International Letters of Natural Sciences *Online: 2015-01-27*
ISSN: 2300-9675, Vol. 33, pp 9-11
doi:10.56431/p-9p3kom

Response of Fenu-Greek (*Trigonella foenum-graecum* L.) to Rhizobium Inoculation

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ABSTRACT

Green revolution increased the food production enormously to feed the geometrically growing population. In India, the availability and affordability of fossil fuel based chemical fertilizers at the farm level have been ensured only through imports and subsidies. Dependence on chemical fertilizers for future agricultural growth would mean further loss in soil quality. The possibilities of water contamination and unsustainable burden of the fiscal system. The Government of India has been trying to promote an improved practice involving use of biofertilizers along with fertilizers. These inputs have multiple beneficial impacts on the soil and can be relatively cheap and convenient for use. The agricultural chemicals like pesticide and weedicides were being used to save the standing crop from the attack of pests and to boost crop production. At the same time the excess use of chemical fertilizers degraded the soil properties. In this context, the farmers are expecting for the cheapest and eco-friendly alternative for getting higher yield. Biofertilizers is only the alternative way to get more production without harmful to environment. So the effect of different doses of biofertilizer (Rhizobium) on germination studies of Fenu-greek seed germination percentage, seedling growth, fresh weight and dry weight, chlorophyll, protein and soluble sugar content has been studied in the laboratory condition. There parameters increased to application when biofertilizer compared to control.

Keywords*:* Biofertilizers; seed germination; seedling growth; environment

1. INTRODUCTION

Fenugreek is the commonly found in meditarranean region. It is an annual plant in the family Fabaceae. Fenugreek (*Trigonella foenum -graecum*. L) is the multi use and commercially important spice crop is grown during winter season as a leafy vegetable. Seed or leaf spice is used for human consumption, fodder for the animals and as a green manure to enrich the soil fertility. Biofertilizers are live formulates of microorganisms (useful bacteria and fungi) that are ready to be used and improve the quality and the health of the soil and the plant species by increasing the nutrient availability for the soil and plants. Biofertilizers naturally activate the microorganisms found in the soil restoring the soil's natural fertility and protecting it against drought and soil disease and therefore stimulate plant growth (Han *et al*., 2006). Biofertilizers were obtained using natural election of different type of beneficial living organism (Asghazadeh 2006). Using biofertilizers that certain different microbial strain has led to a decrease in the use of chemical fertilizers and has provided high products free of harmful agro chemicals for human safety (Mahfouz and Sharaf-Eldin 2007). Biofertilizers can substitute for inorganic fertilizer to maintain productivity and environmental quality Choudhary (2002) and Nahum *et a*l., (2007). India is an agricultural country and its ranks second position by its population in the world. There is a constant pressure on crop production from available cultivable land with limited water resources in order to keep face with the food

requirements for ever increasing population. Application of suitable fertilizers is one of the ways to attain the maximum crop yield (Gayathri and Anburani, 2008). The Indian population has crossed the one million mark and is expected to go up to 1156 million in 2010, 1270 in 2020 and 1374 in 2030 (Kumar and Nepalia, 2002). There is a great need to increase the food production to meet the demand and supply for the geometrically growing population. The use of chemical fertilizers caused considerable damage to the environment through air, water, and soil pollution (Yadav and Lourduraj, 2005a).

Rhizobium: The inoculants are known for this ability to fix atmosphere nitrogen in symbiotic association with plants forming nodules in roots.

2. MATERIALS AND METHOD

Trigonella foenum-graecum L. seeds were procured from Rice Research Institute, Aduthurai, Tamil Nadu. The seeds were surface sterilized with 70 % ethanol and washed with distilled water followed by running tap water. The seeds are soaked in distilled water for six hours. The plastic cups were filled with 100 gram soil. The different doses (10, 20, 30, 40 and 50g) of biofertilizer were (*rhizobium*) added to the soil. One set is treated as control. All the seeds were allowed to grow in similar environmental conditions. Calculated and for a period of 10 days. The germination percentage, seedling growth measured on the 10^{th} day. The dry weight of seedling was taken by using an electrical pan balance after keeping the materials in a hot air oven at 80^0c for 24 hours.

3. RESULT AND DISCUSSION

The Rhizobium treated in *Trigonella foenum-graecum* L. plants were showed better performance than the control. The root length and shoot length was gradually increased in treated plants and the minimum level was observed in control (Table-1).Chlorophyll a, chlorophyll b and also total chlorophyll contents level of rhizobium treated plants were also significantly higher than untreated plants.(Table 2). Rhizobium inoculated plants showed increased seed germination, shoot length (cm), root length (cm), fresh weight, dry weight, chlorophyll, protein and soluble sugar content constituents when compared to uninoculated control plants. The protein content showed higher amount than other treated plants. The lowest amount was recorded in control plants (Table 2). Soluble sugar content were increased significantly with increasing levels of biofertilizer and the minimum was recorded with 50g which was significantly higher than 40,30,20,10g and control.

Root length increased significantly with increasing levels of biofertilizer and maximum (0.186 cm) was recorded with 50g, which was significantly higher than 40g, 30g, 20g, 10g and control. The biofertilizer (*Rhizobium)* proved to be the best in enhancing the root length (cm). The plant Fresh weight increased significantly with increasing levels of biofertilizer and the maximum was recorded with 50g, which was significantly higher than 40g, 30g, 20g, 10g and control. The biofertilizer (*Rhizobium)* proved to be the best in enhancing the plant Fresh weight (g).

Table 1. Effect of Biofertilizer on germination studies of Fenugreek.

Doses Of Bio fertilizer	Germination (%)	Shoot length (Cm/Seedling)	Root length (Cm/Seedlings)	Fresh weight (g/seedlings)	Dry weight (g/Seedlings)
Control	85%	5.50± 0.40	2.40± 0.26	1.23± 0.10	0.31± 0.32
10g	85%	7.36± 0.47	3.16± 0.30	1.57± 0.13	0.51± 0.76
20g	90%	8.20± 0.30	4.33± 0.37	1.83± 0.09	0.83± 0.14
30g	95%	9.40± 0.43	4.96± 0.20	2.02± 0.56	1.06± 0.49
40g	100%	10.23± 0.30	5.66± 0.20	2.37± 0.18	1.50± 0.20
50g	100%	11.40± 0.81	6.46± 0.30	2.80± 0.16	2.02± 0.12

Table 2. Effect of Biofertilizer on biochemical analysis of Fenugreek.

Doses of Bio fertilizer	Chl a	Chl b	Tot Chl	Protein	Sugar
Control	0.20±0.010	0.14±0.01	0.34±0.015	0.18±0.002	0.06±0.002
10	0.26±0.015	0.16±0.05	0.43±0.015	0.19±0.003	0.13±0.010
20	0.30±0.010	0.21±0.02	0.52±0.010	0.28±0.001	0.16±0.010
30	0.34±0.015	0.26±0.01	0.62±0.015	0.29±0.006	0.18±0.010
40	0.39±0.010	0.32±0.02	0.71±0.010	0.35±0.001	0.22±0.152
50	0.43±0.017	0.38±0.03	0.81±0.015	0.39±0.350	0.25±0.152

The plant dry weight increased significantly with increasing levels of biofertilizer and the maximum (0.01g) was recorded with 50g, which was significantly higher than 40g, 30g, 20g, 10g and control. The biofertilizer (*Rhizobium*) proved to be the best in enhancing the plant dry weight (g).

4. CONCLUSION

From our study, the application of biofertilizer improved the germination parameters of plants when compared to control. The formers should be encouraged to use biofertilizers for getting higher productivity. The use of biofertilizer keeps not only increasing the productivity but also increasing the soil fertility. From the above result is clear it is a good source can be used for application of biofertilizers in field is recommended.

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(Received 08 January 2015; accepted 20 January 2015)