Think India Journal
ISSN: 0971-1260 Vol-22, Special Issue-31
National Conference ETDAB-2019
Held on 23th & 24th December 2019
Organized by: Deptt. of Botany, Deogiri College, Aurangabad, M.S

Effect of *Phormidium mucosum* Extracts on Growth and Development of Certain Legume Crop Plants

Yadav S.G.

Department of Botany Shivaji Mahavidyalaya Renapur Dist.Latur: 413527 (MS) India

ABSTRACT

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 biochemicals which are present in algae improve seed germination, seedling development and increases plant tolerance to environmental stresses. 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 solvants and used to study their effects on seed germination of three legumes viz.*Cicer arientinum* (Chickpea), *Phaseolus radiata* (Green-gram) and *Vigna mungo* (Black-gram). The minimum percentage of germination was recorded in toluene extract (60-65%) which was similar to control and maximum percentage was recorded in acetone extract (95-100%) and followed by hot water, chloroform and petroleum ether (80-85%).The cold water, methanol, and ethanol algal extracts showed good percentage (70-75%).Present investigation reveals that, *Phormidium mucosum* contains certain growth promoting substances which enhances the seed germination.

KEY WORDS:*Phormidium mucosum*, seed germination, algal extracts, legumes

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 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.

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 enhance 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 of legumes .*Phormidium mucosum i*s 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 the Marathwada region of Maharashtra state. Effect of algal extracts in different solvents of *Phormidium mucosum* were used for the study of seed germination of three legumes.

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 2014 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 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 40^0c for 6 hours. After the drying fine powder was prepared in grinder and stored in acid washed air tight bottles.

c) Preperation 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, 1 gm of fine algal powder was taken in 100 ml 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.

Treatment of seeds with algal extracts:

The healthy seeds of local variety of three legumes viz.*Cicer arientinum*(Chickpea), *Phaseolus radiata* (Green-gram) and *Vigna mungo* (Black-gram) were obtained from local market of Renapur Dist. Latur in the Marathwada region of Maharashtra. 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 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:

Table 1: Effect of different extracts of *Phormidium mucosum* on seed germination of *Cicer arientinum* (Chickpea):

Sr.No.	Solvents	Seed germination percentage (%)	Shoot length (cm)	Root length (cm)
1	Cold water	75	4.7	4.3
2	Hot water	85	5.6	4.4
3	Acetone	95	6.4	6.8
4	Methanol	75	4.6	4.5
5	Ethanol	75	5.8	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

Table 2: Effect of different extracts of *Phormidium mucosum* on seed germination of *Phaseolus radiata* (Green-gram):

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	6.5	7.3
7	Petroleum ether	85	5.4	5.6
8	Toluene	65	3.6	2.8
9	Control	65	4.3	4.5

Table 3: Effect of different extracts of *Phormidium mucosum* on seed germination of *Vigna mungo* (Black-gram):

Sr.No.	Solvents	Seed germination percentage (%)	Shoot length (cm)	Root length (cm)
1	Cold water	75	4.5	4.2
2	Hot water	85	5.5	4.2
3	Acetone	100	6.5	6.2
4	Methanol	75	4.6	4.3
5	Ethanol	75	6.7	4.6
6	Chloroform	85	6.5	7.2
7	Petroleum ether	85	5.2	5.4
8	Toluene	65	3.8	2.6
9	Control	65	4.4	4.2

DISCUSSION:

The acetone extracts of *Phormidium mucosum* showed promising results in seed germination of three legumes viz.*Cicer arientinum* (Chickpea), *Phaseolus radiata* (Green-gram) and *Vigna mungo* (Black-gram) .The extracts in acetone showed 95% germination in Chickpea with 6.4cm shoot length and 6.8cm root length(table 1), 100% germination with 6.3 cm shoot length and 6.8cm root lengths in Green-gram(table 2) and 100% germination with 6.5 cm shoot length and 6.2cm root lengths in Black-gram(table 3). The same alga extracted with chloroform shows equal 85% of germination with the good development of shoot in Chickpea with 6.5cm shoot length and 7.2cm root length, 6.5 cm shoot length and 7.3cm root lengths in Green-gram and with 6.6 cm shoot length and 7.2cm root lengths in Black-gram, which was maximum compare to control and all extracts .

Extracts in petroleum ether showed 85% germination with the moderate growth in Chickpea with 5.2cm shoot length and 5.8cm root length, 5.4 cm shoot length and 5.6cm root lengths in Green-gram and with 5.2 cm shoot length and 5.4cm root lengths in Black-gram. The hot water

extract proved helpful in increasing in germination percentage (85%), in Chickpea with 5.6cm shoot length and 4.4cm root length, 5.5 cm shoot length and 4.6cm root lengths in Green-gram and with 5.5cm shoot length and 4.2cm root lengths in Black-gram, 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 exracts 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 three legume crop plants showed results in table 1, table 2 and table 3.In control, the germination was recorded similar 65% in legumes in Chickpea with 5.6cm shoot length and 4.4cm root length, 5.5cm shoot length and 4.6cm root lengths in Green-gram and with 5.5cm shoot length and 4.2cm root lengths in Black-gram.

The three legume crop seeds germinated with cold water, methanol, and ethanol shows similar percentage of germination (75%) with moderate shoot and root lengths. Ethanol extract shown 75% seed germination in Chickpea with 5.8cm shoot length and 4.8cm root length, 6.2cm shoot length and 4.8cm root lengths in Green-gram and with 6.7cm shoot length and 4.6cm root lengths in Black-gram and followed by methanol in Chickpea with 4.6cm shoot length and 4.5cm root length, 4.8cm shoot length and 4.6cm root lengths in Green-gram and with 4.6cm shoot length and 4.3cm root lengths in Black-gram (table 1,table 2 and table3) Similar types of observations were recorded by Kamble (2008) while studying effects of *Hydrodictyon reticulatum* and *Spirogyara 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 legume seeds.

CONCLUSION:

From the present investigation it is concluded that, legume 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 legume 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.

REFRENCES:

Chandrakala, G.and Vidyavati. Influence of leaf extracts Azardiracta indica(L.) on Cladophora crispata (Roth) Kutz.2nd All India App.Phycological congress.(1987) Abstr.pp.3.

Fayza A.Faheed and Zenaib Abd.El-fattah. Effect of Chlorella vulgaris is as biofertilizer on growth parameters and metabolic aspects of Lettuce plant. Journal of agricultural and social Sci. (2008)**D4 (4)**165-169.

Fouly E.L., Abdullah M.M.F. Shaaban, M.M. Multipurpose large scale production of microalgae biomass in Egypt.Proc.Eygption Italian Symp.on Biotechnology, Assuit, Egypt,(1992) pp.305-315.

Gupta, A.B. Algal flora and its importance in the economy of Rice fields.Phycologia (1964) **28 (2)** 213-222.

Gupta, A.B.and Shukla, A.C.Effect of algal extracts of Phormidium species on growth and development of rice seedling.Hydrobiologia. (1969)**4(2):** 77-84.

Ganapathy S.G., Balamurugan M., Thinakaran T.and Sivakumar Developmental changes in the germination, growth and chlorophyll activity of Vigna munga L.Using seaweed extract of Ulva reticulata.Farsskal.International research journal of Pharmacy. (2013) 04 (01) pp.252-254.

Kambale, Suhas M.Studies on effect of bioactive compound of algae on some fungi.Ph.D.Thesis, Dr.Babasaheb Ambedkar Marathwada University, Aurangabad.(2008)

Kushwaha, A.S. and Gupta A.B.Effect of pretreating the seeds with extracts of Phormidium foveolarum on growth and development of Maize seedlings.Hydrobiologia.(1972) **35**:203-209

Mahmood, M.S. Nutritional status and growth of maize plants as affected by green microalgae as soil additives.J.Biol.Sci.(2001) **1**:475-479

Mehata, P.M. and Gajaria S.C.Impact of extracts of higher plants and algae on germination, seedling growth and oxidizing enzymes of rice seedlings. Ad. Plant Sci.(1999)**12 (2):**567-572.

Mogli, T.G., and Vidyavati .Effect of leaf extract on periwrinkle on Cladophora crispata (Roth) Kutz.Phycos.(1984).**23(1&2):**254-259

Shakuntala, J.Effect of algal extracts on growth and development of certain crop seedlings.Proc.Intnl.Pl.Physiol. Banaras Hindu University,(1991).pp.119-127

Venkatraman Kumar V., Mohan V.R., Murugeshwari R., Muthusamy M. Effect of crude and commercial seaweed extracts on seed germination and seedling growth in green gram and black gram. Seaweed Res.Utilin.(1993).**16**:23-27.