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The Promoting Effect of the Extract of Blue Green Alga *Nostoc muscorum* (Agardh ex Born.et Flah.1888) in Seed Germination of Groundnut (Arachis hypogea L.)

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Abstract: ***Algae are also considered as rich source of fats, vitamins, minerals and antimicrobial compounds. It was also observed that the algae are found to be stimulatory for the seed germination and plant growth. In present work extracts of blue green alga Nostoc muscorum in different solvents were used to study their effects on seed germination of ground nut (Arachis hypogeaL.) The hot water extract showed enhancing effects in germination and development of shoot and root. The algal extracts prepared in chloroform also shown stimulatory effects on seed germination. The extracts in Petroleumether and Tolune inhibited seed germination. The present investigation reveals that blue green alga Nostoc muscorum contains certain growth promoting substances which enhances seed germination. Use of hot water algal extract can be recommended to the farmers as ecofriendly agriculture practice for attaining better germination and growth which yields crop production.***

Keywords: Algal extracts Nostoc muscorum, seed germination, development, and groundnut

1. Introduction

Algae are important members of plant world and several of them are significant to man in many ways. They are beneficial in the field of Agriculture, Industry, Medical Science, Space research, Bio-diesel production and Bioremediation. They gain importance in the modern time not only as an alternative potential source of protein for man but also as the primary source of food for aquatic animals. Algae are considered as rich source of fats, vitamins, minerals and antimicrobial compounds. Algae contain different bioactive compounds and these bioactive compounds have certain effects on seed germination and plant growth. The biochemical present in algae improves seed germination, seedlings and development and increase plant tolerance to environmentalstress. In India works on algal extracts and seed germination has been started since 1964 by Gupta.He observed that Paddy seeds treated with algal extracts shows stimulatory effects.Fouly et.al. (1992) AND Mahmood (2001) found that green algae contains high percentage of macronutrients, considerable amount of micronutrients and amino acids. The main objective of present investigation was to study the effect of extracts of blue green algae on seed germination .A blue green alga like Nostoc muscorum found dominantly in back water of Bhandarwadi reservoir at Kamkheda.The alga in pure form was collected and used for making algal extracts in different solvents.Groundnut (Arachis hypogea L.) is commonly grown as oil seed crop in Renapur tehsil of Latur district in the Marathwada region of Maharashtra. The effects of algal extracts in different solvents of Nostoc muscorum on groundnut seed germination was studied out.

2. Materials and Methods

a) Collection of algal material and preparation of fine powder:

The blue green alga Nostoc muscorumis found very dominantly in the backwater of Bhandarwadi minor irrigation project at Kamkheda in Renapur tehsil of Latur district in the Marathwada region of Maharashtra. The alga was collected in a huge quantity from a village Kamkheda, backwater area of Bhandarwadi irrigation project in March 2018 and identified with the help of standard literature on algae. The after identification, algal samples washed carefully and thoroughly with fresh water to remove unwanted impurities, epiphytes and adhering sand particles and mud. The algal samples placed on filter paper sheet in shade for air drying at room temperature for 4 days. Shade drying of algal material is followed oven drying at 40^0 c for 8 hours. After drying fine powder was prepared n grinder and stored in acid washed air tight bottles.

b) Preperation of algal extracts in different solvents :

The algal extracts in different solvents such as cold water,hot water, acetone,methanol, chloroform, petroleum ether and toluene were prepared. For the preparation of cold water extract 1gm of fine algal powder was taken in 100ml conical flask .20ml cool sterile distilled water added to it, flask plugged with cotton and kept it overnight. The next day it has been filtered through Whatmann filter paper No.1 and coloured filtrate obtained and used for soaking of seeds. The hot water extract was obtained by taking 1 mg of fine algal powder in 100ml conical flask.50ml sterile distilled water added to it and boil for 10 to 15 minutes, cooled it and filtered. The filtrate obtained used for soaking of seeds .The extracts in acetone was prepared by taking 1 gm. of fine algal powder in 100ml conical flask.50 ml sterile distilled water added to it and boil for

10 to 15 minutes, cooled it and filtered. The filtrate obtained used for soaking of seeds. The extracts in acetone was prepared by taking 1 gm. of fine algal powder in 100 ml conical flask.20 ml acetone added to it and flask was pluged with cotton and kept overnight undisturbed in cool and dry place. The volume was restored and content were centrifuged to collect maximum supernatant. The content was filtered through whatmann filter paper no.1 and the filtrate was allowed to dry at room temperature .20 ml of sterile distilled water was added to it and used for soaking of seeds. In similar way algal extracts in different solvents were prepared separately.

c) Treatment of seeds with algal extracts:

The healthy seeds of groundnut were obtained from from local market. To avoid the microbial contamination during germination, the selected seeds were surface sterilized with 0.1% $Hgcl_2$solution. Surface sterilized 10 seeds were soaked in algal extract for 4 hours .The seeds soaked in sterilized water served as control. After that they were placed in equidistance on moist germination paper for germination in sterilized petriplates. The percent germination ,root and shoot length of seedling were measured after 7 days of incubation at room temperature.

3. Results and Discussion

Treatment of groundnut seeds with different extracts of Nostoc muscorum for seed germination showed interesting results (Table 1).In cold water extract seed germination was55% with 1.4 cm shoot length and 1.6 cm root length, which is less than control.In control seed germination was recorded up to 60% with2.7 cm shoot length and 2.4 cm root length. In hot water extract seed germination was 75% with 4.2cm shoot length and 4.5 cm root length. Hot water extract shows highest percentage of seed germination with maximum shoot and root length as compared to other solvents. Acetone extracts shows 65% seed germination with 2.4 cm shoot length and 2.8 cm root length. The algal extracts in methanol shows 60% seed germination with 1.8 cm shoot length and 2.2 cm root length. Ethanol extracts shows 65% seed germination with 2.8 cm shoot length and 2.1 cm root length .Chloroform extracts shows 65% seed germination with 2.6 cm shoot length and 2.4 cm root length. In petroleum ether extracts only 30% seed germination was recorded with 1.2 cm shoot length and 1.4 cm root length and in tolune extracts also just 30% seed germination was recorded with 1.6 cm shoot length and 1.2 cm root length. In present investigation hot water extracts of *Nostoc muscorum* stimulated germination of groundnut seeds. Similar kind of observations were made by Kamble (2008) while studying effects of extracts of *Spirogyra plena* on Sorghum, Mothbean, and Seasamum.Adam (1999) found that extracts of *Nostoc muscorum* enhances seed germination in Sorghum,Wheat,and Maize.Pingle and Abhang (2007) observed that cold water and hot water extracts of Nostoc and Lyngbya increases shoot length and root length of tomato,chilli and fenugreek plants.Shariatmadri et.al.(2011) found that aqueous extract of *Anabaena vagnicola*,*Nostoc*species, and*Nodularia herveyna* enhances seed germination.Jadhav and Borkhade (2015) observed that cold water and hot water algal extracts stimulate seed germination in wheat.Jadhav and Mahadik (2020) showed that aqueous extract of *Cladophora crispata* shows enhancing results in seed germination of sunflower. The blue green alga *Nostoc muscorum* contains growth promoting substances which stimulates seed germination. The present investigation is useful to farmers in sustainable agriculture development.

Table 1: Effect of different extracts of *Nostoc muscorum* on seed germination of Groundnut

S.No.	Solvent used for preparation of algal extract	Percentage of germination (%)	Shoot length (cm)	Root length (cm)
1	Acetone	65	2.4	2.8
2	Cold water	55	1.4	1.6
3	Chloroform	65	2.6	2.4
4	Ethanol	65	2.8	2.1
5	Hot water	**75**	**4.2**	**4.5**
6	Methanol	60	1.8	2.2
7	Petrolium ether	40	1.2	1.4
8	Toluene	40	1.6	1.2
9	Control	60	2.7	2.4

4. Conclusion

From the present investigation it is concluded that ground nut seeds treated with hot water extracts of *Nostoc muscorum* shows enhancement in germination, shoot length, root length. This ecofriendly practice can be recommended to farmers for attaining better germination and growth .The algal extracts prepared in chloroform also shows stimulatory effects on ground nut seed germination. The present research work reveals that *Nostoc muscorum* contains certain growth promoting substances which enhances seed germination; therefore it is a potential blue green alga for the production of effective biostimulants.

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