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Knowledge level of Makhana growers regarding cultivation practices in the Mithila region of Bihar

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Abstract

The study was conducted in Mithila region of Bihar where makhana cultivation is a primary occupation. A total sample of 120 makhana growers was included with the specific objective to measure the level of knowledge of growers related to Makhana cultivation practices. Results show that most growers used traditional methods, with 86% relying on self-collected seeds and 77% not applying fertilizers. Disease control practices were often learned from fellow farmers. The overall knowledge distribution revealed that 71% of respondents had a medium level of understanding, 22% had low knowledge and only 7% demonstrated high expertise in Makhana cultivation. Correlation analysis reveals that younger Makhana cultivators with higher education, larger landholdings, more farming experience, mass media exposure, greater income, and stronger economic incentives generally have better knowledge of Makhana cultivation.

Keywords: Knowledge level, growers, makhana cultivation

Introduction

Makhana (*Euryale ferox*), also known as Gorgon Nut or Fox Nut, is a highly valued aquatic crop with a rich history, especially in Eastern Asia, and it is now recognized globally for its nutritional and economic importance. It is cultivated predominantly in Bihar, with the Mithila and Kosi-Seemanchal regions being the primary hubs for its production. Bihar accounts for around 85–90% of India's total makhana output, making it a significant player in the market. The recent Geographical Indication (GI) tag for Mithila Makhana has further strengthened its global reputation, positioning it as a superfood in the international market. The crop's adaptability to off-season lowland rice fields has also contributed to the expansion of its cultivation. As a result, districts like Madhubani, Darbhanga, Saharsa, Katihar, and Purnea have become major contributors to Bihar's makhana industry. However, despite its growing market and health benefits, makhana cultivation still faces challenges, including limited research on production practices, fragmented data, and market constraints. Farmers often rely on traditional knowledge and practices, with limited access to modern production techniques and marketing strategies. Keeping this in view, the present study has been carried out to assess the knowledge level of Makhana growers related to its recommended cultivation practices.

Methodology

The research was conducted in the Darbhanga and

Madhubani districts of North Bihar. These districts are recognized as major centres for Makhana production. Two blocks were purposively chosen from each district and three villages were chosen from each block. This selection was based on the assumption that these blocks exhibit the largest areas and highest production levels of Makhana. Respondents for the study were identified through a disproportionate stratified random sampling technique, ensuring a diverse representation of Makhana growers. A total of 120 Makhana producers from the selected blocks were identified and included in the research sample. A structured interview schedule was developed to measure these aspects.

Results and Discussion

Knowledge level of Makhana growers related to recommended cultivation practices

The primary objective of the study was to assess growers' understanding of the various methods employed in makhana production. The components of makhana cultivation practices were categorized into several sections, including suitable soil types, qualities, and characteristics; types, slopes, and depths of makhana ponds; preparation and maintenance of the ponds; seed sources and quality; fertilizer application and disease management; the maturation process and timing of harvesting; grading and marketing of makhana; and knowledge of different processing technologies. The findings related to these aspects, along with supporting tables, are presented here.

Table 1: Knowledge levels of growers regarding Makhana cultivation practices

Sl. No.	Categories	Maximum obtainable score	Obtained mean score	Percentage (%)
1	Soil	5	4.31	86.20
2	Pond	4	3.29	82.25
3	Seed Quality	4	3.38	84.50
4	Pond Preparation	3	2.57	85.67
5	Weed Management	2	1.47	73.50
6	Fertilizer Usage	2	1.21	60.50
7	Manuring	2	1.54	77.00
8	Disease	3	2.42	80.66
9	Harvesting	3	2.39	79.67
10	Price and Sale	3	2.35	78.33
11	Processing Technology	5	3.26	62.20

The table 1 illustrates the knowledge levels of makhana growers concerning various facets of makhana cultivation. The highest achievable score for each category signifies the utmost possible level of knowledge, whereas the calculated mean score indicates the average knowledge level among the growers. The percentage reflects the extent of knowledge attained by the farmers relative to the maximum possible score. The growers exhibited proficient knowledge in soil management, achieving a mean score of 4.31 out of 5, which corresponds to 86.20 percent of the total possible knowledge. This implies that farmers possess a robust understanding of soil-related factors in makhana cultivation. With a mean score of 3.29 out of 4, the knowledge about pond management reached 82.25 percent, demonstrating that most growers are acquainted with the fundamental aspects of pond maintenance necessary for successful cultivation. Farmers achieved 84.50 percent (3.38 out of 4) in this domain, indicating a high level of awareness regarding seed selection and quality, which is an essential aspect for achieving successful yields. The understanding of preparing ponds for cultivation was also notably high, with 85.67 percent (2.57 out of 3), suggesting that most farmers have a solid grasp of this procedure. The mean score was lower in this area, at 73.50 percent (1.47 out of 2), indicating that growers are less knowledgeable about effective weed management compared to other topics. Farmers displayed moderate knowledge in fertilizer application, scoring 60.50 percent (1.21 out of 2), signifying the necessity for a better comprehension of optimal fertilizer utilization. Knowledge regarding manuring practices was quite high, with 77.00 percent (1.54 out of 2), reflecting that farmers are generally adept at applying organic or natural manure to boost production.

Farmers attained 80.66 percent (2.42 out of 3) in disease control, suggesting they are somewhat knowledgeable but could benefit from additional information on managing plant diseases. The score of 79.67 percent (2.39 out of 3) indicates that farmers have a sound understanding of the harvesting process, which is vital for preserving the quality of makhana. Knowledge in the pricing and sale sector scored 78.33 percent (2.35 out of 3), implying that while farmers are familiar with the marketing aspects of their produce, there remains an opportunity for improvement in understanding market dynamics. Farmers exhibited the least knowledge in this area, scoring 65.20 percent (3.26 out of 5). This suggests that their understanding of modern

processing technologies is relatively limited, and there is potential for enhancing knowledge in this significant field. In conclusion, the research reveals that even though farmers have considerable skills in certain fields including soil handling, seed selection, and crop gathering, there are important shortcomings in their awareness of weed control, fertilizer strategies, and processing innovations, emphasizing the importance of focused education and outreach programs to boost their insight into these vital subjects.

Table 2: Overall knowledge levels of growers regarding Makhana cultivation practices (n=120).

Sl. No.	Category	Frequency (f)	Percentage (%)
1	Low (< 24.17)	26	22
2	Medium (24.17 - 32.21)	85	71
3	High (>32.21)	9	7
Mean= 28.19, SD=4.02, SE=0.36			

The above table depicts the overall knowledge levels of 120 makhana cultivators based on their comprehension of makhana cultivation techniques. The participants are divided into three categories: low, medium, and high knowledge levels. Among the entire sample, 22% (26 cultivators) are classified in the low knowledge category, which encompasses individuals whose knowledge score is below the (< 24.17). This suggests that a considerable number of growers have limited awareness or understanding of critical elements of makhana cultivation. A significant portion of the respondents (71%, or 85 cultivators) is identified as having a medium level of knowledge, characterized by scores that lie within the range of (24.17 - 32.21).

This segment reflects an average level of understanding and familiarity with cultivation methods, indicating that most growers possess a moderate comprehension of the fundamental aspects of makhana farming. Only 7% (9 cultivators) are placed in the high knowledge group, which comprises those with scores exceeding the (>32.21). These farmers are likely to have a more sophisticated understanding of cultivation practices and could be more adept or experienced. The average knowledge score is 28.19, with a standard deviation of 4.02, suggesting some variation in knowledge levels among the growers. The standard error is 0.36, which indicates the accuracy of the mean score.

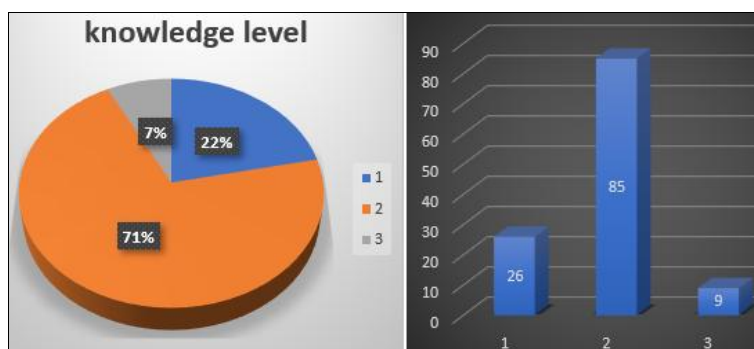


Fig 1: Overall, Knowledge levels of growers

Table 3: Relationship between selected socio-economic, personal, and communicational variables with the Knowledge level of Makhana growers

Sl. No.	Categories	Values correlated with knowledge level		Remarks
		(Correlation coefficient)	p-value	
1	Age	-0.397**	0.000	S
2	Gender	0.029	0.751	NS
3	Caste	-0.041	0.658	NS
4	Education	0.249**	0.006	S
5	Landholding	0.224*	0.014	S
6	Farming experience	0.319**	0.000	S
7	Occupation	-0.075	0.414	NS
8	Annual Income	0.226*	0.013	S
9	Social participation	0.146*	0.012	S
10	Mass media exposure	0.209*	0.038	S
11	Credit orientation	0.030	0.748	NS
12	Extension contact	0.053	0.563	NS
13	Economic motivation	0.201*	0.028	S
14	Scientific orientation	-0.037	0.686	NS

* = Significant at 0.05 level of probability

** = Significant at 0.01 level of probability.

NS= Not significant, S=Significant

Among the fourteen variables studied, eight factors—age, education, landholding, farming experience, annual income, social participation, mass media exposure, and economic motivation—were significantly associated with the knowledge levels of makhana growers. However, six factors—gender, caste, occupation, credit orientation, extension contact, and scientific orientation—did not show a significant relationship with the grower's knowledge levels. A significant negative correlation exists between age and knowledge, meaning that as farmers grow older, their knowledge levels decrease. This implies that younger farmers tend to have more knowledge about Makhana farming practices. The relationship is statistically significant, with a p-value of 0.000. Gender has a very weak positive correlation with knowledge, and the relationship is not statistically significant ($p = 0.751$). This suggests that gender does not play a significant role in determining the level of knowledge among Makhana growers. Caste with Knowledge Level shows a negligible negative correlation with knowledge, and the correlation is not statistically significant ($p = 0.658$). This indicates that caste has no meaningful influence on the level of knowledge of Makhana growers. Education with Knowledge Level has a positive correlation with knowledge, meaning that farmers with higher education levels tend to have more knowledge about Makhana farming practices. The significance level of 0.006 indicates that this relationship is statistically significant.

There is a positive correlation between landholding size and knowledge, suggesting that farmers with larger landholdings tend to possess more knowledge about Makhana cultivation. The relationship is statistically significant with a p-value of 0.014.

Farming experience with Knowledge Level has a significant positive correlation with knowledge, indicating that more experienced farmers have higher levels of knowledge regarding Makhana cultivation. This relationship is statistically significant with a p-value of 0.000. Occupation with Knowledge Level has a weak negative correlation with knowledge, and the relationship is not statistically significant ($p = 0.414$). This implies that occupation does not have a substantial influence on the knowledge levels of Makhana growers. Annual income shows a positive correlation with knowledge, meaning that farmers with higher incomes tend to have more knowledge about Makhana farming. The significance level of 0.013 suggests that this relationship is statistically significant. Social participation with Knowledge Level shows a weak positive correlation with knowledge, but the relationship is statistically significant ($p = 0.012$). This implies that participation in social activities or groups does have an impact on the knowledge levels of Makhana farmers. There is a positive correlation between mass media exposure and knowledge, indicating that farmers who are more exposed to mass media may have slightly more knowledge and the

relationship is statistically significant with ($p = 0.038$). Credit orientation with Knowledge Level shows a negligible positive correlation with knowledge, and this relationship is not statistically significant ($p = 0.748$). This indicates that farmers' attitude toward credit does not greatly affect their knowledge about Makhana farming. Extension contact with Knowledge Level has a weak positive correlation with knowledge, but the relationship is not statistically significant ($p = 0.563$). This suggests that the amount of contact with extension services does not significantly influence farmers' knowledge levels.

Economic motivation with Knowledge Level has a positive correlation with knowledge, indicating that farmers who are more economically motivated tend to have higher knowledge levels. The relationship is statistically significant with a p -value of 0.028. Scientific Orientation shows a very weak negative correlation with knowledge, and the relationship is not statistically significant ($p = 0.686$). This suggests that a farmer's scientific orientation does not play a significant role in determining their knowledge about Makhana farming. In conclusion, factors such as age, education, landholding size, farming experience, income, and economic motivation are significantly linked to the knowledge levels of Makhana farmers. Younger farmers with higher education, larger landholdings, more farming experience, higher incomes, and greater economic motivation tend to have better knowledge of Makhana cultivation. On the other hand, factors like gender, caste, social participation, mass media exposure, and scientific orientation show weaker or minimal connections with knowledge levels.

Conclusion

The study found that most respondents (71%) possessed a moderate level of knowledge about Makhana cultivation practices, while 22% had low knowledge and only 7% exhibited a high level of expertise. The correlation analysis revealed that growers who were younger, better educated, had larger landholdings, greater farming experience, higher exposure to mass media, higher income, and stronger economic motivation tended to have a better understanding of Makhana cultivation practices. By assessing the knowledge levels of Makhana growers, the study provides valuable insights for designing more effective policies and interventions aimed at enhancing their livelihoods.

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