International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 14, Issue 12, 2022, pp.-12075-12077.
Available online at https://bioinfopublication.org/pages/jouarchive.php?id=BPJ0000217

Research Article

ASSESSING THE DIFFERENT BIOPRIMING METHODS AND KNOWLEDGE DISSEMINATION OF BIOPRIMING IN BHENDI THROUGH ON FARM TRIAL

K. NELSON NAVAMNIRAJ[1], G. PRABUKUMAR[2], R. VIJAYAN[3], P. DEVANAND[3] AND S. KAVITHA[4]

[1]Seed Centre, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
[2]Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
[3]Forest College & Research Institute, Mettupalayam, 641301, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
[4]Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
*Corresponding Author: Email - nelsonnavamaniraj@tnau.ac.in

Received: December 04, 2022; Revised: December 27, 2022; Accepted: December 28, 2022; Published: December 30, 2022

Abstract: One of the most important pre sowing seed improvement techniques for managing biotic and abiotic challenges is seed bio-priming, which ensures uniform stand establishment under adverse conditions. "Bio-priming" seed treatment combines biological (inoculating seeds with protective organisms) and physiological (hydrating seeds) components of disease management. Recently, it has been employed as an alternate technique for eradicating numerous soil- and seed-borne diseases. In the current study, an On-Farm Trial with three biopriming treatments *viz*,.(i) 10% *Tirchoderma viridae*, (ii) 10% *Pseudomonas flurescence*, and (iii) in combination of 5% *Tirchoderma viridae* and 5% *Pseudomonas flurescence* for 6 hours was conducted in farmers' fields during *Rabi*, 2020. Untreated seeds served as the control. The findings showed that 10% *Tirchoderma viridae* outperformed other biopriming seed treatment in terms of yield (165.1 q/ha), net return (Rs. 93, 340/ha), and benefit-cost ratio (2.36), than the untreated control. The 10% *Pseudomonas flurescence* primed seeds, which was the next-best treatment, had high yields, net returns, and BCR values of 162.3 q/ha, Rs. 90,340/ha, and 2.28 respectively. So, it was concluded that biopriming of seeds with 10% *Tirchoderma viridae* for six hours increased the production of bhendi. Hence, through dissemination of extension activities like training and method demonstration revealed that the understanding of farmers about bioprming rose from 12.5 to 87.5 percent.

Keywords: *Bhendi, seed biopriming, Knowledge dissemination, Seed yield*

Citation: K. Nelson Navamniraj, *et al*., (2022) Assessing the Different Biopriming Methods and Knowledge Dissemination of Biopriming in Bhendi Through On Farm Trial. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 14, Issue 12, pp.- 12075-12077.

Academic Editor / Reviewer: Dr P. Jaisridhar, Shaloo, Dr K. Malarkodi

Introduction

Bio-priming is an originative skill and cost effective seed treatment that assimilates biological (inoculation of seed with beneficial organism to protect seed) and physiological facets (seed hydration) of disease control [1]. By excreting chemicals and solubilizing minerals, bio-priming directly contributes to the enrichment of plant development [2]. Advance technologies are being used in modern agriculture to increase crop productivity and break through yield barriers. Creating diverse seed enhancement technologies play a significant role in ensuring uniform field emergence, better crop stands and higher yield for various crops. Bio-priming, which combines a variety of plant extracts, microbial products and biotic agents to manage seed crops and target them against biotic and abiotic stresses, has been hailed as a novel management strategy because it uses fewer chemicals, increases the efficacy of the seeds, lowers management costs, eliminates pollution risks and interferes with biological equilibrium to the least amount possible. Therefore, using "On Farm Testing" in farmers' fields, an effort was undertaken to gauge the effectiveness of seed biopriming with novel biocontrol agents (*Tirchoderma viridae* and *Pseudomonas flurescence*) in bhendi.

Materials and Methods

In order to shorten the time lag between the development of a technology and its adoption by farmers, Krishi Vigyan Kendra's demonstrate the newest agricultural technologies to farmers and extension workers of the State Agriculture Department through " On Farm Testing (OFTs) and Frontline demonstrations (FLDs). During the month of *rabi* in 2020, the " On Farm Testing " was done at five sites in Vadakadu Village, Tiruvarankulam block of Pudukkottai district, Tamil Nadu. The village was chosen based on the Pudukkottai district's *rabi* agricultural practices and the Rural Appraisal technique. Farmers received information about seed biopriming treatments and other improved crop management techniques through training programmes prior to the OFT. The CO(Bh)H_4 Bhendi seeds were bioprimed for 6 hours with 10% *Tirchoderma viridae*, 10% *Pseudomonas flurescence* and iii) in combination of 5% *Tirchoderma viridae* and 5% *Pseudomonas flurescence* and They were compared with untreated control seeds. The beneficiaries received the crucial inputs, including bhendi seeds (CO(Bh)H_4), Arka vegetable special, and IPDM components. The Tamil Nadu Agricultural University's approved bhendi farming package and methods were taught to farmers. The KVK scientists routinely visited the OFT fields during various crop stages to ensure that nutrients and plant protection measures were applied in a timely manner. They also offered the farmers other suggested measures and collected feedback data on each stage to further improve the research and extension programme. The yield data was assessed using the cumulative yield method, with 10% *Tirchoderma viridae*, 10% *Pseudomonas flurescence* and iii) in combination of 5% *Tirchoderma viridae* and 5% *Pseudomonas flurescence*. A field day was held in conjunction with extension agents from the Department of Agriculture to share the improved farming practices used by OFT farmers with other farmers. A well-planned interview schedule with a predetermined list of questions was used to gather the pertinent information regarding the cost of cultivation, market preferences and other restrictions. Each farmer provided statistics on crop output and profitability for the OFT and control plots, which were then averaged across all locations. Using the appropriate statistical methods, the gathered data were pooled and tabular analysis was completed to determine the technical gap.

Table-1 Performance of biopriming in bhendi under OFT programme

Technology option	Field Emergence (%)	Plant population at 60 DAP(%)	Fruit Yield (q/ha)
Untreated	82	74	156.3
Biopriming with 10 % *Tirchoderma viridae*	94	90	165.1
Biopriming with 10% *Pseudomonas flurescence*	90	84	162.3
Biopriming with 5 % *Tirchoderma viridae* + 5 % *Pseudomonas flurescence*	90	86	161.5

Table-2 Economic analysis of bioprimed seeds in bhendi

Treatments	Gross cost (Rs./ha)	Gross income(Rs./ha)	Net income(Rs./ha)	BCR
Untreated	38,500	1,24,880	86380	2.24
Biopriming with 10 % *Tirchoderma viridae*	39,500	1,32,080	93340	2.36
Biopriming with 10% *Pseudomonas flurescence*	39,500	1,29,840	90340	2.28
Biopriming with 5 % *Tirchoderma viridae* + 5 % *Pseudomonas flurescence*	39,500	1,29,200	89700	2.27

Table-3 Distribution of respondents based on their knowledge level (n=40)

SN	Category	Before OFT		After OFT	
		Number	Per cent	Number	Per cent
1	Low	14	35.0	5	12.5
2	Medium	21	52.5	25	62.5
3	High	5	12.5	10	25.0
	Total	40	100	40	100

Table-4 Knowledge level of the bhendi farmers in improved production technologies (n=40)

SN	Technologies	Before OFT programme		After OFT programme		% Increase in Knowledge level of farmers
		Number	%	Number	%	
1	Application of FYM	40	100	40	100	0
2	Improved Bhendi varieties from public sector	10	25.0	32	80.0	55.0
3	Optimum seed rate	32	80.0	38	95.0	15.0
4	Seed biopriming	5	12.5	35	87.5	75.0
5	Foliar nutrition	20	50.0	33	82.5	32.5
6	INM	19	47.5	36	90.0	42.5
7	IWM	10	25.0	26	65.0	40.0
8	IPDM	10	25.0	36	90.0	65.0

When the cropping phase is complete, furthermore, using, the knowledge level of OFT farmers using improved bhendi production technology was compared before and after KVK interventions and knowledge test was done as recommended by [3]. the respondents also received the various improved production technologies such as the choice of improved varieties, Integrated Nutrient Management (INM), foliar spray of crop boosters (Arka vegetable special), and Integrated Pest and Disease Management (IPDM).

[4] States that the knowledge level was scored, with each correct response receiving two points and each erroneous response receiving one point. The pre- and post-evaluation scores were evaluated, and the respondents' knowledge Index was determined as shown below.

The formula used for the calculation of knowledge index of each respondent was

Knowledge Index = (K/P) x 100

Where,

K - Knowledge scores obtained by an individual respondent

P - Maximum possible scores for all items

The respondents were classified into three categories such as low, medium and high using mean and standard deviation.

Results and Discussion

The results of the current study, which evaluated the efficiency of seed biopriming with *Tirchoderma viridae* and *Pseudomonas flurescence* of bhendi from seed to harvest in farmers' fields, are summarised below.

The results showed that the farmers, using 10% *Tirchoderma viridae* and 10% *Pseudomonas flurescence* primed seeds, respectively, produced an average fruit production of 165.1 and 162.3 q/ha, compared to the control's 156.1 q/ha [Table-1]. (9.0 q/ha) The difference in fruit output between *Tirchoderma viridae* primed seed and control. *Tirchoderma viridae* primed seeds also performed exceptionally well in terms of plant population and field emergence.

The same outcome is also supported by [5], who discovered that seeds treated with *Pseudomonas flurescence* had improved bhendi yield and growth. An increase in okra plant height, fruit production, and yield per plant had received [6]. Bioprimed seeds with *Trichoderma harzianum*, which increases plant tolerance to abiotic stressors and controls disease-causing organisms through the release of antimicrobial compounds [7,8]. As a result of seed treatment with *Tirchoderma viridae* and *Pseudomonas fluorescens*, *Tirchoderma viridae* have been shown to protect a variety of crop plants by hyper parasitizing pathogenic fungi [9,10]. When used, bioagents have a remarkable ability for multiplication and grow exponentially they can even resist stress conditions by spores with strong walls form [11]. The results of the present experiment are supported by data from [12,13] on improvements in the vegetable output of bitter gourd and brinjal respectively. *Tirchoderma viridae* were used to increase yield in white cabbage and cauliflower, according to [14].

Seed hydration is followed by the introduction of helpful microorganisms to the seed surface in a process known as seed biopriming, which is regarded as an advanced method of seed treatment [1,15,16]. According to initial inoculum levels, it was found that during biopriming, bacterial populations increased (10 to over 10,000 folds) [17]. Different priming techniques are used in the seed biopriming process, such as wet finely crushed lignite or coal (solid matrix priming) [18] or moist conditions in a plastic bag [19]. Before priming, it's crucial to disinfest seeds in order to minimise or get rid of the undesirable microorganisms, if the seeds are diseased or contaminated with pathogens, this will be amplified during the priming process, having unfavourable consequences on emerging plants [1,20,21]. Additionally, the survival of helpful bacteria used during the seed biopriming process may be harmed by the growth of undesirable indigenous microorganisms [22].

The economic analysis of biopriming was studied based on gross income which was calculated with average yield multiplied by prevailing market price of Rs.800 /quintal during that particular year. It could be observed that the average net income of the *Tirchoderma viridae* bioprimed seeds was Rs.1,32,080/- ha, which was Rs.1,29,840 per ha, Rs.1,29,200 per ha and Rs.1,24,880 in *Pseudomonas flurescence* and *Tirchoderma viridae* + *Pseudomonas flurescence* and control plots, respectively. Further, the benefit cost ratio was 3.40,3.29, 3.27 and 3.17, respectively [Table-2].

Knowledge is a requirement for innovation adoption and would give farmers the ability to fully understand a technology and its relative advantages. When evaluating the effective diffusion of technology, the level of farmer knowledge regarding the effects of biopriming and other improved techniques is essential.

So, an effort was undertaken to compare the level of knowledge before and after KVK interventions during the conduct of OFT programme, the degree of expertise of medium category bhendi growing farmers in upgraded technologies increased from 52.5 to 62.5% [Table-3]. Due to extension activities, the percentage of farmers with modest expertise was reduced from 35 to 12.5%.

When it comes to farmers' understanding of new technologies, it can be shown that before the OFT programme was implemented, only about 12.5 percent of farmers knew about presowing seed treatment of biopriming, and that number rose to 87.5 percent after the programme was implemented [Table-4].

Like this, the percentage improvement in farmers' knowledge on the usage of hybrid bhendi, optimum seed rate, seed biopriming, foliar nutrition, INM, IWM and IPDM was 55.0, 15.0, 75.0, 32.5, 42.5, 40.0, and 65.0 percent, respectively. Improved level of knowledge on bhendi producing technologies could be the extension activities like training sessions, method demonstrations, and field days during the conduct of the OFT programme by KVK. Additionally, KVK Pudukkottai contributed significantly to the spread of technologies by providing important material throughout the extension operations.

Conclusion

It may be established that seeds biopriming with 10% *Tirchoderma viridae* outperformed other bioprimed seeds and untreated control in terms of yield (165.1 q/ha), net return (Rs. 93,340/ha), and benefit cost ratio (2.36) followed by the 10% *Pseudomonas flurescence* primed seeds, which had high yield, net return and BCR values of 162.3 q/ha, Rs, 90,340/ha and 2.28, respectively. So it was discovered that biopriming of seeds with 10% *Tirchoderma viridae* for six hours increased the yield of bhendi and the knowledge on seed bioprming rose from 12.5 to 87.5 percent.

Application of research: Study and understanding of farmers about bioprming

Research Category: On Farm Testing (OFTs), Frontline demonstrations (FLDs)

Acknowledgement / Funding: Authors are thankful to Seed Centre, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India

****Principal Investigator or Chairperson of research: K. Nelson Navamniraj**
University: Tamil Nadu Agricultural University, Coimbatore, 641003, India
Research project name or number: Research station study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Vadakadu Village, Tiruvarankulam block

Cultivar / Variety / Breed name: Bhendi

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

References

[1] Reddy P.P. (2013) *Bio-priming of seeds. In, Reddy, P.P. (Ed.), Recent Advances in Crop Protection. Springer, India*, 83-90.
[2] Sukanya V., Patel R.M., Suthar K.P. and Singh D. (2018) *International Journal of Pure and Applied Bioscience* 6, 771−783.
[3] Singh A.K. (1986). Tests, Measurements and Research Methods in Behavioral Sciences. Tata McGraw-Hill publishing company Ltd., New Delhi.
[4] Madhan P. (2002) M.*Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India*.
[5] Rafique M., Riaz A., Anjum A., Qureshi M.A. and Mujeeb F. (2018) *Universal Journal of Agricultural Research*, 6(3), 105-112.
[6] Rai A.K. and Basu A.K. (2014) *The Bioscan*, 9(2), 643-647.
[7] Ahmad P., Hashem A., Abd-Allah E.F., Alqarawi A.A., John R., Egamberdieva D. and Gucel S. (2015) *Frontiers in plant science*, 6, 868.
[8] Mastouri F., Bjorkman T. and Harman G.E. (2012) *Molecular plant-microbe interactions*, 25(9), 1264-1271.
[9] Durrell L.W. (1968) *Mycopathol Mycol. Appl.*,35, 138-144.
[10] Barnett H.L. and Binder H.A. (1973) *Annual Review of Phytopathology*, 11, 273-292.
[11] Bharath Lokesh B.G.S. and Shetty H.S. (2005) *Integrative Biosciences*, 9, 75-78.
[12] Janaki I., Suresh S.and Karuppuchamy P. (2012) *Journal of Biopesticides*, 5(1), 87-90.
[13] Naveen Kumar K.S., Sowmyamala B.V., Sadhan Kumar P.G., Vasudev P.N., Vasantha Kumar R. and Nagaraj H.T. (2012) *International Journal of Applied Biology & Pharmaceutical Technology*, 3, 1-7.
[14] Abd Alla M.A. and El-Shoraky F.S. (2017) *Journal of Sustainable Agricultural Sciences*, 43(1), 27-38
[15] Singh H.B. (2016) *Indian Phytopath*., 69, 203-209.
[16] Singh V., Upadhyay R.S., Sarma B.K. and Singh H.B. (2016) *Int. J. Agric. Environ. Biotechnol.*, 9, 361-365.
[17] Callan N.W., Mathre D. and Miller J.B. (1990) *Plant Dis*., 74, 368-372.
[18] Harman G.E. and Taylor A.G. (1988) *Phytopathology* 78, 520-525.
[19] Callan N.W, Mathre D.E. and Miller J.B. (1991) *Hortic. Sci*.,26, 1163-1165
[20] Jain A., Singh A., Singh S. and Singh H.B. (2015) *J. Basic Microbiol.*, 55, 961-972.
[21] Singh A., Sarma B.K., Upadhyay R.S. and Singh H.S. (2013) *Microbiol. Res.*, 168, 33-40.