

Impact of fungicide Mancozeb on the chlorophyll content of two blue-green algae collected from Gogabil Lake of Katihar district

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ABSTRACT

Fungicides are used in agriculture system to control fungal pathogen. A part of fungicide runs off in water resources which became toxic to aquatic animals. Some blue-green algae are capable to absorb fungicides. In the present study, effect of a fungicide was tested on two blue-green algae, *Oscillatoria tenuis* and *Anabaena circinalis*. Lower concentration of fungicide enhances the growth of both algae. At a concentration of 30mg/l of fungicide, chlorophyll content of *Oscillatoria tenuis* and *Anabaena circinalis* increased by 7.327% and 3.563% respectively but in higher concentration growth decreased. In 100mg/l concentration of Mancozeb chlorophyll content in *Oscillatoria tenuis* was observed as 0.43µg/ml and in *Anabaena* 0.21µg/ml while in control chlorophyll content was observed as 16.65µg/ml in *Oscillatoria* and 13.47µg/ml in *Anabaena*.

Key Words - Fungicide, Mancozeb, Chlorophyll, Blue green algae, Gogabil Lake

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INTRODUCTION

Blue-green algae are prokaryotic photosynthetic microorganism inhabiting in fresh water, marine water and on exposed surface of building. Heterocyst as blue-green algae like *Nostoc*, *Anabaena*, *Rivularia*, *Calothrix*, etc. play an important role of nitrogen fixation and hence used as biofertilizer. Application of blue-green algae in paddy field as biofertilizer is an old practice (De P.K., 1939; Relwani L.L. 1963).

Application of fungicides, insecticides, pesticides and herbicides in agriculture system is a common practice. A part of these agrochemicals remain within the soil and run off in surroundings water reservoirs which adversely affect aquatic organisms including blue-green algae. Singh *et al.*, (1979) reported that the recommended dose of Butachlor (herbicide) is toxic to blue-green algae *Anabaena doliolum*, *Nostoc muscorum* and *Aphanothece*

stagnina. Gangawane and Saler (1979) investigated effect of fungicides Difolatum, Methyl Benzi midazole carbonate, Brassicol and Hexacop on blue-green algae *Calothrix*, *tolypothrix*, *Aulosira* and *Nostoc*. Sahu *et al.*, (1992) reported toxic effect of endosulfan on several blue-green algae. Venkataraman and Rajya Laxmi (1971) investigated the effect of 2, 4-D on some blue green algae. They observed that application of 2,4-D at a concentration of 200kg/ha do not affect the growth of *Aulosira ferlilissima*.

MATERIAL & METHODS

Oscillatoria tenuis and *Anabaena circinalis* were isolated from Gogabil lake of Katihar district. Both alga were cultured in BBM medium, Chu-10 medium and BG-11 medium. Axenic culture of both algae was prepared by sub-culturing in same medium supplemented with 50mg/l cyclohexamide and

antibiotic Amoxicillin to eliminate eukaryotes and bacterial contamination. Bacterial contamination was further tested on nutrient medium.

Test for the effect of Mancozeb:

To assess the effect of Mancozeb on both algae it was supplemented in fresh medium at a concentration of 20mg/l, 30mg/l, 40mg/l, 50mg/l and 60mg/l. Axenic culture of each alga was inoculated in each concentration and in fresh medium without Mancozeb. Medium without Mancozeb was considered as control. All cultures were incubated at 25±2°C under 600 lux light intensity for 20 days.

Chlorophyll extraction: Test alga was harvested from one ml of each culture and centrifuged at 15000xg for 7 minutes. Supernatant was discarded and pellets were collected. Centrifugation was repeated three times. Collected pellets were dissolved in 1ml of pre-cooled (4°C) methanol. It was then homogenized by mixing and incubated at 4°C for 20 minutes. Incubated material was centrifuged at 1500xg and filtered through Whatman filter paper no. 1. OD of filtrate was taken at 720nm and 665nm. Chlorophyll (a) was calculated by the formula:

$$Chl (a) = (A_{665} - A_{720}) \times 13.9$$

RESULT & DISCUSSION

Effect of a fungicide Mancozeb was tested on two blue-green algae, *Oscillatoria tenuis* and *Anabaena circinalis*. Both algae were cultured in BBM medium, CHU-10 medium and BG-11 medium. Best growth of both algae was observed in BBM medium. The fungicide Mancozeb showed inhibitory effect on chlorophyll content of both test algae *Oscillatoria tenuis* and *Anabaena circinalis*. Low concentration of fungicide enhanced the chlorophyll content in both algae i.e. increased the photosynthesis and there by increased growth of both algae up to concentration of 30mg/l but higher concentration of fungicide showed adverse effect. Prasad A.B. *et al.*, (1986) and Prasad S.M. *et al.*, (2005) also reported adverse effect of mercury fungicide and endosulfan on chlorophyll content of cyanobacteria. Increase in chlorophyll in low

concentration of pesticides was also reported by Anand *et al.*, (1997), Goyal S.K. (1989) and Panigrahi *et al.*, (2003). In the present study, it was observed that chlorophyll content in *Oscillatoria* increased by 7.327% and chlorophyll content of *Anabaena* increased by 3.563% in a concentration of 30mg/l of Mancozeb. Megharaj *et al.*, (1989) studied the effect of carbofuran on cyanobacteria and observed increase in chlorophyll content at low concentration similarly Jha *et al.*, (2005) observed the effect of insecticides on cyanobacteria and found that low concentration of insecticides enhance chlorophyll content in cyanobacteria. Cyanobacteria metabolize pesticides at low concentration. Increase in chlorophyll content of cyanobacteria at low concentration may be due to metabolization of pesticides. In 60mg/l concentration of Mancozeb chlorophyll content of both algae become about 50% less than control. In 100mg/l concentration of Mancozeb chlorophyll content in *Oscillatoria tenuis* was observed as 0.43µg/ml and in *Anabaena* 0.21µg/ml while in control chlorophyll content was observed as 16.65µg/ml in *Oscillatoria* and 13.47µg/ml in *Anabaena*.

Table 1: Effect of Mancozeb concentration on chlorophyll content of *Oscillatoria* and *Anabaena*

Concentration of Mancozeb	Chlorophyll content (µg/ml)	
	<i>Oscillatoria</i>	<i>Anabaena</i>
20mg/l	17.53	13.84
30mg/l	17.87	13.95
40mg/l	15.36	12.23
50mg/l	12.14	10.53
60mg/l	8.45	6.32
70mg/l	5.25	4.27
80mg/l	3.78	2.57
90mg/l	1.31	1.12
100mg/l	0.43	0.21
Control	16.65	13.47

CONCLUSION

In the present study, effect of a fungicide Mancozeb was tested on two blue-green algae, *Oscillatoria tenuis* and *Anabaena circinalis*. Both algae were cultured in three different media, BBM medium, CHU-10 medium and BG11 medium. Maximum

growth of both algae was observed in BBM medium. Growth was measured on the basis of chlorophyll content. In low concentration of Mancozeb, growth of both algae increases. In a concentration of 30mg/l of Mancozeb, growth of *Oscillatoria tenuis* increased by 7.32% and growth of *Anabaena circinalis* increased by 3.563%. In higher concentration of fungicide growth gradually decreased in both algae. The chlorophyll content in *Oscillatoria tenuis* and *Anabaena circinalis* was recorded as 8.45µg/l and 6.32µg/l in 60mg/l Mancozeb concentration respectively which is about 50% in comparison to control (16.65µg/ml) in *Oscillatoria tenuis* and 13.47µg/ml in *Anabaena circinalis*. In 100mg/l concentration of Mancozeb chlorophyll content in *Oscillatoria tenuis* was observed as 0.43µg/ml and in *Anabaena* 0.21µg/ml while in control chlorophyll content was observed as 16.65µg/ml in *Oscillatoria* and 13.47µg/ml in *Anabaena*.

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