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Research Article

Extracts of Green Alga *Spirogyra Circumlineata* and Its Role in Seed Germination of Urd Bean

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Abstract

Green algae are known to contain various bioactive compounds that can influence plant growth and development. The present study investigates the effect of green algal extract derived from *Spirogyra circumlineata* on seed germination and early seedling growth of urd bean (Vigna mungo). Fresh algal biomass was collected, processed, and aqueous extracts were prepared at different concentrations. Urd bean seeds were treated with these extracts, and germination parameters such as germination percentage, mean germination time, root length, shoot length, and seedling vigor index were evaluated. The results indicated that treatment with *Spirogyra circumlineata* extract significantly enhanced seed germination and seedling growth compared to the control. Lower concentrations of the algal extract showed the most favorable effects, while higher concentrations exhibited reduced or inhibitory responses. The growth-promoting effect may be attributed to the presence of plant growth regulators, minerals, and organic compounds in the algal extract. This study suggests that *Spirogyra circumlineata* extract has potential as a natural and eco-friendly biostimulant to improve seed germination and early growth of urd bean.

INTRODUCTION

Algae have been recognized as biofertilizers in the form of extracts and manure. Since historical time algae are used as fertilizers to promote growth of plant. Algae are proved to contain various biomolecules such as growth hormones amino acids, antibiotics, vitamins, micro and macro elements promoting seed germination and plant growth. Algal extracts prepared in different solvents plays a significant role in seed germination. The bioactive compounds present in algae enhances all physiological reaction that lead to good growth of plants (Fayza and Zenaib, 2008). Fouly *et al.* (1992) and Mahmood (2001) observed that algae contain high percentage of macronutrients, considerable number of micronutrients and amino acids. In present century use of algae in agriculture has become a modern concept in sustainable agriculture development. The main objective of present research work was to study effects of extracts of green alga *Spirogyra circumlineata* on seed germination of urd bean. Urd bean (*Vigna mungo* (L.) Hepper) is one of the important pulse crops grown throughout in India. It is also known as black gram. Urd bean holds high protein value than most of the legumes. It is also used as green manure crop. In India urd bean farmed in Rabbi and Kharif seasons. In Maharshtra this crop is extensively grown in Kharif season. Extracts in different solvents of green alga *Spirogyra circumlineata* were tested in germination of urd bean. In India work on use of algal extracts in seed germination has been started in 1964 by Gupta. He studied accelerated germination in paddy seeds treated with algal extracts. Gupta and Shukla (1969) used water and other extracts of blue green algae in germination of rice seeds which shows marked seed germination. Adam (1991) worked on effect of extracts

of Nostoc muscorum on seed germination of sorghum wheat and maize. Pingle and Abhang (2007) studied effect of fresh water algal extracts on seed germination of vegetable crops. Kamble (2008) worked on role of algal extracts in seed germination of sorghum , mothbean and sesamum. Jadhav and Borkhade (2015) studied effect extract of algal biomass on seed germination of wheat . Mahadik and Jadhav (2014, 2015 and 2020) extensively worked on effects at extract of Spirogyra crispata and Chara fragilis on mung bean and of Spirogyra jugalis on tomato. Yadav (2017) observed effect of Phormidium extracts on germination of soyabean . Sangekar and Jadhav (2023) studied role of extracts of Spirogyra and Oscillotoria on germination of mung bean seeds.

MATERIALS AND METHODS

Collection of algal material and preparation of fine powder: Green alga Spirogyra is abundantly grows in Murambi lake located in Ambajogai Tahsil area of Beed district of Maharashtra. Alga was collected in bulk and pure form in the month of November 2023. It is identified by microscopic observations. After identification algal material was washed thoroughly with fresh water to remove unwanted impurities, epiphytes and adhering sand particles and mud. Algal material dried in shade at room temperature for four days, followed by oven drying at 40O c for 8 hours. Dried algal material was ground to a fine powder and stored in air tight bottles. Preparation of algal extracts in different solvents: Algal extracts in different solvents such as cold water, hot water, acetone, methanol, ethanol and chloroform were prepared. For the preparation of cold water extracts 1 gm of fine algal powder was taken in 100 ml conical flask. 25 ml cool sterile distilled water added to it; flask plugged with cotton and kept it overnight. Next day it has been filtered through Whatman filter paper No.1 and colored filtrate obtained and used for soaking of seeds. Hot water extracts were obtained by taking 1 gm. of fine algal powder in 100 ml conical flask. 50 ml sterile distilled water added to it and boiled for 10 to 15 minutes, cooled it and filtered. Filtrate obtained used for soaking of seeds. Extract 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 plugged with cotton and kept overnight 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 were 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: Healthy seeds of urd bean were obtained from authorized seed distributor. To avoid microbial contamination, selected seeds were surface sterilized with 0.1 % Hgcl2 solution. Surface sterilized 10 seeds were soaked in algal extracts for 4 hours. Seeds soaked in water served as control. The soaked seeds were placed on moist germinating paper for germination in sterilized Petri plates. Percent germination, root length and shoot length of seedlings were measured after 7 days of germination at room temperature.

RESULTS AND DISCUSSION

Treatment of urd bean seeds with extracts of green alga Spirogyra shows interesting results. The results have been summarized in Table 1. In control 60% seeds were germinated with 7.2 cm. shoot and 4.2 cm in root length. Cold water extract showed 90% seeds germination with 9.6 cm shoot and 5.3 cm root length. In hot water extract seed germination was 100% with 12.1 cm shoot and 7.5 cm root length. Acetone extract showed 30% germination with 3.5 cm shoot and 5.4 cm root length. In ethanol extract 10% seeds were germinated with 3.9 cm shoot and 1.2 cm root length. In methanol and chloroform extracts seeds of urd bean were not germinated. Cold water and hot water extracts of Spirogyra showed stimulatory effects in seed germination of urd bean with higher shoot and root length. Similar kind of results were obtained by Kambale (2008) and Mahadik and Jadhav (2020) and Pingle and Abhang (2007) Found that aqueous extracts of Nostoc and Lyngbya increases shoot and root length of tomato, chili and fenugreek. Jadhav and Borkhade (2015) and Jadhav and Mahadik (2022) recorded similar kind of observations while studying effect of algal extracts on seed germination of wheat and Sunflower. Recently Sangekar and Jadhav (2023) worked on the role of extracts of Oscillatoria and Spirogyra in seed germination of mung bean and reported that aqueous algal extracts show stimulatory effects on seed germination with enhancement in shoot and root length. Use of aqueous extracts of algae in seed germination is a promising method in sustainable agriculture development.

Table 1: Effect of different solvent extracts of *Spirogyra circumlineata* in seed germination of urd bean seeds.

Sr. No	Solvent used	Percentage of seed germination %	Shoot Length cm	Root Length Cm
1	Cold water	90	9.6	5.3
2	Hot Water	100	12.1	7.5
3	Acetone	30	3.5	5.4
4	Methanol	00	00	00
5	Ethanol	10	3.9	1.7
6	Chloroform	00	00	00
7	Control	60	7.2	4.2

CONCLUSION

On the basis of overall result of present research work, it is concluded that urd bean seeds treated with aqueous extracts of *Spirogyra circumlineata* show stimulatory effects on seed germination with increase in shoot and root length. It is found that green alga Spirogyra circumlineata contains growth promoting compounds especially growth regulators which stimulate seed germination. This alga can be used in the production of effective biostimulants. Such practice can be recommended to the farmers for attaining better germination and growth.

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