RESEARCH ARTICLE Legume Research- An International Journal, Volume 44 Issue 1: 98-100 (January 2021)

In Vitro Investigation of Biopriming on Seed Quality Parameters in Green Gram [*Vigna radiata* (L.)]

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ABSTRACT

The *in vitro* investigation was conducted during the *kharif* 2017 in the Department of Seed Science and Technology, College of Agriculture, Vijayapura. The experiment comprised of nine biopriming treatments along with control. The experiment was laid out in CRD with three replications. The seeds were subjected to *in vitro* studies and data was analysed statistically. The seed bioprimed with *Rhizobium leguminosarum* @ 20 per cent recorded higher seed germination percentage (90.50 %), shoot length (19.27 cm), root length (12.38 cm), seedling length (31.65 cm), seedling dry weight (373.0 mg), seedling vigour index I (2864), seedling vigour index II (33.75), dehydrogenase enzyme activity (1.010 OD value) and lower electrical conductivity (0.107 dS m^{-1}) followed by *Pseudomonas fluorescens* @ 20 per cent, *Fluorescent pseudomonad* sp. @ 20 per cent as compared to control.

Key words: Biopriming, Dehydrogenase enzyme activity, Germination, Green gram, Seed quality.

INTRODUCTION

Green gram [*Vigna radiata* (L.) Wilczek] is commonly known as mungbean, golden gram, mung or moong (John, 1991). It is the third most important pulse crop grown in India in an area of 33.70 lakh hectares with a total production of 16.43 lakh tonnes and an average productivity of 488 kg ha^{-1} (Anonymous, 2017). It is widely grown in Indian states such as Orissa, Andhra Pradesh, Maharashtra, Karnataka and Bihar. In Karnataka, it occupies an area of 4.15 lakh hectares contributing to total production of 1.15 lakh tones and an average productivity of 277 kg ha^{-1}. Non-availability of quality seeds, absence of suitable seed production technology, heavy flower dropping and heavy incidence of pest and diseases, inadequate post harvest handling operations and lack of knowledge about varieties by farmers lead to fall in productivity. Good quality seed is the key for successful agriculture to India produce a vigorous seedling ensuring higher yield. Low productivity of pulses was mainly attributed to the use of poor quality seed, improper crop management and cultivation in marginal soils which are hungry and thirsty (Sathiya *et al.,* 2017). It could be enhanced by developing suitable low cost seed production technology by combining conventional and scientific practices for achieving the commercial success of the crop.

Seed priming is a controlled hydration process that involves exposing seeds to low water potentials that restrict germination but permits pregerminative physiological and biochemical changes (Khan, 1992). Good seed germination and seedling quality characters are important for forestry, horticulture and agriculture crops. Biopriming is the one of the priming methods which enhances the seed and seedling character. It is a process of biological seed treatment that refers combination of seed and inoculation of seed with beneficial organism to protect seed. It is an ecological approach using selected fungal antagonists against the soil and seed borne pathogens. Biological seed treatments may provide an alternative to chemical control. Therefore the *in vitro* experiment was under taken during 2017 with a objectives of effect of biopriming on seed quality in green gram.

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How to cite this article: Sajjan, A.S., Waddinakatti, S., Jolli, R.B. and Goudar, G.D. (2021). *In Vitro* Investigation of Biopriming on Seed Quality Parameters in Green Gram [*Vigna radiata* (L.)]. Legume Research. 44(1): 98-100. DOI: 10.18805/LR-4071.

Submitted: 18-08-2018 **Accepted:** 24-10-2019 **Online:** 03-12-2019

MATERIALS AND METHODS

The laboratory experiment was conducted during the *kharif* 2017 in the Department of Seed Science and Technology, College of Agriculture, Vijayapura, Karnataka. The experiment consisting of nine treatments and laid out in CRD design with three replications. Different bioagents as per treatment were taken and grown in broth. Then 20 ml of broth from each bioagent taken into beaker separately and made up the volume to 100 ml which becomes 20% solution. The 100 g of seeds were weighed separately for each bioagent and soaked for 8 hours. Then seeds were taken out from solution and kept for germination on standard germination papers by adopting paper towel method and incubated in seed germinator at 25°C and relative humidity of 95 per cent for 7 days. The observations on seed quality parameters *viz*., seed germination percentage (%), shoot length (cm), root length (cm), seedling length (cm), seedling dry weight

(mg), seedling vigour index I(Abdul-Baki and Anderson., 1973), seedling vigour index II, dehydrogenase enzyme activity (OD value) and electrical conductivity (dS m^{-1}) were recorded.

RESULTS AND DISCUSSION

All the biopriming treatments were found to be beneficial by recording higher seed quality parameters over control in the seeds of green gram. The data on present investigation indicated significant differences among the biopriming seed treatments for seed quality parameters (Table 1 and Fig 1). Among the bioprimings, the seed bioprimed with *Rhizobium leguminosarum* @ 20 per cent recorded higher seed quality parameters *viz.*, seed germination percentage (90.50 %), shoot length (19.27 cm), root length (12.38 cm), seedling length (31.65 cm), seedling dry weight (373.0 mg), seedling vigour index I (2864), seedling vigour index II (33.75), dehydrogenase enzyme activity (1.010 OD value) and lower electrical conductivity (0.107 dS m^{-1}) followed by *Pseudomonas fluorescens* @ 20 per cent, *Fluorescent pseudomonad* sp. @ 20 per cent. The increased per cent germination noticed with *Rhizobium leguminosarum* @ 20 per cent followed by *Pseudomonas fluorescens* @ 20 per cent, *Fluorescent pseudomonad* sp. @ 20 per cent was to the tune of 16.77, 14.19 and 12.90 per cent respectively. While control recorded lower seed germination percentage (77.50 %), shoot length (10.74 cm), root length (8.45 cm), seedling length (19.19 cm), seedling dry weight (214.8 mg), seedling vigour index I (1492), seedling vigour index II (16.65), dehydrogenase enzyme activity (0.576 OD value)

Table 1: Seed quality as influenced by biopriming in green gram (*Vigna radiata* L.).

Treatments	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling dry weight (mg)	Seedling vigour index I	Seedling vigour index II	EC values (dS m^{-1})	Dehydrogenase activity (OD value)
T_1	85.50 (67.59)*	11.41	17.50	28.91	281.3	2471	24.05	0.248	0.806
T_2	88.50 (70.15)	11.52	18.20	29.72	341.0	2631	30.20	0.124	0.986
T_3	87.50 (69.27)	11.42	18.04	29.46	298.3	2578	26.10	0.177	0.872
T_4	83.50 (66.27)	11.09	15.74	26.83	264.0	2240	22.04	0.284	0.778
T_5	90.50 (72.02)	12.38	19.27	31.65	373.0	2864	33.75	0.107	1.010
T_6	81.25 (64.32)	10.36	14.41	24.77	257.3	2012	20.90	0.315	0.692
T_7	80.25 (63.59)	10.15	14.36	24.51	243.0	1966	19.49	0.322	0.657
T_8	78.75 (62.52)	8.50	13.63	22.13	233.0	1740	18.35	0.323	0.605
T_9	77.50 (61.83)	8.45	10.74	19.19	214.8	1492	16.65	0.365	0.576
Mean	**83.72 (66.18)**	**10.59**	**15.76**	**26.35**	**278.4**	**2222**	**23.50**	**0.252**	**0.776**
S.Em. ±	**1.71**	**0.207**	**0.33**	**0.47**	**6.15**	**48.25**	**0.56**	**0.0044**	**0.014**
C.D. (P=0.01)	**6.22**	**0.753**	**1.21**	**1.69**	**22.34**	**175.35**	**2.03**	**0.0160**	**0.052**

Note: * Figures in the parenthesis indicate arcsine values. T_1 : *Trichoderma harzianum* @ 20 per cent; T_2 : *Pseudomonas fluorescens*@ 20 per cent; T_3 : *Fluorescent pseudomonad* sp. @ 20 per cent; T_4 : *Bacillus* sp. @ 20 per cent; T_5 : *Rhizobium leguminosarum* @ 20 per cent; T_6 : *Streptomyces* sp. strain AUDT-248@ 20 per cent; T_7 : *Streptomyces* sp. strain AUDT-502@ 20 per cent; T_8 : Hydropriming with $CaCl_2$ @ 2 per cent; T_9 : Control.

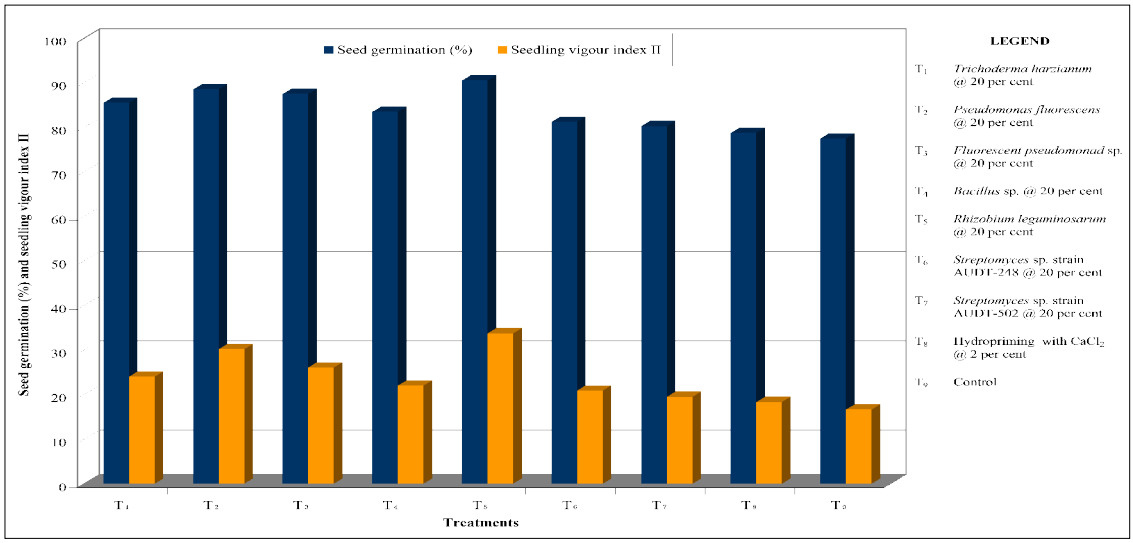


Fig 1: Influence of seed biopriming on seed germination (%) and seedling vigour index II in green gram.

and higher electrical conductivity (0.365 dS m^{-1}). The higher seed quality parameters in seeds treated with *Rhizobium leguminosarum* @ 20 per cent was mainly attributed to increased synthesis of hormones like gibberellins, which would have triggered the activity of specific enzymes that promoted early germination such as amylase, which have brought an increase in availability of starch assimilations. Higher germination may be due to completion of pre germination metabolic activities during seed priming, making the seed ready for germination soon after planting and the highest germination percentage (Fazulla *et al.,* 2017 in green gram). The variation in seed germination percentage and seedling length may be attributed to plant growth promotional effect of seed primers especially bioagents that may produce growth regulatory substances (hormones) upon seed imbibitions (Sathiya *et al.*, 2017 in back gram). The results are in agreement with Vishwas *et al.*, 2017 in chickpea by mentioning the variation in seed germination percentage and seedling length may be attributed to plant growth promotional effect of seed primers especially bioagents that may produce growth regulatory substances (hormones) upon seed imbibitions. Similar results of enhanced speed of germination, germination percentage, root length, shoot length, dry matter production and vigour index were also reported the treated seeds by Srimathi *et al*. (2007) and Kamaraj and Padmavathi (2012) in green gram.

CONCLUSION

The seed biopriming with *Rhizobium leguminosarum* @ 20 per cent is suitable bioagents not only to get high seed germination but also to get high vigorous seedling by enhancing seedling length and other higher seed quality parameters followed by *Pseudomonas fluorescens* @ 20 per cent, *Fluorescent pseudomonad* sp. @ 20 per cent as compared to control.

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