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EFFECT OF ALGAL EXTRACT ON SEED GERMINATION AND SEEDLING GROWTH OF CHILLY [*Capsicum annuum* (L.)][#]

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Abstract

Commercial utilization of algal plants to increase the productivity of vegetable crops is the key feature in the present investigation. It also serves the purpose of organic food production. The present research is focused on the utilization of different concentrations of algal extract to study the effect on growth parameters like seed germination and seedling growth of *Capsicum annuum*. The concentrations for the pre-soaking treatment were 5%, 10% and 20% along with control. The pre-soaking treatment of *Capsicum annuum* seeds with the extract of *Nostoc commune* accelerates germination, increases germination percentage and promotes seedling growth of plants. The best results on seedling growth and germination percentage were noted in 20% extract treatment for 6 hours duration. The beneficial results obtained led to the conclusion that some type of growth promoting substances may be present in the algal extract. It also paved way for the use of algae as organic fertilizer for organic crop production.

Key words: *Algae, Nostoc commune, Capsicum annuum, Seed germination, Seedling growth.*

[#]Research Article

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Introduction

Algal extract has many practical applications in agriculture. Its mode of action on germination, growth and development of cultivated plant is still in the fundamental research state. The positive effects of algal extract on crop plants tempted many researchers to carry out more precise studies in this field. William (1949) and Radley (1961) extracted IAA and gibberellins type substances from *Laminaria agardhii* and *Fucus vasicolosus* respectively. Gupta (1964) reported accelerated germination in paddy seeds treated with extract of *Phormidium foveolarum, Fischerella mucicola* and *Nostoc* sp. Tarar and Parate (1983) and Tarar (1987) observed that seeds presoaked in the extract of two *Nostoc* sp. remarkably enhanced the vegetative growth and yield of tomato and paddy seedlings. Present investigation was therefore undertaken to study the effect of algal extract *Nostoc commune* on germination and seedling growth of chilli plant.

Material and Methods

The alga *Nostoc commune* was collected from Pachmari and unialgal culture was obtained by repeated subculturing in BG 11 culture medium. The algal extract was made by macerating 10 gm dried algae in electric homogenizer and further adding it to 100 ml distilled water. This extract was later used for preparing different concentration of algal extract for presoaking chilli seeds. Different concentrations of this extract viz. 5%, 10% and 20% were prepared by adding distilled water by considering the original extracts as 100% concentration.

1) 5ml. Algal extract + 95ml. Distilled water = 5%
2) 10ml. Algal extract + 90ml. Distilled water = 10%
3) 20ml. Algal extract + 80ml. Distilled water = 20%
4) Distilled water = Control

Seeds of *Capsicum annum* were soaked in the algal extract of 5%, 10% and 20% concentration for 6 hours duration in dark. Seeds soaked only in distilled water served as control. 50 seeds were taken for each treatment. After 6 hours, the soaked seeds were washed three times with distilled water. The germination of the seeds and the rate of seedling growth were studied by growing them in (a) sand culture and (b) on germination paper.

a) Sand Culture Method

Small polythene bags of 20 x 15 cm. in size were taken for growing the seeds in sand. Dry sand was filled in each bag up to 10 cm depth. The seeds were sown at the depth of 2 cm from the surface in the sand. All the polythene bags were kept on the open terrace in natural condition. Each bag was marked with the respective concentration of algal extracts in which the seeds were soaked. The time at which the seeds were arranged was noted down. The sand was watered twice a day.

b) Germination Filter Paper Method

Moistened germination filter papers (45 x 25 cm) were taken for growing the seeds. Each filter paper was spread on the polythene sheet of same size. After spreading the seeds it was covered with the second moistened filter paper and then again covered

with another polythene sheet. Both the filter papers were folded a little below to prevent seeds from falling out. Both the filter papers along with the polythene sheets were rolled up to the other end and then kept in the incubator where constant temperature and humidity was maintained. The duration and time of treatment was noted down.

Morphological characters like length of radical, length of plumule and dry weight of seedling were observed and only the highest value was recorded for each treatment. The average of such values was calculated. In case of germination filter paper method readings were noted after 7 and 14 days and in sand culture method after 30 days.

Observations

It was observed that seed soaked in algal extract was germinated 3 days earlier than that of control. Three replications were kept for each treatment. Germination percentage was found out to be highest in 20% treatment i.e. 82% after 7 days and 88% after 14 days in case of germination filter paper method as compared to that of control i.e. 70%. In case of sand culture method germination percentage was found to be 80% in 20% treatment. The results are presented in table 1 and 2.

Result and Discussion

The results obtained in the present investigation indicate that soaking of chilli seeds with algal extract of *N. commune* accelerates the germination. It also markedly promotes the growth of chilli seedlings. The best results on germination and growth of seedlings were obtained in case of 20% treatment. As the climate factors was same for all treated seeds, the beneficial effects in some treated seeds with the algal extract may be due to the presence of some algal hormones like phytohormones responsible for the growth and germination of chilli plant seedlings. Increase in growth of crop plants due to the extracellular products secreted by algae has been reported by venkataraman (1961). Venkataraman and Neelkantan (1967). Choudhari *et. al.* (1979) performed the experiment with *N. commune* and found that lower concentration of boiled and crude extracts promotes the vegetative growth of wheat seedlings. Tarar (1987) studied the effect of *N. commune* extracts on germination and seedling growth of rice seeds. Narasimha rao and chatterjee (2014) studied the effect of seaweed liquid fertilizer from *G. textorii* & *H. musciformis* on seed germination of brinjal, tomato and chilly reported increase in germination.

The use of algae to increase germination percentage and seedling growth is now by an established fact. Recently some research work has been carried out to study the effect of algal extracts on crop plants by Gupta and Gupta, 1973; Tarar and Parate, 1983; Tarar, 1987; Minero-Amador *et al.*, 1994; Moller *et al.,* 1998; El-Sheekh, *et al.*, 2000; Bodkhe, 2001.

Conclusion

From the results obtained it can be concluded that the pre-soaking treatment of chilli seeds with extract of *N. Commune* accelerates germination, increase germination percentage and markedly enhanced growth of chilli seedlings. The best results on growth and germination was obtained in case of 20% treatment for 6 hours duration. The

beneficial results obtained leads to the conclusion that some type of growth promoting substances such as phytohormones may be present in the extract of this alga.

Table:1. Showing the Mean Results of the Effect of Pre-Soaking Seed Treatment in Extract of *Nostoc commune* on Chilli Seeds in Germination Filter Paper

Nature of observation	After 7 days				After 14 days			
	Control	Algal extract			Control	Algal extract		
		5%	10 %	20 %		5%	10 %	20%
Germination%	70.2	79.1	80.6	82.7	70.2	82.1	83.5	88.2
Difference over control	–	8.9	10.4	12.5	–	11.9	13.3	18.0
Length of radical (cm)	6.0	6.7	6.9	7.1	7.2	9.2	10.3	10.9
Difference over control	–	0.7	0.9	1.1	–	2.0	3.1	3.7
Length of plumule	4.5	5.0	5.3	5.4	5.1	5.8	6.2	6.5
Difference over control	–	0.5	0.8	0.9	–	0.7	0.8	0.4
Total length of seedling (cm)	40.5	11.7	12.2	12.5	12.3	15.0	17.0	17.4
Difference over control	–	1.2	1.7	2.0	–	2.7	3.7	4.1
Dry weight of root system (gm)	0.10	0.10	0.11	0.12	0.12	0.13	0.14	0.14
Dry weight of shoot system (gm)	0.26	0.27	0.27	0.28	0.30	0.31	0.31	0.32
Total dry weight (gm)	0.36	0.37	0.38	0.40	0.42	0.44	0.45	0.46
Difference over control	–	0.01	0.02	0.04	–	0.02	0.03	0.05

Table: 2. Showing the Mean Results of the Effect of Pre-Soaking Seed Treatment in Extract of *Nostoc commune* on Chilli Seeds in Sand Culture

Nature of observation	After 30 days				Difference over control		
	Control	Algal extract			Algal extract		
		5%	10%	20%	5%	10%	20%
Germination%	70.4	78.1	79.4	80.2	7.7	9.0	9.8
Length of radical (cm)	20.0	21.2	21.4	21.8	1.2	1.4	1.8
Length of plumule	14.4	15.2	15.8	16.1	0.8	1.4	1.7
Total length of seedling (cm)	34.4	36.4	37.2	37.9	2.4	2.8	3.5
Dry weight of root system (gm)	0.10	0.13	0.14	0.15	0.03	0.04	0.05
Dry weight of shoot system (gm)	0.38	0.39	0.39	0.40	0.1	0.01	0.02
Total dry weight (gm)	0.48	0.52	0.53	0.55	0.4	0.05	0.07

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