

Title of the thesis: CHLORINATED PESTICIDES STRESS RESPONSES IN CYANOBACTERIA

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ABSTRACT

Pesticides and chemical fertilizers are necessary for food productivity, but they have side effects to the target as well as non target organism due to their bioaccumulation and biomagnifications in the ecosystem. There is an urgent need to find out toxic responses of the pesticides on the non target organism in order to find out strategies for their detoxification that is very necessary for making biofertilizer strains to be resistant enough to pesticide to N₂ fixation. Cyanobacteria are the cosmopolitan photosynthetic organisms that are used as biofertilizers in paddy fields. Cyanobacteria compensate for the need of chemical fertilizers as well as biotransformation of the pesticides.

In present study N₂ fixing heterocystous *Nostoc muscorum*, *Anabaena variabilis* and *Aulosira fertilissima* cyanobacteria of order Nostocales, family Nostocaceae are being used and the findings are as follow:-

Growth behaviour of cyanobacteria in presence of endosulfan: They showed varying toxicity to the selected cyanobacterial strains. It was found that extent of toxicity on growth increased with increasing concentration of the pesticide. The order of toxicity of the test organisms was *Aulosira fertilissima* > *Anabaena variabilis* > *Nostoc muscorum*. These findings were supported by changes in biomass and chlorophyll content.

Effect of endosulfan on cyanobacterial biochemical constituents:

- i. Chlorophyll contents at different pesticide concentrations in studied strains were almost same. Their maximum amounts found in presence of 2.5 µg/ml endosulfan. But beyond this chlorophyll amount decreased gradually with increasing pesticide concentrations.

- ii. Carotenoid and phycobiliprotein contents increase was more noticeable in *Aulosira fertilissima*. Maximum phycobiliprotein was detected in *Aulosira fertilissima* in 5 µg/ml endosulfan.
- iii. The carbohydrate content was more than control till 5 µg/ml endosulfan exposures in *Nostoc muscorum*, *Anabaena variabilis* while upto 7.5 µg/ml endosulfan in *Aulosira fertilissima*, but there after it decreased gradually due to damaging effect of pigments contents.
- iv. The total protein contents were more than control till 7.5 µg/ml pesticide concentrations in all test strains. The maximum protein enhancement was observed in *Aulosira fertilissima* (43%) at 7.5 µg/ml pesticide concentration.
- v. The proline content increased significantly till 2.5µg/ml endosulfan then it started to decline. The praline was more than control even in last tested pesticide concentration suggesting their role in pesticide tolerance.
- vi. Malondialdehyde (MDA) content increased with increasing concentrations of pesticide 6.4
- vii. Antioxidant enzymes like SOD, APX and CAT produced under stress condition
- viii. The protein profile of control and endosulfan (5µg/ml, 10 µg/ml) stressed samples of cyanobacteria have not shown any significance change. Few low molecular weight bands was produced under stress condition.

Degradation of endosulfan by test strains analyzed by HPLC

Endosulfan exposed culture of test strains showed very short peaks having retention time of 23.66-25.61 min, 23.40-25.61 min, 23.09-25.43 min observed in *N. muscorum*, *A.variabilis*, and *A. fertilissima* respectively indicating their endosulfan degradation potential of endosulfan was also observed with passage of time its peak was less than endosulfan inocubated with cyanobacterial strains