



EFFECT OF *STREPTOMYCES DIASTATICUS* ON SEED GERMINATION AND SEEDLING CHARACTERS IN SOME AGRICULTURAL IMPORTANT PLANTS

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ABSTRACT: The present study evaluates the effect of indole-3-acetic acid (IAA) produced by *Streptomyces diastaticus* on seed germination and seedling growth parameters, including root length, shoot length, and number of root hairs. Agriculturally important plants such as *Zea mays*, *Solanum lycopersicum*, *Beta vulgaris*, *Vigna radiata*, and *Brassica nigra* were selected. The results demonstrated that seeds treated with the culture filtrate of *S. diastaticus* showed enhanced germination percentage and improved seedling growth compared to control. This indicates the potential role of actinomycetes-derived IAA in plant growth promotion.

Keywords: IAA, Seed germination, Seedling, Agriculture

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INTRODUCTION

Actinomycetes are Gram-positive bacteria known for their ability to survive under adverse environmental conditions (Waksman, 1961). They are commonly found in the rhizosphere and contribute to plant growth by producing phytohormones such as auxins and gibberellins (Brown, 1972; Merckx *et al.*, 1987).

Among these, indole-3-acetic acid (IAA) plays a significant role in regulating plant growth and development. Microbial production of IAA has been reported to enhance seed germination, root elongation, and overall plant vigor. Therefore, the present study focuses on evaluating the effect of IAA produced by *Streptomyces diastaticus* on selected crop plants.

MATERIAL AND METHODS

PRODUCTION OF IAA FROM *S. DIASTATICUS* AND PREPARATION OF BROTH CULTURE

Production of IAA by *S. diastaticus* was determined. Discs (8 mm diameter) from colonies of the actinomycetes isolates grown on Starch Casein Agar and incubated at 30°C for 7 days were transferred to 500 ml Starch Casein broth containing 2 mg/ml L-tryptophan. These cultures were incubated at 28°C with shaking condition at 125 rpm for 7 days and then harvested by centrifuging at 11,000×g for 15 min (Khamna *et al.*, 2010).

EFFECT OF IAA ON SEED GERMINATION

To study the effect of IAA on the germination of

seeds of some agricultural important plants selected i.e. *Zea mays*, *Solanum lycopersicum*, *Beta vulgaris*, *Vigna radiate* and *Brassica nigra*. The culture filtrate of *S. diastaticus* was used for test and distilled water was used as control. All seeds were surface sterilized by soaking in a 10% sodium hypochlorate (NaOCl): 10% ethanol solution for 1.5 min followed by through rinsing in distilled water (Abd *et al.*, 2013).

EFFECTS OF CULTURE FILTRATE ON ROOT ELONGATION

The supernatant of *S. diastaticus* was filtrate (Milipore filter, 0.45mm) and the cell free filtrate was used for subsequent testing and assayed for

IAA concentrations. The surface-sterilized seeds were separately soaked in 250 ml of the culture filtrate and sterile distilled water for 24 h and then planted in pots of sterile sand. The measurements of the root length and shoot length of the plants were made 10 days after germination.

RESULT AND DISCUSSION

EFFECT OF IAA ON SEED GERMINATION

Plant hormone (IAA) produced by both plants and actinomycetes and other microbes. Soil actinomycetes can significantly affect seed germination. IAA enhances the seed germination of some plants.

Table 1. Effect of culture filtrates on seed germination

S.No.	Name of seeds	No of seeds put for germination		Days for germination		Total seeds of germinated		Percentage of seed germination	
		Control	Test	Control	Test	Control	Test	Control	Test
1	<i>Zea mays</i>	10	10	4	4	10	10	100%	100%
2	<i>Solanum lycopersicum</i>	10	10	4	3	4	6	40%	60%
3	<i>Beta vulgaris</i>	10	10	6	5	4	6	40%	60%
4	<i>Vigna radiate</i>	10	10	4	4	5	7	50%	70%
5	<i>Brassica nigra</i>	10	10	4	3	4	5	40%	50%

For each treatment, ten seeds were set for see the effect of IAA on germination. In germination each plant show different percentage of seed germination after treatment with culture filtrate like *Zea mays* 100%, *Solanum lycopersicum* 60%, *Beta vulgaris* 60%, *Vigna radiate* 70% and *Brassica nigra* 50%. Also, these plants show different percentage of control such as *Zea mays* 90%, *Solanum lycopersicum* 40%, *Beta vulgaris* 40%, *Vigna radiate* 50% and *Brassica nigra* 40%. It was observed that test provide highest percentage rate as compare to control and also seen that the test seed germinating faster or in less days while control seeds take more time as

well as grow in less number in all experimental plant.

EFFECT OF CULTURE IAA ON DIFFERENT PARAMETERS OF PLANT GROWTH

On comparing the growth of *Zea mays*, *Beta vulgaris*, *Vigna radiate*, *Beta vulgaris* and *Brassica nigra* in culture filtrate and control (d/w). It was found that the increase shoot length, no of root hairs and root length in treatment comparison with control on both dicot and monocot plants. This confirmed that the IAA in the culture filtrate plays a role in plant growth promotion.

Table 2. Effect of culture filtrate of *S. diastaticus* on root length, shoot length and no of fibrous root on monocot plant.

S.No	Name of seeds which sow	No of replicates		Average root length	Average shoot length	No of fibrous roots
1.	<i>Zea mays</i> (Maize)	20	Test	26.4±7.91	29.07±4.10	17.05±3.4*
			Control	29.1±6.4	31.23±2.9	17.95±3.3
2.	<i>Beta vulgaris</i> (Beet root)	20	Test	3.58±0.92	3.59±0.48	6.55±1.23*
			Control	3.40±0.91	3.36±0.53	4.3±0.80

Data are presented as mean± standard deviation (n=20); *indicate that differences between root length, shoot length and number of

secondary roots in comparison between culture IAA and control are statistically significantly different at 0.05 level of significance.

Table 3. Effect of culture filtrate of *S. diastaticus* on root length, shoot length and no of adventitious root on dicot plants.

S.No	Name of seeds which sow	No of replicates		Average root length	Average shoot length	No of adventitious roots
1.	<i>Solanum lycopersicum</i> (Tomato)	20	Test	1.99±0.31	2.01±0.65	3.65±1.18*
			Control	1.92±0.32	1.96±0.61	2.85±0.74
2.	<i>Vigna radiate</i> (Moong dal)	20	Test	7.2±0.97	7.26±0.9	15±1.21*
			Control	6.5±1.04	7.03±0.9	12.4±1.56
3.	<i>Brassica nigra</i> (Mustard)	20	Test	2.10±0.27	3.025±0.37	5.9±0.96*
			Control	2.02±0.33	2.94±0.32	4.05±0.80

Dobbelare in 2015 studied the effect of *P. aeruginosa* on plant growth. They found that seed germination index was higher in bacterized seeds (82.4%), which germinated earlier in comparison to the control (69.3%) . Khamna *et al.*, 2010 found that the culture filtrate of *Streptomyces* CMU-H009 could promote plant growth based on seed germination and root elongation in maize and cowpea plants, in comparison with control.

CONCLUSION

The present study confirms that *Streptomyces diastaticus* produces IAA, which significantly

enhances seed germination and seedling growth in selected agricultural plants. This highlights its potential application as a biofertilizer in sustainable agriculture.

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