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Effect of seed bio priming with *Pseudomonas fluorescens* on yield attributing characters and yield of bio-fortified rice

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Abstract

Seed bio-priming with bio agents is one of the new strategy for management of the crop. Present study revealed that seed bio-priming with *Pseudomonas fluorescens* enhanced Seed bio priming with *Pseudomonas fluorescens* significantly increase in effective tillers (177 and 183), panicle length (18.56 and 19.11cm), number of grains panicle⁻¹ (144 and 163) and grain yield (3.70 and 4.23 t ha⁻¹) was observed in crop harvesting stage during both the years of experiments and lowest yield attributing characters and yield was found under farmers practices.

Keywords: Bio-fortified rice, seed bio priming

1. Introduction

Rice is the major caloric supplements for two third of Indian population with a consumption of around 220 gm daily. Zinc malnutrition is a major issue in India as well as some part of Chhattisgarh. Bio-priming treatment is potentially able to promote rapid and more uniform seed germination and plants growth associated with bacterial coatings. Seed priming with living bacterial inoculums is termed as bio priming that involves the application of plant growth-promoting rhizobacteria. It increases speed and uniformity of germination; also ensures rapid, uniform and high establishment of crops and hence improves harvest quality and yield. Seed bio-priming allows the bacteria to enter and adhere the seeds and also acclimatization of bacteria in the prevalent conditions (Mahmood *et al.* 2016) [1].

Seed bio priming is now emphasized to exploit an eco-friendly, easy and cost-effective technique to improve seed germination and growth enhancement which may ultimately lead to increase in the yield (Kumar *et al.*, 2019, Srivastava *et al.*, 2011) [3,5]. Beneficial microbes are included in the process of bio-priming mainly focuses as a technique for colonizing seed and or to control soil-borne pathogen by enhanced production of several secondary metabolites in region of spermosphere. Different strains of *Pseudomonas* are known to enhance root growth and development, resistance to abiotic stress and uptake of nutrients (Martinez-Medina *et al.*, 2011) [4].

2. Materials and Methods

Experiments were conducted under Biotech Kisan Hub project during *kharif season* 2019-20 and 2020-21 at five villages of Mahasamund district (Saradih, Birkoni, Paraswani, Barbaspur and Achhola) in Chhattisgarh. Experiment consists of two treatments of rice variety zinco rice-1 treatment consisting of T₁ - seed bioprimering with *Pseudomonas florescence* and T₂ - farmer practice. Before sowing of seeds, seed bio-priming was done by using *Pseudomonas florescence* @ 5 ml/kg of seed in demonstrated plot. Climatologically, Mahasamund comes under the seventh Agro-climatic region of India i.e. Eastern plateau and hills, which is classified as sub-humid with hot summer and cold winter. The source of rainfall is southwestern monsoon. It receives an average annual rainfall of 1200-1400 mm, mostly (86%) precipitated during the period of rainy season. Observation was recorded under-treated plot and farmers practice at five villages of Mahasamund district.

3. Results and discussion

Among the treatments, Seed bio priming with *Pseudomonas fluorescens* significantly

increase in effective tillers (177 and 183), panicle length (18.56 and 19.11 cm), number of grains panicle⁻¹ (144 and 163) and grain yield (3.70 and 4.23 t ha⁻¹) was observed in crop harvesting stage during both the years of experiments and lowest yield attributing characters and yield was found under farmers practices.

It was observed that plants derived from seed bio-priming with *Pseudomonas* fluorescence consistently at all five locations of Mahasamund district over two years improved germinations and plant growth. Seed bio-priming forms protective covering around the seed coat which ensures better seedling germination and reduces pre and post-emergence

mortality of seedling due to different seed and soil-borne pathogens. Potential bacteria *Pseudomonas* fluorescence used in the present investigation had strong hormonal effects on plants through bio-priming. The similar findings have been also reported by Kotasthane *et al.* (2014) [6]. *Pseudomonas fluorescence* a well-known major rhizobacteria encouraged the plant growth through producing yellow-greenish siderophores which are known for high-affinity transport of iron in the cell. It has been shown that the bacteria completely colonized the roots and caused significantly increase in the root and shoot length which ultimately led to enhancement in yield (Mandal and Kotasthane, 2014) [6].

Table 1: Effective tillers m⁻¹, panicle length (cm), number of grains panicle⁻¹ and grain yield (t ha⁻¹) as influenced by seed bio priming with *Pseudomonas fluorescence* in Bio-fortified rice

	Effective Tillers				Panicle Length (c.m)				Number of Grains/Panicle				Grain Yield			
	Farmer practice		Seed bio-priming with <i>Pseudomonas fluorescence</i>		Farmer practice		Seed bio-priming with <i>Pseudomonas fluorescence</i>		Farmer practice		Seed bio priming with <i>Pseudomonas fluorescence</i>		Farmer practice		Seed bio priming with <i>Pseudomonas fluorescence</i>	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
Mean	159.0	166.2	177.1	183.1	16.3	17.2	18.4	19.1	113.0	127.0	143.2	163.0	3.34	3.61	3.70	4.23
SD	1.93	1.70	1.27	1.33	0.21	0.22	0.65	0.23	1.00	1.00	0.89	0.91	0.07	0.05	0.12	0.14
CV	3.73	2.90	1.61	1.76	0.04	0.05	0.43	0.05	1.00	1.00	0.79	0.82	0.05	0.05	0.013	0.021
Cal.T	17.456		17.46		6.611		13.499		50.472		59.676		4.198		8.968	

SD - Standard deviation, CV- Coefficient of variation, Cal. T -Calculated T Statistic

T table value (5%) = 2.30

T table value (1%) = 3.35

4. References

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