Knowledge of Liquid Biofertilizers among the Soybean Growers in Marathwada region of Maharashtra

ABSTRACT

~~The study "Knowledge and adoption of liquid biofertilizers among the soybean growers" was conducted to study the Knowledge of liquid biofertilizers~~The study was conducted to evaluate the knowledge of liquid biofertilizers among the soybean growers in Parbhani district of Marathwada region of ~~Maharashtra state~~the Indian state of Maharashtra. 120 respondents were randomly selected for the present study from 12 villages of 2 talukas of the Parbhani district. Data ~~were~~ was collected using a well-structured interview schedule. There were two dependent variables namely "knowledge" and "adoption" and ten independent variables. Data were analysed by using frequency, percentage, mean and standard deviation. It was observed that majority of soybean growers (75.00%) had medium level of knowledge about liquid biofertilizer, followed by low (13.33%) and high (11.67%) level of knowledge. It was observed that more than 90.00 per cent of the soybean growers had correct knowledge about liquid-biofertilizers that ~~is~~ are recommended for soybean, recommended application method of liquid-biofertilizer in soybean, used liquid-biofertilizer and chemical fertilizers separately, properly applied liquid-biofertilizer after fungicides treatment only, drying of seed treated with liquid-biofertilizer in shade before sowing.

Keywords: Knowledge, liquid biofertilizers, Maharashtra, soybean, soybean growers.

1. INTRODUCTION

Soybean (*Glycine max* L. Merrill) is a vital legume crop that plays a crucial role in human livelihoods. It is rich in high-quality protein (40%) and edible oil (20%), containing essential amino acids. Soybean also serves as a significant source of protein in livestock feed, contributing to about two-thirds of the world's protein concentrate used in animal feed and providing 25% of the global edible oil supply. Brazil ranks first in soybean production with 121.80 million tonnes followed by United States of America (112.55 million tonnes), Argentina (48.80 million tonnes), China (19.60 million tonnes) and India (11.23 million tonnes) accounting for 34, 32, 14, 6 and 3 per cent of world production, respectively.

India ranks fourth in area with 12.12 million hectares (29.94 million acres) accounting for 8.86 per cent of the world area and fifth in production with 11.23 million tonnes in 2020-21. The major soybean growing states are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, and Telangana. According to the first advance estimates 2023-24, Government of

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India, soybean crop is estimated at 115.28 lakh tonnes as compared to 149.85 lakh tonnes in 2022-23. Among the states, Madhya Pradesh is leading in soybean production with 45.97 lakh tonnes followed by Maharashtra (45.74 lakh tonnes), Rajasthan (10.69 lakh tonnes), Karnataka (4.73 lakh tonnes) Gujarat (4.23 lakh tonnes) and Telangana (2.90 lakh tonnes). (Source: Soybean Outlook, January 2022, Agricultural Market Intelligence Centre, PJTSAU)

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Liquid biofertilizers, derived from natural sources and enriched with beneficial microorganisms, offer a sustainable solution for enhancing soil fertility, reducing reliance on chemical inputs, and promoting eco-friendly agricultural practices. These biofertilizers can mobilize and convert unavailable nutrients into accessible forms through biological processes. For soybean cultivation, commonly used liquid biofertilizers include Rhizobium and Phosphorus Solubilizing Bacteria (PSB).

Effective application of liquid biofertilizers requires certain precautions: they should be protected from direct sunlight and stored in cool conditions. They must not be mixed with chemical inputs like insecticides, fungicides, or fertilizers. In seed treatment, treated seeds should be kept in the shade for half an hour before sowing. Ensuring soil moisture is crucial before sowing treated seeds, as dry soil can cause the death of beneficial microorganisms. Additionally, applying chemical fungicides alongside or immediately after biofertilizers can destroy the microorganisms in the biofertilizers.

Liquid biofertilizers such as Rhizophous (a mixture of Rhizobium and PSB), Azotobacter, and Bio-NPK Consortia are available for sale at ICAR's All India Network Project on Soil Biodiversity-Biofertilizers (AINP SBB) under the Department of Soil Science and Agricultural Chemistry at Vasantrao Naik Marathwada Agricultural University (VNMKV), Parbhani. These biofertilizers are recommended for soybean cultivation.
(Source: All India Network Project on Soil Biodiversity-Biofertilizers (AINP SBB), Department of Soil Science and Agricultural Chemistry, VNMKV, Parbhani)

~~The study was conducted with an objective to study the knowledge of liquid biofertilizers among the soybean growers in Parbhani district of Marathwada region of Maharashtra state. This study aims to provide insights that could inform strategies to promote the widespread adoption of liquid biofertilizers and enhance the sustainability of soybean farming.~~

2.MATERIALS AND METHODS

~~The present study was conducted purposively in the Parbhani district of the Marathwada region in Maharashtra, where a considerable number of soybean growers use~~

~~liquid biofertilizers.~~ The objective was to study the knowledge of liquid biofertilizers among soybean growers. Two talukas, Parbhani and Jintur, were selected purposively from the district. From each taluka, six villages with a significant number of soybean growers using liquid biofertilizers were randomly chosen. In each village, 10 soybean growers who using liquid biofertilizers were selected randomly, making a total of 120 respondents for the study. Two dependent variables Knowledge and Adoption were selected for the study. The knowledge test was formed using the practice packages recommended by VNMKV, Parbhani's liquid biofertilizer technology's literature and after consulting with subject matter specialists. A list of 25 items was selected for the purpose and each was administered in a question form to the respondents to obtain the response. One point was awarded for a right response to a question, and zero for a wrong one. This quantified the replies. Consequently, the highest possible score was 25, and the lowest possible score was 0.

The total number of questions that a respondent answered correctly was added up to determine their overall knowledge score.

After computing knowledge level score, the respondents were grouped into low, medium and high knowledge categories based on the mean ± SD as indicated below;

Sr. No.	Category	Score
1	Low	Up to 18.46
2	Medium	18.47 to 22.90
3	High	22.91 and above

(Mean=20.68) (S.D.= 2.22)

Data were collected from respondents using an interview schedule through personal interviews. The data were analysed using frequency, percentage, mean and standard deviation.

3.RESULTS AND DISCUSSION

1. Knowldege of liquid biofertilizers among the soybean growers

The data regarding the overall knowledge of liquid biofertilizers among the soybean growers were presented in Table 1.

Table 1: Distribution of soybean growers according to their overall knowledge

(N=120)

Sr. No.	Knowledge	Frequency	Percentage
1	Low (up to 18.46)	16	13.33
2	Medium (18.47 to 22.90)	90	75.00
3	High (22.91 and above)	14	11.67

It is noticed from the Table 1 that majority of respondents (75.00 %) had medium level of knowledge about liquid biofertilizer, followed by low (13.33 %) and high (11.67 %) level of knowledge.

It was observed that majority of the respondents had medium level of knowledge. These findings were supported by Bodake [1], Adhayage [2], Kharmale [3], Hiremath [4], Lavania and Dilipkumar [5], Magarvadiya and Patel [6] and Jadhav [7].

Most of the soybean growers had medium level of knowledge about liquid biofertilizer technology. The probable reason could be that most of them having medium extension contact, and were educated up to Middle school level and High school level, had medium source of information and innovativeness.

Table 2: Knowledge of soybean growers about specific aspects of liquid-biofertilizer

(N=120)

Sr. No.	Specific knowledge about liquid-biofertilizer	Frequency	Percentage
1	Biofertilizers contains beneficial living microorganisms.	98	81.67
2	Forms of biofertilizers.	93	77.50
3	Liquid-biofertilizer that are recommended in soybean.	120	100.00
4	Role of rhizobium.	86	71.67
5	Crops in which rhizobium is recommended.	91	75.83
6	Specific nitrogen fixing activity of rhizobium.	103	85.83
7	Role of PSB.	97	80.83
8	Specific phosphorous solubilizing activity of PSB.	100	83.33
9	Consortium (Mixture) of liquid-biofertilizers that is recommended in soybean.	96	80.00
10	Recommended application method of liquid-biofertilizer in soybean.	116	96.67
11	Recommended application dose of liquid-biofertilizer (Rhizobium and PSB consortium) in soybean.	87	72.50
12	Liquid-biofertilizer and chemical fertilizers should be used separately.	110	91.67
13	Liquid-biofertilizer should be used after the application of fungicide treatment.	113	94.17
14	Liquid-biofertilizer should not be mixed with insecticides.	104	86.67
15	High temperature or direct sunlight kills the microorganism present in liquid-biofertilizer.	72	60.00
16	Drying of seed treated with liquid-biofertilizer in shade before sowing.	108	90.00

17	Soil should be necessarily moist before sowing of inoculated soybean seed.	104	86.67
18	Duration of shelf-life of liquid-biofertilizer.	86	71.67
19	Advantage that useful nitrogen reserve is available in soil for subsequent crop.	101	84.17
20	Advantage in improvement of grain quality.	103	85.83
21	Advantage in improvement of soil fertility and soil texture.	100	83.33
22	Advantage in increasing the productivity and biological activity of soil.	100	83.33
23	Advantage of liquid-biofertilizer as compared to powder form.	93	77.50
24	Availability of liquid-biofertilizers from various sources such as at VNMKV, Parbhani or Krishi Seva Kendar or Krishi Vigyan Kendra.	104	86.67
25	Liquid-biofertilizer consortium available at VNMKV, Parbhani that is recommended for soybean.	97	80.83

It is noticed from the Table 2 that 81.67 per cent respondents knew that biofertilizers contains beneficial living microorganisms, 77.50 per cent knew about forms of biofertilizers, 100.00 per cent had knowledge about liquid-biofertilizer that is recommended in soybean. Further is was revealed that 71.67 per cent respondents knew about function of rhizobium, 75.83 per cent had knowledge about crops in which rhizobium is recommended, 85.83 per cent knew about specific nitrogen fixing activity of rhizobium.

With respect to function of PSB and specific phosphorous solubilizing activity of PSB, 80.83 and 83.33 per cent respondents had knowledge, respectively. 80.00 and 96.67 per cent respondents knew about consortium of liquid-biofertilizers recommended in soybean and recommended application method of liquid-biofertilizer in soybean, respectively. 72.50 per cent respondents knew about recommended application dose of liquid-biofertilizer (Rhizobium and PSB consortium) in soybean.

Further, Table 2 revealed that knowledge about Liquid-biofertilizer and chemical fertilizers should be used separately, was known by 91.67 per cent respondents, and liquid-biofertilizer should be used after the application of fungicide treatment was known by 94.17 per cent. Liquid-biofertilizer should not be mixed with insecticides was known by 86.67 per cent respondents.

With respect to knowledge that high temperature or direct sunlight kills the microorganism present in liquid-biofertilizer was known by 60.00 per cent of the respondents, 90.00 per cent respondents knew about drying of seed treated with liquid-biofertilizer in shade. 86.67 and 71.67 per cent respondents knew that soil should be necessarily moist before sowing of inoculated soybean seed and the duration of shelf-life of liquid-biofertilizer, respectively.

Advantage that useful nitrogen reserves are available in soil for subsequent crop and advantage in improvement of grain quality due use of liquid biofertilizer was known by 84.17 and 85.83 per cent of the respondents, respectively. 83.33 per cent respondents had knowledge about advantage in improvement in soil fertility and soil texture and increase in productivity and biological activity of soil. 77.50 per cent of the respondents knew about the advantage of liquid-biofertilizer as compared to powder form.

With respect to availability of liquid-biofertilizer from various sources such as at VNMKV, Parbhani or Krishi Seva Kendar or Krishi Vigyan Kendra, 86.67 per cent of respondents had knowledge. 80.83 per cent of respondents knew about liquid-biofertilizer consortium that is available at VNMKV, Parbhani which is recommended for soybean.

The probable reasons for good knowledge could be that they have got proper information from VNMKV, Parbhani and KVK, Parbhani about the liquid biofertilizer technology that is recommended in soybean along with the precautions that are supposed to be taken while using it.

4.CONCLUSION

It was observed that majority of soybean growers (75.00%) had medium level of knowledge about liquid biofertilizer, followed by low (13.33%) and high (11.67%) level of knowledge. It was observed that more than 90.00 per cent of the soybean growers had correct knowledge about liquid-biofertilizer that is recommended for soybean, recommended application method of liquid-biofertilizer in soybean, used liquid-biofertilizer and chemical fertilizers separately, properly applied liquid-biofertilizer after fungicides treatment only, drying of seed treated with liquid-biofertilizer in shade before sowing. The study also identified some knowledge gaps, particularly regarding the shelf-life of liquid-biofertilizers and the impact of high temperatures on the microorganisms present. Overall, the study suggests that promoting the adoption of biofertilizers among soybean farmers requires a multi-faceted approach that addresses knowledge gaps, ensures availability and accessibility, and provides policy support. By addressing the knowledge gaps identified in this study, policymakers, extension agencies, and other stakeholders can develop effective strategies to promote the adoption of biofertilizers among soybean farmers. Ultimately, this can contribute to improved crop productivity, soil health, and environmental sustainability.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI Technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image Generators have been used during the writing or Editing of this manuscript.

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