



Adoption of Recommended Bio-fertilizer Technologies among Soybean Growers in Ujjain District of Madhya Pradesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Bio-fertilizers are living organisms that enrich the nutrient quality of the soil. It refers to the use of microbes instead of chemicals to enhance the nutrition of the soil. Conventional fertilizers are those formed through decomposition including compost; household wastes and green manure while chemical fertilizers are manmade or mined. Conventional fertilizers are nature friendly but not effective as chemical fertilizers. Conventional or natural fertilizers provide nutrient to plant at slow rate and lower concentration but chemical fertilizers provide nutrient at fast rate and higher concentration so, farmers frequently try to use chemical fertilizers in the field for crop development. Ujjain district has a high potential for soybean production. The crop is processed for oil, protein and animal feed. A smaller percentage is processed into soy milk, soy flour, soy protein, tofu for human consumption. The higher use of chemical fertilizers in soybean crop for higher yield creates negative effect on human, animal and environment health. Hence, research in the use of bio-fertilizer in soybean crop in Ujjain district was conducted with 120 respondents. The major finding (e.g. quantity of bio-fertilizer used as seed treatment) was obtained as Adoption of recommended bio-fertilizer technologies by beneficiary farmers was higher than non beneficiary farmers.

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1. INTRODUCTION

Bio-fertilizer is a novel tool for agriculture because it provides eco- friendly organic input and is more cost-effective than chemical fertilizers. Bio-fertilizer symbiotically associates with plant roots through the utilization of microorganisms to convert complex organic material in simple compounds. Bio-fertilizers are already used in organic farming systems, but there is currently little mechanistic insight behind the choice of plant cultivars and microbial inoculants [1,2]. There are different types of microorganisms which are used as bio-fertilizer namely Rhizobia and Phosphate solubilizing bacteria (PSB) which are commonly applied in microbial inoculants legumes (Soybean). The rhizobium culture strains are antigenically selective and require a particular host. Recently, bio-fertilizers are commercially available in the market for farmers [3]. This help replenishes the soil nutrients and reduces the dependency on chemical fertilizers. This helps in maintaining the mineral content of the soil and reduces pollution in the environment. Although bio-fertilizers have been promoted due to its several beneficial used their use has been limited. The objectives of the study to determine the adoption behavior of farmers about the use of biofertilizers.

Virang et al. [4] showed that majority of the beneficiaries were found to have medium adoption of various components of soybean production technology under ATMA program Issa and Hamm [5] studied adoption of organic farming as an opportunity for Syrian farmer and revealed that most farmers used at least one of the practice that is also part of certified organic production and hold strong positive attitudes and intention to adopt organic farming.

Lothe et al. [6] studied awareness and adoption of organic farming by vegetable growers revealed that training received, landholding, extension contact were found to be positive and highly significant.

Mahant et al. [7] showed that the majority of trained farmers had a high level of knowledge concerning making different organic manures. It was concluded that there was a significant role of Krishi Vigyan Kendra (KVK) in promotion of an innovative organic manures production technology and demonstration. This will ensure

the adoption process and entrepreneur development as a source of income for the promotion of organic farming in the Janjgir–Champa district. This is important towards the sustainability of the agro-ecosystem.

Dhakar et al. [8] found that about 40 per cent of farmers were found to apply the bio-fertilizers. Knowledge gap by farmers about the use of bio-fertilizers and the use of chemical fertilizers were found to be the prime factors influencing lack of adoption of bio-fertilizers.

1.1 Objective

To determine the adoption behaviour of farmers in relation to the use of bio- fertilizers.

2. MATERIALS AND METHODS

The samples for the present study were selected randomly. A list of farmers from ten selected villages who used recommended bio-fertilizers technologies on soybean crop were selected. From these selected villages, 60 beneficiary farmers were selected. On the other hand, 60 non-beneficiary farmers were also selected from the same village as the previous. Thus, a total of 120 respondents were used in this study.

Adoption of recommended bio-fertilizer technology in the present study level of adoption on the farmers regarding recommended bio-fertilizer technology in soybean crop. An adoption index was developed to know the adoption level of respondents. A village wise list of beneficiary was prepared with the help of information obtained from Krishi Vigyan Kendra Ujjain and from beneficiaries list six farmers selected from each villages and same list was prepared for non-beneficiaries for comparative study between beneficiary and non beneficiary.

3. RESULT AND DISCUSSION

3.1 Adoption Behavior of Farmers in Relation to Use of Bio-fertilizer

Detail distribution of respondents according to their overall adoption of bio-fertilizers in soybean crop is presented in Table 1.

Table 1 show that out of total 60 beneficiary respondents 53.33 per cent of respondents had medium adoption of recommended bio-fertilizer

technologies while 30.00 per cent were high followed by 16.67 per cent were low adoption of recommended bio-fertilizer technologies.

The table also revealed that out of 60 non-beneficiary farmers, higher percentage of the respondents i.e., 48.33 per cent had low adoption of recommended bio-fertilizers technologies.

Thus, the majority of beneficiaries were found to be medium level in terms of adoption of recommended bio-fertilizer technologies followed by high and low level of adoption of recommended bio-fertilizer technologies.

3.2 Adoption Behaviour of Beneficiary Farmers

A close examination of the results indicate that a considerable percentage i.e. 53.33 per cent of the respondents belong to medium level adoption rate, whereas 30.00 per cent and 16.67

per cent of respondents belong to bio-fertilizer users in high and low level of adoption, respectively. This finding was in conformity with Pathak (2016). The reasons for the low level of adoption could be due to the fact that some aspects of bio-fertilizer technology involved difficult technical aspects which might have come in the way of acquiring needed information.

The result indicated that the beneficiary farmers of soybean crop using bio-fertilizers. It was found that 68.33 per cent of the respondents used Rhizobium while, 38.33 per cent used PSB followed by 18.34 per cent used other bio-fertilizers in soybean crop. Purchase of bio-fertilizers by soybean growers indicated 53.33 per cent of respondents purchased bio-fertilizers from insecticide shop, while 40.00 per cent purchased from Agriculture University or KVK and the remaining 25.00 per cent respondents purchased bio-fertilizers from other places. Most of the respondents, about 60.00 per cent used bio-fertilizers as seed treatment on soybean crop

Table 1. Distribution of the total respondents according to their extent of adoption of recommended bio-fertilizers technologies in soybean crop

Adoption behavior	Beneficiary	Non-beneficiary
Low	10(16.67)	29(48.33)
Medium	32(53.33)	23(38.33)
High	18(30.00)	08(13.34)

(Figures in parenthesis indicate percentage)

Table 2. Practice wise adoption behavior of beneficiary farmers for using recommended bio-fertilizers technology on soybean crop

Practices		Adoption behavior			F	P	M.S.	Rank
		High	Medium	Low				
Type of bio-fertilizer used	Rhizobium	23	13	05	41	68.33	3.03	I
	PSB	14	06	03	23	38.33		
	Other	04	06	01	11	18.34		
Purchase of bio-fertilizers	Agriculture university/KVK	15	07	02	24	40.00	2.81	II
	Insecticide shop	12	16	04	32	53.33		
	Other	06	09	00	15	25.00		
Method of application	Seed treatment	18	11	07	36	60.00	2.43	IV
	Broadcasting	10	13	07	30	50.00		
Quantity of bio-fertilizers used for one hectare	<1 kg/ha	05	07	00	12	20.00	2.56	III
	1-5kg/ha	12	14	05	31	51.66		
	> 5 kg/ha	08	13	06	27	45.00		
Time of application	Before sowing	17	13	08	38	63.33	2.28	V
	After sowing	07	11	09	27	45.00		
Sole application of bio-fertilizers		33	13	07	53	88.33	2.2	VI
Insect and disease control by use of bio-fertilizer		23	09	05	37	61.66	1.53	VIII
Increase yield		19	26	07	52	86.66	1.93	VII

Where, F= Frequency, P= Percentage, M.S. = Mean Score

Table 3. Practice wise adoption behavior of non beneficiary farmers for using recommended bio-fertilizers technology on soybean crop

Practices		Adoption behavior			F	P	M.S.	Rank
		High	Medium	Low				
Type of bio-fertilizer used	Rhizobium	12	18	09	39	65.00	2.58	I
	PSB	07	14	05	26	43.33		
	Other	03	05	01	09	15.00		
Purchase of bio-fertilizers	Agriculture university/K VK	10	07	04	21	35.00	2.35	II
	Insecticides shop	15	11	03	29	48.33		
	Other	02	07	03	12	20.00		
Method of application	Seed treatment	11	15	09	35	58.33	2.23	III
	Broadcasting	13	09	05	27	45.00		
Quantity of bio-fertilizers used for one hectare	<1 kg/ha	05	06	00	11	18.33	2.1	IV
	1-5kg/ha	08	15	06	29	48.33		
	>5 kg/ha	05	07	10	22	36.66		
Time of Application	Before sowing	10	15	11	36	60.00	1.86	V
	After sowing	03	09	14	26	43.33		
Using bio fertilizer without chemical fertilizers	Mixing with	07	15	09	31	51.66	1.00	VII
Insect and disease control by use of bio-fertilizer		08	11	15	34	56.66	1.01	VI
Increase yield		05	11	20	36	60.00	0.95	VIII

Where; F= Frequency, M.S. = Mean Score, P= Percentage

whereas 50.00 per cent had used bio-fertilizers through broadcasting. Most of the respondents about 51.66 per cent had used 1-5 kg/ha of bio-fertilizer, whereas 45.00 per cent had used >5 kg/ha of bio-fertilizer and 20.00 per cent of the respondents had used <1 kg/ha of bio-fertilizers. Regarding time of application, majority of the respondents 63.33 had used bio-fertilizer in soybean crop before sowing, whereas 45.00 per cent had used after sowing. With respect to the utilization of bio-fertilizer without mixing with chemical fertilizers, 88.33 per cent beneficiary in soybean crop. 61.66 per cent of respondent indicated the use of bio-fertilizer control to Insect and disease. 86.66 per cent respondents indicated the use of bio-fertilizers to increase the yield of soybean crop.

3.3 Practice Wise Adoption Score of Non Beneficiaries Farmers on the Utilization of Recommended Bio-fertilizers Technologies in Soybean Crop

Study showed that type of bio-fertilizer used had I rank, Purchase of bio-fertilizers II, Method of application III, Quantity of bio-fertilizers used for one hectare IV, Time of application V, Insect and

disease control by use of bio-fertilizer VI, Using bio-fertilizer without mixing with chemical fertilizers VII and Increase yield VIII.

4. CONCLUSION

Thus, it is concluded from this study that the adoption behaviour of the beneficiary was higher than non-beneficiary farmers. Difference between the adoption of bio-fertilizer technology was due to the level of mass media exposure, extension contact, guidance from an expert, risk-bearing ability, their education level, landholding and psychological aspects. All these variables were used to find out the adoption level of farmers. Impact on soybean yield was higher on beneficiary farmers than non-beneficiary. Improved soil condition, subsidy on purchasing of bio-fertilizer, guidance from experts encouraged farmers to adopt bio-fertilizer. Adoption of recommended bio-fertilizer technologies by beneficiary farmers was higher than non-beneficiary farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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