, J.I.S.**, Sarma, T.A. & Sharma, A. (2004). Criteria for determining resistance of the cyanobacterium *Anacystis nidulans* and its mutants towards nickel. In: *Plant Diversity in India*. J.S. Dargan & T.A. Sarma (eds). Bishen Singh Mahendrapal Singh Publishers, Dehra Dun pp. 361-369.
47. **Khattar, J.I.S.**, Singh, D.P. & Sarma, T. A. (2002) Characterization and optimization of chromium uptake by alginate cells of *Anacystis nidulans* in a continuous flow bioreactor. In : *Biotechnology in Agriculture and Environment* . S.S Marwaha and Rajesh Grover (Eds) Asia Tech. Publishers, New Delhi. pp.182-189.
48. **Khattar, J.I.S.**, Sarma, T.A., Singh, D.P. & Sharma,A. (2002). Bioaccumulation of chromium ions by immobilized cells of a filamentous cyanobacterium *Anabaena variabilis*. *J. Microbiol. Biotechnol.* 12: 137-141.
49. Sarma , T.A., Ahuja, G. and Khattar, J.I.S. (2000) Effect of nutrients and aeration on O<sub>2</sub> evolution and photosynthetic pigments of *Anabaena torulosa* during akinete differentiation. *Folia Microbiol.* 45: 434-438.
50. **Khattar, J.I.S.**, Sarma , T.A. & Singh, D.P. (1999). Removal of chromium ions by agar immobilized cells of the cyanobacterium *Anacystis nidulans* in a continuous flow bioreactor. *Enz. Microbial Technol.* 25 : 564-568.
51. Sarma, T.A., **Khattar, J.I.S.**, Gurpreet Ahuja & Veena Saini (1998). Influence of aeration and nutrients on akinete differentiation in the cyanobacterium *Anabaena torulosa* . In : *Cyanobacterial Biotechnology*. G. Subramanian, B.D. Kaushik and G.S. Venkataraman (eds.) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. pp 99-102.
52. **Khattar, J.I.S.** and Sarma, T.A. (1996) Nitrate utilization and sporulation in *Anabaena torulosa* in the presence and absence of inhibitors. In : *Current Researches in Plant Sciences*. Vol II. T.A. Sarma, S. S. Saini, M.L. Trivedi and M. Sharma (eds.). Bishen Singh Mahendra Pal Singh Publisher, Dehra Deun. pp. 29-34.
53. Sarma, T.A. and **Khattar, J.I.S.** (1994). Glucose-6-phosphate dehydrogenase (G6PDH) activity in *Anabaena torulosa* in relation to sporulation. In: *Recent advances in Phycology*. A.K.Kashyap and H.D. Kumar (eds). Rastogi Publishers, Meerut. pp. 107- 112.

54. Sarma, T.A. and **Khattar, J.I.S.** (1994). Photoheterotrophic and chemoheterotrophic nitrogen fixation and nitrate utilization by the cyanobacterium *Anabaena torulosa*. *Folia Microbiol.* 39: 404-408.
55. Sarma, T.A. and **Khattar, J.I.S.** (1993). Akinete differentiation in phototrophic, photoheterotrophic and chemoheterotrophic conditions in *Anabaena torulosa*. *Folia Microbiol.* 38: 335-340.
56. Sarma, T.A. and **Khattar, J.I.S.** (1992). Phosphorus deficiency, nitrogen assimilation and akinete differentiation in the cyanobacterium *Anabaena torulosa*. *Folia Microbiol.* 37 :223-226.
57. Sarma, T.A. and **Khattar, J.I.S.** (1986). Accumulation of reserve products during sporulation in the cyanobacterium *Anabaena torulosa* under photoheterotrophic and heterotrophic conditions. *Biochem. Physiol. Pflanz.* 181:541-549.
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#### NCBI submissions:

List of Accession number obtained from NCBI GenBank

Organism	Accession number		
	16S rRNA gene	<i>rbcL</i> gene	PC-IGS
<i>Cyanobium parvum</i> PUPCCC 007.1	KJ705090	KM377021	KM377069
<i>Synechococcus elongatus</i> PUPCCC 010.5	KM376977	KM376999	KM377059
<i>Synechocystis pevalekii</i> PUPCCC 062.1	KM384741	KM377022	KM377070
<i>Synechocystis</i> sp. PUPCCC 62	KF475890	-	KF573457
<i>Synechocystis</i> sp. PUPCCC 64	GQ907237	-	-
<i>Gloeocapsa gelatinosa</i> PUPCCC 009.2	KM376978	KM377000	KM377060
<i>Gloeocapsopsis pleurocapsoides</i> PUPCCC 008.2	KJ705091	KM377023	KM377071
<i>Gloeocapsopsis thermalis</i> PUPCCC 008.4	KM376979	KM377001	KM377061
<i>Chroococciopsis cubana</i> PUPCCC 005.5	KM384742	KM377024	KM377072
<i>Pseudanabaena limnetica</i> PUPCCC 106.2	KM376978	KM377002	-
<i>Pseudanabaena thermalis</i> PUPCCC 106.4	KM376979	KM377003	-
<i>Pseudanabaena</i> sp. PUPCCC 106.7	KJ705103	KM377025	-
<i>Geitlerinema sulphureum</i> PUPCCC 110.2	KM376980	KM377004	-
<i>Limnothrix redekei</i> PUPCCC 116	GU552680	-	-
<i>Limnothrix redekei</i> PUPCCC 116.2	KJ705099	KM377026	-

<i>Geitlerinema acutissimum</i> PUPCCC 110.4	KJ705093	KM377027	-
<i>Leptolyngbya antarctica</i> PUPCCC 112.2	KJ705094	KM377028	-
<i>Leptolyngbya benthonica</i> PUPCCC 112.5	KM384743	KM377029	-
<i>Leptolyngbya carnea</i> PUPCCC 112.15	KM376981	KM377005	-
<i>Leptolyngbya cebennensis</i> PUPCCC 112.4	KM384744	KM377030	-
<i>Leptolyngbya copelandii</i> PUPCCC 112.16	KM376982	KM377006	-
<i>Leptolyngbya foveolarum</i> PUPCCC 112.8	KJ705095	KM377031	-
<i>Leptolyngbya frigida</i> PUPCCC 112.1	KJ705096	KM377032	-
<i>Leptolyngbya gelatinosa</i> PUPCCC 112.19	KM376983	KM377007	-
<i>Leptolyngbya laminosa</i> PUPCCC 112.17	KM376984	KM377008	-
<i>Leptolyngbya lurida</i> PUPCCC 112.6	KJ705097	KM377033	-
<i>Leptolyngbya orientalis</i> PUPCCC 112.18	KM376985	KM377009	-
<i>Leptolyngbya ramosa</i> PUPCCC 112.21	KM376986	KM377010	-
<i>Leptolyngbya subtilis</i> PUPCCC 112.12	KM384745	KM377034	-
<i>Leptolyngbya subtruncata</i> PUPCCC 112.10	KM384746	KM377035	-
<i>Leptolyngbya thermarum</i> PUPCCC 112.23	KM376987	KM377011	-
<i>Leptolyngbya thermobia</i> PUPCCC 112.20	KM376988	KM377012	-
<i>Leptolyngbya</i> sp. PUPCCC 112.7	KJ705098	KM377036	-
<i>Leptolyngbya</i> sp. PUPCCC 112.9	KM384747	KM377037	-
<i>Leptolyngbya</i> sp. PUPCCC 112.11	KM384748	KM377038	-
<i>Leptolyngbya</i> sp. PUPCCC 112.22	KM376989	KM377013	-
<i>Nodosilinea epilithica</i> PUPCCC 111.2	KM384749	KM377039	KM377073
<i>Planktothrix clathrata</i> PUPCCC 108.8	KM384750	KM377040	KM377074
<i>Planktothrix</i> sp. PUPCCC 108.5	KJ705102	KM377041	KM377075
<i>Planktothrix</i> sp. PUPCCC 108.6	KM384751	KM377042	KM377076
<i>Phormidium ambiguum</i> PUPCCC 118.1	KM376990	KM377014	KM377062
<i>Phormidium autumnale</i> PUPCCC 118.4	KM384752	KM377043	KM377077
<i>Phormidium chalybeum</i> PUPCCC 118.8	KM384753	KM377044	KM377078
<i>Phormidium</i> sp. PUPCCC 118.3	KM376991	KM377015	KM377063
<i>Phormidium</i> sp. PUPCCC 118.2	KM376992	KM377016	KM377064
<i>Microcoleus acremanii</i> PUPCCC 120.2	KM384754	KM377045	KM377079
<i>Microcoleus vaginatus</i> PUPCCC 120.5	KM384755	KM377046	KM377080
<i>Anabaena fertilissima</i> PUPCCC 410.5	KT270438	-	KT270439
<i>Anabaena variabilis</i> PUPCCC 410.2	KM384756	KM377047	KM377081
<i>Desmonostoc muscorum</i> PUPCCC 405.10	KM 225636	KM 225637	-
<i>Nodularia sphaerocarpa</i> PUPCCC 420.1	KM384757	KM377048	KM377082
<i>Nodularia spumigena</i> PUPCCC 420.5	KJ705107	KM377049	KM377083
<i>Nostoc commune</i> PUPCCC 405.1	KM384758	KM377050	KM377084
<i>Nostoc muscorum</i> PUPCCC 405.4	KM384759	KM377051	KM377085

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<i>Nostoc</i> sp. PUPCCC 405.2	KJ705104	KM377052	KM377086
<i>Nostoc</i> sp. PUPCCC 405.3	KM384760	KM377053	KM377087
<i>Nostoc</i> sp. PUPCCC 405.6	KJ705105	KM377054	KM377088
<i>Nostoc</i> sp. PUPCCC 405.7	KM384761	KM377055	KM377089
<i>Nostoc</i> sp. PUPCCC 405.8	KJ705106	KM377056	KM377090
<i>Nostoc</i> sp. PUPCCC 405.9	KM384762	KM377057	KM377091
<i>Tolypothrix</i> sp. PUPCCC 415.2	KM384763	KM377058	KM377092
<i>Microcoleus chthonoplastes</i> PUPCCC 120.4	KM376993	KM377017	KM377065
<i>Chlorogloeopsis fritschii</i> PUPCCC 505.4	KM376994	KM377018	KM377066
<i>Fischerella thermalis</i> PUPCCC 510.2	KM376995	KM377019	KM377067
<i>Mastigocladus laminosus</i> PUPCCC 515.6	KM376996	KM377020	KM377068
<i>Nostoc</i> sp. PAN 549	KF 921498		

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