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Inspiration of Different Bio Fertilizer on Germination and Seedling Growth of Rice (*Oryzasativa*L.) by Seed Treatment Method

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Abstract: *Bio fertilizers are natural fertilizes which are living microbial inoculants of bacteria, algae, fungi alone or in combination and they augment the availability of nutrients to the plants. The role of biofertilizers in agriculture assumes special significance, particularly in the present context of increased cost of chemical fertilizer and their hazardous effects on soil health. For the evaluation of impact of various fertilizers on Rice (OryzasativaL.) cultivar Karjet were collected from Kharland Research station, Panvel. Biofertilizerssuch asAzospirillumbrasilense(Agrosun) , Bacillus megaterium(Biostila) Pseudomonas fluorescens (Remonas),Trichodermaviride (Bhparistricho), Blue green algae, and Mycorrhizae (Reap Mycorrhiza) were purchased from Agharkar Research Institute Gopal Ganesh Agarkar Road, Pune, Maharashtra. The Chemical fertilizer (19:19:19-Paras) were collected from Authorized Private Agro Centre, Panvel.The seeds are with inoculatedviz. Azospirillumbrasilense, Bacillus megaterium, Trichodermaviride Pseudomonas fluorescens, Blue green algae and Mycorrhizae in single and with different combinations.The results of germination percentage of highest in seeds treated with triple inoculants (**T_{11}**- A.brasilense +B. megaterium + P. fluorescens, 97.66, 10.609 and 19.214 similarly seedling growth on 7th days of sowing were significantly higher than those recorded in single and double inoculation as compare to untreated seeds control (T0). Overall results suggest that Biofertilizers inoculation improves germination percentage and seedling growth of Rice.*

Keywords: Rice (OryzasativaL.), Biofertilizers, and Germination root length, shoot length and Seedling growth.

I. INTRODUCTION

The world's human population continues to increase, posing a significant challenge in ensuring food security, as soil nutrients and fertility are limited and decreasing with time. Thus, there is a need to increase agricultural productivity to meet the food demands of the growing population. Rice can be used as a source of staple food, starch, rice bran, rice bran oil, flaked rice, puffed rice, parched rice and rice husk. Rice is excellent source of complex carbohydrates with low fat, low salt and no cholesterol. It is also a great source of proteins, vitamins and minerals (Chaudhari et al., 2018). The exploitation of beneficial soil microorganisms as a substitute for chemical fertilizers in the production of food is one potential solution to this conundrum (Fasusi et al, 2021).

Biofertilizers can be defined as. 'Natural fertilizers that contains a large population of specific or a group of beneficial microorganisms for enhancing the productivity of crop either by fixing atmospheric nitrogen or by solubilising soil phosphorus or by stimulating plant growth through synthesis of growth-promoting substances or latent cells that activate the biological process render to form a fertilizer compound or make the unavailable form of elements to be available or to facilitate availability of nutrients for plants' (Bhattacharjee and Dey, 2014; Simarmata et al., 2016)

II. MATERIALS AND METHODS

2.1 Germination Study

The healthy seeds of Paddy (*Oryzasativa* L. Cv. Karjet 7) were surface sterilized with 0.1% mercuric chloride for 10 minutes and washed thoroughly with distilled water and then with tap water. The sterilized seeds are then treated with

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treated with the paste of biofertilizers, viz Chemical fertilizer, *Azospirillumbrasilense, Bacillus megaterium, Trichodermaviride* and *Pseudomonas fluorescens,* Blue green algae and *Mycorrhizae* in single and with different combinations. For every 50 g of seeds, BGA, *Azospirillumbrasilense, Bacillusmegaterium Trichodermaviride,, Pseudomonas fluorescens and Mycorrhiyzae* 50 gminoculent were used for single inoculation (T1 to T7).For dual inoculation both Bio fertilizers were given half and totally 50 gms inoculants were applied (T8 to T10).For combined inoculation (T11) all the three bio fertilizers were added equally total up to 50 g. The seeds grown in the germinating tray without any fertilizer application were treated as control (T0). Recommended dose of Chemical fertilizer were added before seed sowing. Three replicates were maintained for these experiments in similar environmental condition.

For inoculation, at first slurry was prepared by mixing the fertilizers with cooled rice gruel (Kanji). Then it was poured on the seeds kept over a polythene sheet. The seeds were gently mixed with hands to have a uniform coating on the surface of seeds. The inoculated seeds were air-dried for 15 minutes and used for sowing. These treated seeds sown in germinating tray by using sterile garden soil. The germinating trays were filled with sterile garden soil mixed with respective bio fertilizers. Three replicates were maintained for these experiments in similar environmental condition.

In this way eleven types of inoculations were prepared. Control was maintained by soaking one set of 50 g of seeds in distilled water for the same period of time. The seeds germinated were counted on seventh day after sowing and the germination percentage was calculated. The number of seeds germinated in each treatment was counted on 7th day after sowing. The total germination percentage was calculated on the basis of data collected on 10th day using following formula (Javed and Panwar, 2013).

$$\textbf{Germination (\%)} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds put for germination}} \times 100$$

The seedling was uprooted gently without causing any damage to the root and shoots system and washed well with water. The root and shoot were measured with a metric scale. The fresh and dry weight of seedlings was determined using digital balance. The germination rate is expressed in percentage (%)

III. Experimental Results

Table 1: Effect of bio fertilizer application on germination percentage and seedling length of Rice (*Oryzasativa*L.) cv. Karjet seedling on 7th days after sowing.

Treatments	Germination %	Shoot length (cm)	Root length (cm)	Seedling length (cm)
T_0 - Control	86.00	7.962	5.264	13.225
T_1- Chemical fertilizer(19:19:19)	91.00	9.523	6.285	15.808
T_2-Blue green algae (BGA)	89.00	8.378	5.398	13.776
T_3- *Azospirillumbrasilense*	90.60	9.175	7.075	16.252
T_4- *Bacillus megaterium*	92.33	9.024	6.887	15.911
T_5- *Trichodermaviride*	88.00	8.478	6.673	15.152
T_6- *Mycorrhizae*	87.00	8.988	6.882	15.871
T_7- *Pseudomonas fluorescens*	90.00	9.743	6.861	16.604
T_8- BGA+ *P. fluorescens*	93.33	9.975	7.944	17.925
T_9- BGA+ *Mycorrhizae*	92.66	10.21	7.956	18.174
T_{10}- *A.brasilense +B.megaterium*	95.00	10.58	8.489	19.071
T_{11}- *A.brasilense +B. megaterium + P. fluorescens*	97.66	10.609	8.605	19.214
SE m ±	1.15	0.194	0.206	0.284
CD at 0.05 %	3.25	0.549	0.583	0.804
C.V.%	0.18	0.298	0.424	0.25

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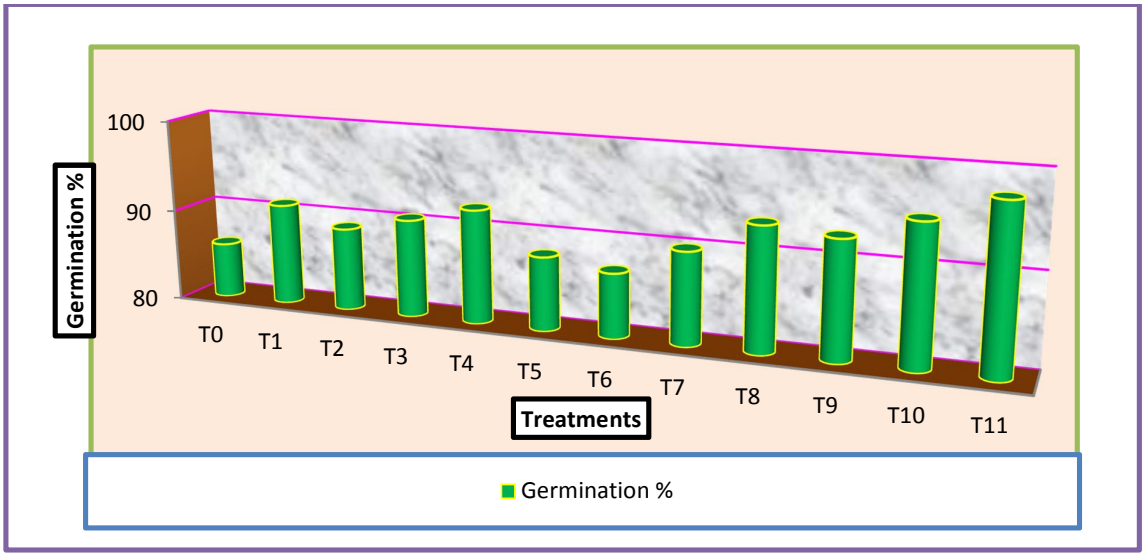

Figure 1: Effect of bio fertilizer application on Germination percentage of Rice (*Oryzasativa*L.) cv. Karjet seedling after seventh days of sowing.

In this study the effect of biofertilizer on germination percentage and seedling growth was indigested. The effect of fertilizers and bio fertilizers on germination studies of **Rice (*Oryzasativa*L.) cv. Karjet** presented in Table 1 and figure No.1. The highest percentage of germination (97.66), root length (8.605 cm/seedling) and shoot length (10.609 cm/seedling), fresh weight (3.367 g/seedling) and dry weight (1.198 g/seedling) was observed in rice crop grown in combined bio fertilizer application (T11- *Azospirillumbrasilense*+ *Bacillus megaterium* +*Pseudomonas fluorescens*). The lowest germination percentage (86), root length (5.264 cm/seedling), shoot length (7.962 cm/seedling), fresh weight (2.384 g/seedling) and dry weight (0.816 g/seedling) was recorded in paddy crop grown without fertilizer application(T0).

In present study, all the treatments including chemical fertilizer (T1) and biofertilizers (T2 to T7) registered higher germination percentage compared to control samples. The maximum, seed germination was observed in combined biofertilizer (*Azospirillum* + *Phosphobacteria*) treatment. The dual inoculation also showed maximum germination percentage (T8-93.33; T9-92.66 and T10-95.) as compare to control. In mono inoculation maximum germination percentage showed in T4 (92.3) treatment.

The results of this study showed that seed treated *Azospirillumbrasilense*+ *Bacillus megaterium* +*Pseudomonas fluorescens* recorded significantly higher values for germination percentage, root length, shoot length, seedling length, dry matter production, over the control. Hence, it is concluded that triple inoculation of biofertilizers *Azospirillumbrasilense*+ *Bacillus megaterium* +*Pseudomonas fluorescens* recommended for improved seed quality over single and dual inoculation.

IV. Discussion

These findings are in agreement with the results of Kumudha and Gomathinayagam (2007) in Albizialabbek and Ram et al., (2014) in *Triticumaestivum* seedlings with biofertilizers treatment. Enhancement of seed germination might be attributed to the role of biofertilizers Azospirillum and phosphobacteria in enhancing the availability of nitrogen and phosphorus in the soil and making of available to the germinating seed with consequent enhancement in the metabolic activity resulting in higher germination (Ram et al., 2011).

Abdul-Baki and Anderson (1973) studied Vigor Determination in Soybean Seed. Ellafi et al. (2010) observed Biofertilizers in action: contributions of BNF in sustainable agricultural ecosystems. Ram and Sunil (2010) studied Productivity, quality, economics and nutrients uptake by natural pasture as influenced by introduction of *Stylosanthes* species, phosphorus and potash levels under annona (*Annonasquamosa*) trees. Simarmata et al. (2011) observed Water Saving and Organic Fertilizers Based Technology to Remediate the Health of Paddy Soils and to

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Increase Rice Productivity in Indonesia. Shozeb and Panwar (2013) observed biofertilizer, vermicompost and chemical fertilizer on different biochemical parameters of Glycine max and Vignamungo. Ghany et al. (2013) studied Role of biofertilizers in agriculture. Aggani (2013) studied development of bio-fertilizers and its future perspective. Brahmaprakash et al. (2017) observed microbial functions of the rhizosphere. Chaudhari et al. (2018) studied the Rice nutritional and medicinal properties. Qureshi et al. (2018) studied of diseases on rice (*Oryzasativa*) in major growing field of Bhandara District. Fasusi et al. (2021) reported Agricultural Sustainability: Micribial Biofertilizers in Rhizosphere Management.

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