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EFFECT OF BGA (*PHORMIDIUM*) EXTRACTS ON SEED GERMINATION OF SOYABEAN (*GLYCINE MAX*)

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ABSTRACT:

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 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 the present investigation, extracts of *Phormidium mucosum* were prepared in different solvents and used to study their effects on seed germination of soybean. The minimum percentage of germination was recorded in toluene extract (65%) which was similar to control and maximum percentage was recorded in acetone extract (100%) and followed by hot water, chloroform and petroleum ether (85%). The cold water, methanol, and ethanol algal extracts showed good percentage (75%).

Present investigation reveals that, *Phormidium mucosum* contains certain growth promoting substances which enhances the seed germination.

KEYWORDS: *Phormidium mucosum* , seed germination, algal extracts, soyabean.

INTRODUCTION:

Since historical period the algae are used as food, fodder and fertilizer. The algae are known to contain different bioactive compounds. It is observed that several algae have stimulatory effects on seed germination and plant growth. The bioactive compounds present in algae have antimicrobial properties. The biochemical which is present in algae improves seed germination, seedlings development and increases plant tolerance to environmental stresses. The work on algal extract started in India by Gupta (1964). He observed, accelerated germination in paddy seeds treated with algal extracts. The algae contain high percentage of macronutrients and amino acids (Fouly *et al.*, 1992 and Mahmood, 2001). The bioactive compounds present in algae enhances all the physiological reactions that leads to good growth (Fayza and Zenaib, 2008). Objective of this investigation were to study the effect of algal extract on seed germination. *Phormidium mucosum* is a fresh water blue green alga, found abundantly in backwater area of Bhandarwadi minor irrigation project at a village Kamkheda in Renapur tehsil of Latur district. In all the seasons oil seeds are cultivated in the Marathwada region of Maharashtra state, of which Soyabean (*Glycine max L.*) is one of the major oil seed crop generally cultivate in the kharif season. In Latur district Soyabean is the major cash crop for the farmers. Effect of algal extracts in different solvents of *Phormidium mucosum* were used for the study of seed germination of soyabean.

MATERIALS AND METHODS:**a) Collection of algal material:**

While working on algal biodiversity of Renapur tehsil, the author came across an interesting member *Phormidium mucosum* belongs to blue green algae. The blue green alga *Phormidium mucosum* is a fresh water alga, found abundantly in back water area of Bhandarwadi minor irrigation project at a village Kamkheda. The alga was collected in large quantity in February-March 2013 and properly identified. After the identification the algal material was washed carefully and thoroughly with fresh water to remove unwanted impurities, attached epiphytes and adhering sand particles and mud.

b) Preparation of fine powder:

After washing the algal material it was placed on the filter paper sheet in shade for air drying at room temperature for 05 days. The shade drying of algal material is followed by oven drying at 40^oc for 6 hours. After the drying fine powder was prepared in grinder and stored in acid washed air tight bottles.

c) Preparation of algal extracts in different solvents:

Algal extracts in different solvents such as cold water, hot water, acetone, methanol, ethanol, 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, then 20 ml cool sterile distilled water was added to it and flask was plugged with cotton and kept it for overnight. Next day it has been filtered through Whatman filter paper No. 1 and coloured filtrate obtained and used for soaking of seeds. Hot water extracts was obtained by taking 1gm of fine algal powder in 100 ml conical flask then 50 ml sterile distilled water was added to it and boiled for 15 minutes. It was then

cooled and filtered. The filtrate obtained was used for soaking of seeds. The extract in acetone was prepared by taking 1 gm of fine algal powder in 100ml conical flask. 20 ml of acetone was added to it and flask was plugged with cotton and overnight undisturbed in cool and dry place. The volume was restored and content were centrifuged to collect maximum supernatant. The content was filtered through whatman filter paper No. 1 and 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.

d) Treatment of seeds with algal extracts:

The healthy seeds of local variety of soyabean were obtained from local market of Renapur Dist. Latur (MS). To avoid the microbial contamination during germination, the selected seeds were surface sterilized with 0.1% HgCl₂ 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 germinating paper for germination in sterilized Petri plates. The percent germination, root and shoot length of seedling were measured after 7 days of incubation at room temperature.

RESULTS AND DISCUSSION:

The acetone extracts of *Phormidium mucosum* showed promising results in seed germination of soyabean. The extracts in acetone showed 100% germination with 7.2 cm shoot length and 7.5 cm root lengths. The same alga extracted with chloroform shows 85% of germination with the good development of shoot (6.7cm length) and root (7.4cm) which was maximum compare to control and all extracts (table 1).

Extracts in petroleum ether showed 85% germination with the moderate

growth (table1). The hot water extract proved helpful in increasing in germination percentage (85%), shoot length (5.5cm) and root length (4.6cm). The results of present investigation are in correlation with the earlier workers (Venkataraman *et al.* (1993), Kamble (2008) and Ganpathy *et al.* (2013). Chandrakala and Vidyavati (1987) observed influence of leaf extract *Azardiracta indica* on *Cladophora crispata*, Gupta and Shukla (1969) studied effect of algal extracts of *Phormidium* species on growth and development of rice seedling, Kushwaha and Gupta(1972) observed the effect of extracts of *Phormidium foveolarum* on Maize seedlings, Mehata *et al.* (1999) studied impact of extracts of higher plants and algae on rice seedlings, Shakuntala (1991) observed effect of algal extracts on crop seedlings, Fayza and Zenaib (2008) observed increase in germination and growth parameters of Lettuce plant by *Chlorella vulgaris* as biofertilizer.

Effect of different extracts of *Phormidium mucosum* on seed germination of soyabean showed results in table 1. In control, the germination was 65% with 4.2cm shoot length and 4.3cm root length. Toluene algal extract showed 65% germination which was similar to control with 3.6cm shoot and 2.8cm root length.

Soyabean seeds germinated with cold water, methanol, and ethanol shows similar percentage of germination (75%) with moderate shoot and root lengths. Ethanol extracts shown 75% seed germination with 6.2cm shoot length and 4.8 cm root length, followed by methanol with 4.8 cm shoot length and 4.6cm root length, then cold water with 4.8cm shoot length and 4.2 cm root length. Similar types of observations were recorded by Kamble (2008) while studying effects of *Hydrodictyon reticulatum* and *Spirogyra plena* on Moth bean.

From the above results it was observed that, blue green alga *Phormidium mucosum* contains growth promoting substances which gave promotive effects in germination of soyabean seeds.

Table 1. Effect of different extracts of *Phormidium mucosum* on seed germination of soyabean

Sr. No.	Solvents	Seed germination percentage (%)	Shoot length (cm)	Root length(cm)
1	Cold water	75	4.8	4.2
2	Hot water	85	5.5	4.6
3	Acetone	100	6.3	6.8
4	Methanol	75	4.8	4.6
5	Ethanol	75	6.2	4.8
6	Chloroform	85	6.7	7.4
7	Petroleum ether	85	5.2	5.8
8	Toluene	65	3.6	2.8
9	Control	65	4.2	4.3

CONCLUSION:

From the present investigation it is concluded that, soyabean seeds treated with extracts of alga *Phormidium mucosum* shows enhancement in germination, shoot length and root length . The algal extracts prepared in hot water, chloroform and petroleum ether also shows stimulatory effect on soyabean seeds followed by cold water, methanol and ethanol. The present investigation reveals that blue green alga *Phormidium mucosum* contains certain growth promoting substances which enhances seed germination.

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