

Saline Stress induced reduction in RNA and DNA content of *Oscillatoria willei*

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ABSTRACT

This study aims to assess the effect of NaCl on the RNA and DNA content of *Oscillatoria willei*. Therefore to know the impact of NaCl, *Oscillatoria willei* was treated with different concentrations of NaCl viz., 0.2, 0.4, 0.6 and 0.8M besides control over 10, 20 and 30 days. The results revealed decrease in RNA contents and DNA contents with increased NaCl concentrations for all the cultures. It was speculated that the reduced RNA and DNA contents under NaCl stress may be due to interference of high NaCl concentrations with the **activity** of the enzymes, leading to reduced transcription and replication.

Keywords : *Oscillatoria willei*, RNA, DNA, Saline Stress

INTRODUCTION

Microalgae are found in a wide range of habitats and they are photosynthetic unicellular organisms. Saline stress is one of the major environmental factors affecting growth and development of microalgae. Salt stress influences microbial life, particularly in aquatic ecosystems where fluctuations in salinity are common. Salinity stress leads to series of changes in basic biosynthetic functions, including photosynthesis, photorespiration and amino acid synthesis in plants (Kawasaki et al., 2001; Ozturk et al., 2002; Seki et al., 2002) *Oscillatoria willei*, a species of cyanobacterium, can tolerate a range of saline conditions. This ability to thrive under saline stress makes it ideal for studying the molecular responses of *Oscillatoria* to increased salinity, particularly in relation to nucleic acid metabolism. Nucleic acids, including DNA and RNA, are essential for the proper functioning and survival of all organisms, and their stability and synthesis are particularly vulnerable to environmental stresses like high salinity. Earlier studies showed that the protein and nucleic acid synthesis sites were most inhibited under chloride salinity (MOROZOVSKII &

KABANOV 1968). Hence in the present study an attempt has been made to know the impact of saline stress on RNA and DNA contents of *Oscillatoria willei*.

MATERIALS AND METHODS

The organism used in the present study i.e., *Oscillatoria willei* BDU 141621 was obtained from National Facility for Marine Cyanobacteria (NPMC) Tiruchirapalli. ASN III medium (Rippka et al., 1979) at pH 7.5 was best suitable for the growth of the alga in the laboratory. Axenic cultures were maintained at temperature of 26±20 C. Further to study the impact of NaCl the experiments were carried out in 250 ml conical flasks, contained 100 ml of ASN III medium. The cultures were treated with different concentrations of NaCl such as 0.2, 0.4, 0.6 and 0.8M besides control. The samples were drawn periodically during growth (10th, 20th and 30th day) from control and different concentrations of NaCl were subjected for the analysis of RNA and DNA. The estimation of RNA was made by orcinol method as described by Plummer (1985). The estimation of DNA was made by

diphenylamine method as described by Plummer (1985).

RESULTS

The alga *O. willei* treated with different concentrations of NaCl viz., 0.2, 0.4, 0.6 and 0.8 M over 10, 20 and 30 days showed significant decline in RNA content at 0.8 M with minimum of 0.212, 0.315 and 0.353 $\mu\text{g}/\text{mg}$ for all the cultures (Table 1 & Fig1). Similarly DNA content also found to be reduced with minimum of 0.0180, 0.0267 and 0.0343 $\mu\text{g}/\text{mg}$ at 0.8 M for all the cultures (Table 2 & Fig2).

DISCUSSION

The present study on RNA and DNA contents of the alga treated with different concentrations of NaCl, revealed decrease in the both RNA and DNA content at lower as well as higher concentrations of NaCl over

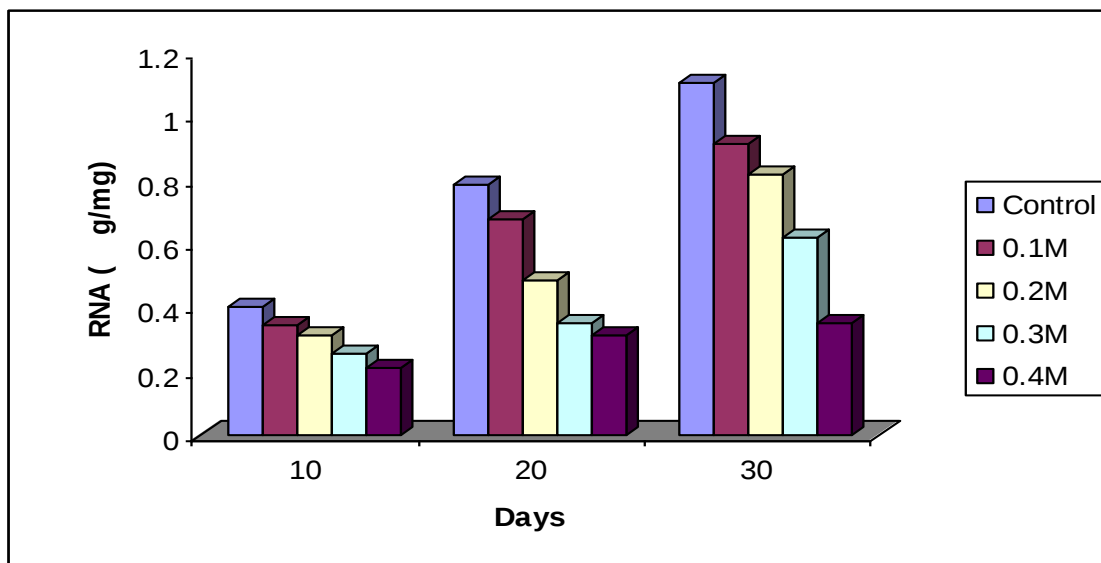
all durations. Previous studies suggested that the sites most inhibited under chloride salinity would be protein and nucleic acid synthesis (Morozovskii and Kabanov, 1968). According to Bollum (1960) DNA polymerase will not work in NaCl concentrations above 100 mM. Bernstein *et al.* (1953) indicated that the physical state of DNA-protein has been shown to be sensitive to salt concentration. Similarly, Hagemann *et al.* (1994) observed decrease in the RNA and DNA content with increase in the NaCl concentrations.

CONCLUSION

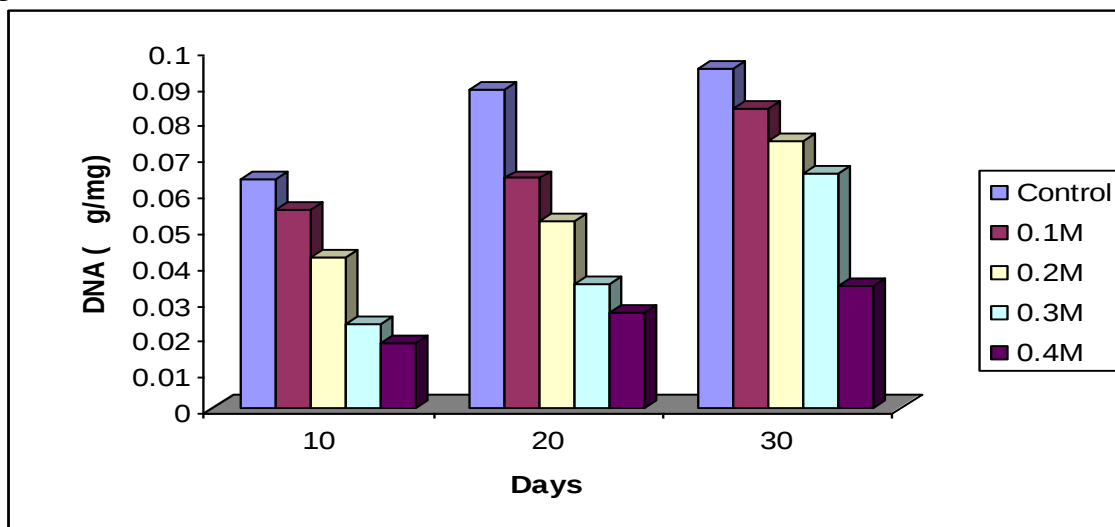
The present work exhibited decrease in the RNA and DNA content in the alga which may be attributed to interference of high NaCl concentrations with the **activity** of the enzymes, leading to reduced transcription and replication.

Table-1: Effect of different concentrations of NaCl on RNA contents of *Oscillatoria willei*

NaCl con. (M)	RNA contents ($\mu\text{g}/\text{mg}$)		
	10 days	20 days	30 days
Control	0.404 $\pm$ 0.02	0.783 $\pm$ 0.03	1.105 $\pm$ 0.06
0.2	0.344 $\pm$ 0.05	0.678 $\pm$ 0.08	0.914 $\pm$ 0.04
0.4	0.314 $\pm$ 0.06	0.485 $\pm$ 0.03	0.816 $\pm$ 0.07
0.6	0.255 $\pm$ 0.02	0.353 $\pm$ 0.00	0.619 $\pm$ 0.08
0.8	0.212 $\pm$ 0.05	0.315 $\pm$ 0.06	0.353 $\pm$ 0.07

Fig-1: Effect of different concentrations of NaCl on RNA contents of *Oscillatoria willei**Oscillatoria willei*Table-2: Effect of different concentrations of NaCl on DNA contents of *Oscillatoria willei*

NaCl con. (M)	DNA ($\mu\text{g}/\text{mg}$)		
	10 days	20 days	30 days
Control	0.0637 ± 0.006	0.0887 ± 0.007	0.0947 ± 0.006
0.2	0.0553 ± 0.002	0.0641 ± 0.001	0.0833 ± 0.004
0.4	0.0421 ± 0.001	0.0522 ± 0.009	0.0743 ± 0.006
0.6	0.0232 ± 0.000	0.0347 ± 0.002	0.0652 ± 0.002
0.8	0.0180 ± 0.002	0.0267 ± 0.003	0.0343 ± 0.006

Fig-2: Effect of different concentrations of NaCl on DNA contents of *Oscillatoria willei**Oscillatoria willei*

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