



EFFECT OF ROGOR AND ENDOTAF PESTICIDES ON TOTAL NITROGEN FIXATION OF *NOSTOC PUNCTIFORME*: A QUANTITATIVE STUDY

G. S. Shinde

K.J. Somaiya College of Arts, Commerce and Science, Kopergaon- 423601 (M.S.), India.
gsshindebhumi@gmail.com

Abstract:

The effect of commonly used pesticides organophosphate, Rogor and organochlorine, Endotaf Pesticides was observed on total nitrogen content of *Nostoc punctiforme* in the nitrogen free BG-11 medium with 2.5, 5, 10, 20, 50, 100, 250 and 500 ppm concentrations of each pesticide. In the laboratory cultures, after 28 days of harvesting total nitrogen fixed by the *Nostoc punctiforme* species was estimated by conventional Micro- kjeldahl method at each concentration of both the pesticides. The pragmatic results revealed that, the organophosphate, Rogor was comparatively less toxic than organochlorine, Endotaf pesticide to the *Nostoc punctiforme*. Further, a progressive decline in the total nitrogen content of the was occurred with increasing concentrations of both the pesticides. Endotaf was found to be highly toxic than the Rogor to the tested *Nostoc punctiforme*. Further it was concluded that at the recommended doses of field application, Rogor and Endotaf had no deleterious effect on nitrogen fixation of *Nostoc punctiforme*.

Keywords: *Nostoc punctiforme*, Rogor and Endotaf, Total Nitrogen fixation.

Introduction

Blue-green are unique in reducing the atmospheric nitrogen by the process “Biological nitrogen fixation” (Tiwari *et al.*, 2001). The cyanobacteria contain nitrogenase and fix atmospheric nitrogen for which these are used as biofertilizer to maintain and improve soil status (Ahmed, 2001). It has been reported that the part of nitrogen requirements for the crops (25- 35 %) could be met by algalisation under different agroclimatic conditions (Ghose and Saha, 1997; Rai *et al.*, 2000). Reduction of chemical fertilizers input upto 30% by supplementing with blue-green algae as a significant finding when conservation of energy is contemplated (Venkataraman, 1978; Roger and Kulasoorya, 1980). One of the problem that has been noticed under field conditions is the destruction of blue-green algal populations by pesticide application intended to control the insects and pests of the various agricultural crops (Venkataraman, 1972; Kannaiyan, 1978). These agrochemicals also damage wide variety of beneficial microorganisms because of their long persistence in the environment (Padhy, 1985). The present data suggest that cyanobacterial forms used in biofertilizers are capable of tolerating pesticide levels recommended for field applications. Therefore, by considering all these issues along with societal responsibilities, the present investigation was carried out to study the effect of pesticides on the total nitrogen fixation of blue-green alga *Nostoc punctiforme* isolated from soil of agro-practices areas of Kopergaon, Ahmednagar district.

Materials and Methods

Pesticides used

In the present work effect of commonly used pesticides Rogor (dimethoate, 30%) and Endotaf (endosulfan, 35%) belonging to organophosphate and organochlorine group, on the total nitrogen fixation of soil blue-green alga *Nostoc punctiforme* was studied. These pesticides are generally used to control sucking, lepidopterous and nematode pests and mites that occurred in maize, wheat, sugarcane, cotton, onion, vegetable and oil yielding crops of this region.

The organophosphate, Rogor is used as contact and stomach action pre- emergence systemic pesticides that make disturbance in the cholin esterase reversible activity, while organochlorine, Endotaf attacks on central nervous system and make interference in α -amino butyric acid receptor activity of the pest. The pesticide application rates recommended to control various crop pests of this region are 0.5 and 0.7 liter/ha for endosulfan (Endotaf) and domethoate (Rogor), respectively which will provide a range of 5- 10 ppm in the agricultural crop field.

Total nitrogen fixation

The effect of commonly used pesticides viz. Rogor and Endotaf was studied on total nitrogen fixation of *Nostoc punctiforme* in experiments with 2.5, 5, 10, 20, 50, 100, 250 and 500 ppm concentrations of each pesticide in the 50 ml of nitrogen free BG- 11 medium. Total nitrogen fixed by the tested alga after 28 days at each concentration of the used pesticides was estimated by conventional Micro- kjeldahl method (Jackson, 1958) in the laboratory

cultures. Experiments were conducted by inoculating equal amounts of actively growing unialgal isolates into cotton stoppered conical flasks.

Results and Discussion:

The results obtained during the present research investigation are depicted in the Table- 1, Graph and was proved statistically (Table- 1a and 1b).

In laboratory cultures, the pragmatic results indicates a progressive decrease in the total nitrogen fixation of tested blue-green alga *Nostoc punctiforme* with increasing concentrations of the Rogor and Endotaf pesticides. However, total nitrogen fixation of *Nostoc punctiforme* was also increased at the lower doses of pesticides viz. 5 ppm organophosphate, Rogor and 2.5 ppm of organochlorine, Endotaf. While in the presence of 10 ppm dose level of Rogor, total nitrogen content was consistently decreased with the increasing concentrations of pesticides upto 250 ppm where 88.6% reduction in nitrogen fixation was recorded over the control in *Nostoc punctiforme*. Concurrently with Endotaf at 5 ppm concentration, progressive decline in nitrogen fixation occurred upto 100 ppm concentration where decrease in total nitrogen content was observed by 85.4% in *Nostoc punctiforme* than the control. Further increase in dose level (i.e. above 100 ppm) of both the pesticides resulted into ending of growth and nitrogen fixation in the tested species *Nostoc punctiforme*. The data presented in tables was proved statistically (Table- 1a and 1b).

Among the Rogor and Endotaf pesticide treatments, Endotaf was found to be highly toxic to *Nostoc punctiforme*. The reduction in total nitrogen content of the pesticide-adapted blue-green algal strains may occurred due to the inhibition of some stage(s) during the process of nitrogen fixation in the presence of higher concentrations of pesticides. Further stimulatory effect of Rogor at lower concentrations on nitrogen fixation by blue-green algae under culture conditions may be due to the presence of nutrients in media that

minimizes the toxicity of organophosphate (Kar and Singh, 1978; Sharama and Gaur, 1981). From the results obtained in the experiments, in general it was seen that even 10 ppm of Rogor and Endotaf, adversely affected the occurrence and survivability of *Nostoc punctiforme* in the laboratory culture which is responsible for nitrogen fixation.

Further it was concluded that at the recommended doses of field application, the studied pesticides had no deleterious effect on nitrogen fixation of *Nostoc punctiforme*. The findings of Isalam *et al.* (2007) and Sardeshpande and Goyal (1982) support the above stated conclusion obtained during present study on the subject of pesticidal effect on total nitrogen fixation of tested alga *Nostoc punctiforme*.

Table- 1: Effect of Rogor and Endotaf on total nitrogen (%) fixed by *Nostoc punctiforme*.

Pesti- cides	Concentratio ns of pesticides (ppm)	Total Nitrogen (%)	percent increase (+) or decrease(-)
Rogor	Control 0.00	4.94%	
	2.5	5.14	+4.0
	5	5.00	+1.2
	10	4.12	-16.6
	20	3.75	-24.9
	50	2.80	-43.3
	100	1.28	-74.0
	250	0.56	-88.6
Endotaf	Control 0.00	4.94%	
	2.5	5.15	+4.2
	5	5.00	-3.2
	10	3.11	-37.0
	20	2.38	-51.8
	50	1.17	-76.3
	100	0.72	-85.4
	250	--	--
500	--	--	

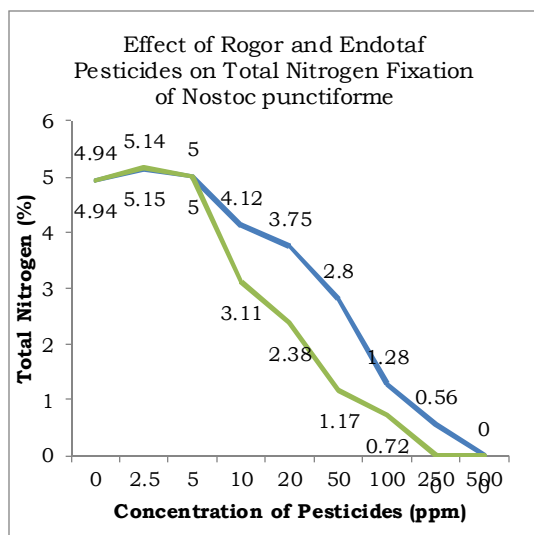
Values represent the mean of three replicates. Percent increase (+) or decrease (-) compared to Control

Table- 1a: Statistical Analysis on effect of Rogor on total nitrogen (%) fixed by *Nostoc punctiforme*.

ANOVA							
S. V.	d. f.	SS	MS	Cal. F	Tab F		TEST
					(5%)	1%	
T	8	96.22027	12.02753	2692.731	2.23	3.12	**
Error	18	0.0804	0.004467				
Total	26	96.30067					
Se. M	0.038586	C.D. (5%)	0.117033	C.D. (1%)	0.162427	C.V.	2.180131
C.F.	253.736	Total SS	96.30067	TSS	96.22027	ESS	0.0804

Table- 1b: Statistical Analysis on effect of Endotaf on total nitrogen (%) fixed by *Nostoc punctiforme*

ANOVA							
S. V.	d. f.	SS	MS	Cal. F	Tab F		TEST
					(5%)	1%	
T	8	111.1494	13.89368	8226.518	2.23	3.12	**
Error	18	0.0304	0.001689				
Total	26	111.1798					
Se. M	0.023727	C.D. (5%)	0.071964	C.D. (1%)	0.099878	C.V.	1.646038
C.F.	168.3003	Total SS	111.1798	TSS	111.1494	ESS	0.0304

**Graph****References:**

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