

A study on the perception of farmers about biopesticides in Karnataka

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Abstract: Biopesticides are becoming more popular as a safe and chemical-free alternative to chemical pesticides. This shift is important in ensuring the quality of agricultural products and promoting environmental sustainability. The study analyzed farmers' perceptions of biopesticides in the Sirsi district of Karnataka. The study collected primary data through a well-structured questionnaire from 120 farmers in 3 talukas of the district. The study found that farmers had a strong understanding of the availability, prices, benefits, and application doses of biopesticides. They gained their knowledge through company sales representatives, progressive farmers, practical demonstrations, and social media. However, traditional media channels such as television, newspapers, and radio had limited impact in disseminating information about biopesticides. The farmers' decision-making process while purchasing biopesticides was significantly influenced by factors such as effectiveness in pest control, past experiences, pricing considerations, and the opinions of fellow farmers. Despite this awareness, the study identified challenges such as delayed product effects, sub-optimal performance, high prices, and the unavailability of preferred brands.

Key words: Biopesticides, Brand, Environmental sustainability, Price, Purchase

Introduction

Pesticides play a vital role in global agriculture (Aliabadi *et al.*, 2020). The indiscriminate use of pesticides and chemical fertilizers in agriculture may have detrimental effects on both the products and the environment (Sharma and Patil, 2018). Unfortunately, low and middle-income countries are most affected by fatal poisonings (Kaur *et al.*, 2023). Pesticide and herbicide residues in food and drinking water pose a significant risk to human health (Kaur *et al.*, 2023). Each year, over 250,000 people die from poisoning, with pesticides causing 150,000 of those deaths, according to the World Health Organization (2020).

The use of biopesticides in organic farming is considered as a sustainable approach that promotes integrated, structured, and environmentally conscious farming systems, resulting in ecological and economic benefits (Ataei *et al.*, 2021). Biopesticides are recognized as a prominent alternative to chemical pesticides as they play a crucial role in producing safe and chemical-free food. They are popular for being more environmentally friendly than chemical pesticides, causing less harm to humans, animals, the environment, and ecosystems (Neisi *et al.*, 2020; WHO, 2020). The shift from chemical pesticides to biopesticides is significant in ensuring the quality of agricultural products and promoting environmental sustainability (Guo *et al.*, 2021). Biopesticides are considered less hazardous than their chemical counterparts, making them particularly well-suited for organic farming practices (Chakraborty *et al.*, 2023).

Around 6 million tons of pesticides are globally used yearly to control crop pests and diseases (Guo *et al.*, 2021). Although biopesticides have made significant strides, they comprise a small proportion of pest management solutions (Chakraborty *et al.*, 2023). The worldwide pesticide market is valued at USD 56 billion, with the biopesticide market projected to range between USD 3 and 4 billion (Keswani, 2020). In India, biopesticides constitute only 4.2 per cent of the total pesticide market (Chakraborty *et al.*, 2023). However, Fortune Business Insights (2022) forecasts a substantial expansion in India's biopesticides market for plants and crops, with a growth rate of 9.38 per cent from USD 69.62 million in 2022 to USD 130.37

million in 2029. With a compound annual growth rate of 14.1 per cent (Marrone, 2014), the development of biopesticides is expected to surpass that of chemical pesticides (Keswani, 2020).

In India, 58 per cent of people rely on agriculture as the main source of livelihood (Chaitra *et al.*, 2020). Numerous studies have shown that most farmers choose not to use biopesticides for pest control (Karunamoorthi, 2012; Lalani *et al.*, 2016). However, the effectiveness of biopesticides depends on understanding why farmers don't use them. Therefore, this study aims to investigate the challenges farmers face in adopting environmentally friendly pest management solutions and their perceptions of biopesticides.

Material and methods

Study Area: The study was conducted in the Sirsi district of Karnataka state. Three talukas were randomly selected for the study. The selected talukas were Sirsi, Yellapura, and Haliyal. The study was conducted in the year 2023.

Sampling procedure and source of data: The study was based on primary data collected through a well-structured questionnaire. A total of 120 farmers were randomly selected from 3 talukas in the district.

Analytical tools and techniques used

1. Descriptive Statistics: Descriptive statistics such as frequency and percentage were used to analyze farmers' perceptions of biopesticides.
2. Garrett's Ranking Technique: Garrett's ranking technique was adopted to analyze the factors considered by the farmers while purchasing biopesticides and the challenges faced by the farmers while using biopesticides. In this method, farmers were asked to rank their preferences for factors considered when purchasing biopesticides and problems encountered when using them according to their preferences. The orders of merit given by respondents were converted into ranks by using the following formula.

Table 1. Socio-economic characteristics of the farmers

Particulars	Category	Percentage
Age	<35 years	20.83
	36 to 45 years	40.83
	>45 years	38.33
Gender	Male	81.67
	Female	18.33
Educational Qualification	Illiterate	10.00
	Upto 7th	26.67
	Upto 10th	28.33
	12th	15.83
Land holding (Acres)	Graduation	19.17
	<2.5	46.67
	2.5 to 5	40.00
	5 to 7.5	11.67
	7.5 to 10	1.67
Annual Income	<2.5 Lakh	63.33
	2.5 to 5 Lakh	24.17
	>5 Lakh	12.50

Per cent position = $100 (R_{ij} - 0.5) / N_j$

Where,

R_{ij} = Rank given for i th item by j th individual

N_j = Number of items ranked by j th individual

Results and discussion

Table 1 provides a comprehensive overview of the socio-economic characteristics of the surveyed farmers. The majority of farmers (40.83%) were between 36 to 45 years old, followed closely by individuals over 45 years (38.33%) and less than 35 years (20.83%). The gender composition reflects a predominantly male population (81.67%), with female farmers comprising 18.33 per cent. Around 10.00 per cent of farmers were illiterate, while 26.67 per cent had completed education up to the 7th grade. A significant portion of the farmers possessed educational qualifications up to 10th grade (28.33%), followed by graduates (19.17%) and up to 12th grade (15.83%). The majority of the farmers (46.67%) had less than 2.5 acres of land, followed by 2.5 to 5 acres (40.00%), 5 to 7.5 acres (11.67%) and 7.5 to 10 acres (1.67%). The majority of farmers (63.33%) reported an annual income below 2.5 lakh, while 24.17 per cent fell within the income range of 2.5 to 5 lakh. Only 2.50 per cent of the farmers had an annual income exceeding 5 lakh.

Fig. 1 illustrates the awareness levels among farmers concerning various components of biopesticides. The study indicated that the majority of farmers (85.83%) were aware of the availability of biopesticides. Furthermore, 75.83% of the surveyed population demonstrated awareness of the benefits associated with biopesticides. Price awareness followed closely, with 68.33 per cent of farmers being cognizant of the pricing of biopesticides. Understanding of application dosage stood at 64.17 per cent, while 58.33 per cent were

Table 2. Factors considered by the farmers while purchasing biopesticides

Particulars	Mean Score	Rank
Effectiveness in controlling pests	78.56	1
Previous Experience	66.43	2
Price	54.55	3
Opinion of fellow farmers	52.45	4
Discounts	50.02	5
Recommendations from Dealers	40.98	6
Promotional Campaigns	34.85	7
Accessibility	32.1	8

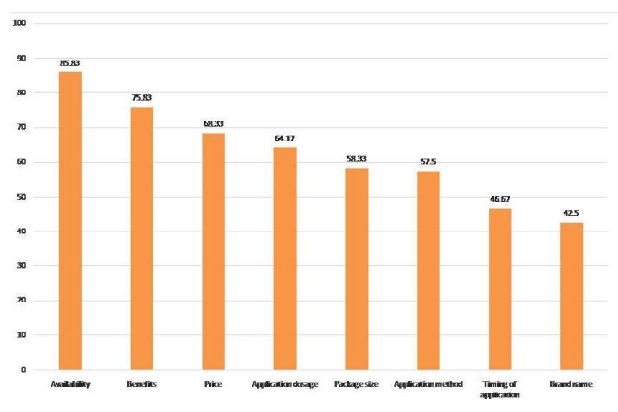


Fig 1. Farmers' awareness of different components of biopesticides (Percentage)

aware of the available package sizes. Moreover, 57.50 per cent of farmers possessed knowledge regarding the application methods of biopesticides. However, the timing of application and brand name awareness exhibited comparatively lower percentages, with 46.67 per cent and 42.50 per cent of farmers being aware, respectively. Guo *et al.* (2021) found that lack of knowledge about biopesticides and biopesticides' incomplete market structure were the main reasons for restraining farmers from their willingness to apply biopesticides in China.

Fig. 2 delineates the sources from which farmers obtained awareness about biopesticides. Nearly 28 per cent of the farmers got information about biopesticides from company sales representatives, followed by progressive farmers (23.60%), practical demonstrations (22.00%), social media (15.60%), and farmer meetings (11.20%). Traditional media channels such as television, newspaper, and radio exhibited lower percentages, with 9.20 per cent, 7.60 per cent, and 2.80 per cent, respectively. The findings suggest that interpersonal interactions with the company representatives, practical demonstrations, and emerging digital platforms were the primary channels for disseminating information about biopesticides among the farmers. Additionally, recognizing the limited reach of traditional media emphasizes the need for innovative communication strategies tailored to the evolving preferences of the agricultural community.

Table 2 presents insights into the factors influencing farmers' decisions when purchasing biopesticides. The product's effectiveness in controlling pests was the most critical factor, ranking first. The previous experience came close behind, indicating its significance in

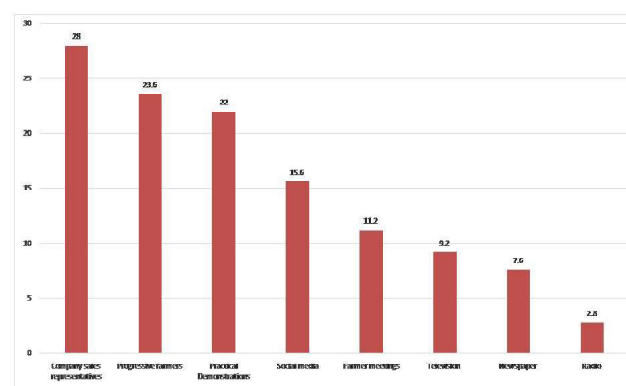


Fig 2. Sources of awareness about biopesticides (Percentage)

Table 3. Problems faced by farmers while using biopesticides

Particulars	Mean Score	Rank
Delayed effect of the product	64.50	1
Poor product performance	60.50	2
High prices	58.80	3
Non-availability of preferred brands	56.35	4
Lack of discounts	40.30	5
Lack of timely availability	34.00	6
Credit unavailability	36.55	7
Insufficient technical knowledge	21.00	8

farmers' decision-making processes. Price was ranked third, indicating its considerable influence on purchasing decisions. The opinions of fellow farmers and discounts also played substantial roles, occupying the fourth and fifth ranks, respectively. Recommendations from dealers, promotional campaigns, and accessibility were found to be of lesser importance in farmers' decision-making processes. These findings highlight the importance of product effectiveness and past experiences in shaping farmers' preferences for biopesticides. Moreover, the influence of peer opinions and pricing strategies suggests the significance of social networks and economic considerations in adopting biopesticides.

Table 3 depicts the problems faced by the farmers while using biopesticides. Firstly, the delayed effect of biopesticides requires further investigation into how we can enhance their speed and efficiency. Secondly, poor product performance was a significant concern that requires focused research and development efforts to improve biopesticide formulations. High prices also underscored the need for

cost-reduction initiatives. Additionally, the unavailability of preferred biopesticide brands has become a sourcing issue that requires strengthened distribution networks. The lack of discounts and unavailability of credit were also highlighted as financial barriers that could be addressed through collaborative efforts and accessible credit facilities. Timely availability and insufficient technical knowledge were also identified as key concerns, emphasizing the importance of efficient distribution systems and targeted education programs. Constantine *et al.* (2020) reported that smallholder farmers in Kenya faced challenges in adopting biopesticides, such as low efficacy against pests, limited range of usage, and high prices.

Conclusion

The study found that the farmers were well-informed regarding biopesticides' availability, benefits, prices, and application doses. Company sales representatives and progressive farmers were the primary sources of information for farmers, followed by practical demonstrations and social media. Traditional media channels such as television, newspapers, and radio had a lower impact on disseminating information about biopesticides. Factors such as effectiveness in pest control, previous experiences, price, and the opinions of fellow farmers were considered when purchasing biopesticides. However, some challenges were identified, including delayed product effects, poor performance, high prices, and the non-availability of preferred brands, highlighting areas for improvement in adopting biopesticides in agricultural practices. Effective education and outreach programmes can increase awareness about biopesticides in agriculture. Company representatives, practical demos, and digital platforms are useful channels to disseminate information among farmers.

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