CONCLUSIONS
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The results of the studies done exclusively on Nostoc muscorum and described in this thesis led to the following conclusions:

1. Mutational analysis of the genetic determinants mediating NH$_4^+$-transport activity, heterocyst differentiation, nitrogenase activity and heterocyst pattern formation was carried out in Nostoc muscorum. Evidence suggested the operation of three separate genetic determinants in such nitrogen control.
   (a) One mediating NH$_4^+$-repression control on both heterocyst formation and NH$_4^+$-transport activity.
   (b) A second (Nif -R) mediating NH$_4^+$-repression control on nitrogenase synthesis/activity.
   (c) A third (Pat-R) essential for intercalary heterocyst formation/distribution.

2. Ammonia itself functioned as repressor signal of heterocyst formation and nitrogenase synthesis/activity and the glutamine synthetase enzyme played no role in the repression/derepression control of heterocyst development and functional nitrogen formation.

3. Spontaneous cyanobacterial mutants resistant to growth toxic effects of alkali metals (Li$^+$, Na$^+$ and Rb$^+$) and alkaline pH (pH 11.0) show an enhanced H$^+$-gradient dependent multiple alkali cation efflux system and are found sensitive to sucrose-induced osmotic stress.

4. The cyanobacterium Nostoc muscorum show a definite requirement for Na$^+$ and K$^+$/Rb$^+$ for optimal growth under diazotrophic growth conditions.

5. The multiple alkali metal resistant nature of the Li$^+$-R, Na$^+$-R, Rb$^+$-R, and pH 11.0-R mutant strains clearly suggest the occurrence of a common physiological mechanism for adaptation to alkali metal stress in Nostoc muscorum.
6. pH 11.0-R mutant and the Li⁺-R, Na⁺-R and Rb⁺-R mutants exhibit cross-tolerance indicate the existence of a role of H⁺-gradient dependent multiple alkali cation specific efflux system functioning in adaptation of the cyanobacterium to both alkali metal induced stress and alkaline pH induced stress.

7. Cs⁺ is transported into Nostoc muscorum by a NH₄⁺ repressible/derepressible NH₄⁺ transport system.

8. There is a definite specific role of ammonium-repressible/derepressible ammonium transport system of the cyanobacterium in caesium uptake, accumulation and toxicity.

9. Cs⁺ uptake and toxicity is diazotrophic specific and NH₄⁺-repressible.

10. Nostoc muscorum can acquire resistance against diazotrophically associated caesium toxicity when supplied with ammonium as a nitrogen source.

11. In addition, alternatively, a mutant strain was Cs⁺-resistant in the absence of any effect on NH₄⁺ transport, suggesting that Cs⁺ resistance may be determined at more than one cellular site.

12. Mutation to caesium resistance phenotype (Cs⁺-R) results in physiological pleitropy, manifest in the form of impaired diazotrophic growth, oxygenic photosynthesis, chlorophyll - a content, nitrogenase activity and osmotolerance.

13. Cs⁺-R mutant is a pleiotropic mutant and its apparent resistance to Cs⁺ is because of the requirement of this cation for its normal diazotrophy.

14. Cs⁺/Rb⁺ alone is found capable of restoring fully the physiological pleiotropy of the Cs⁺-R mutant strain to its normal level.