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Assessment of Farmers' Awareness of the Locust Pest Problem and Their Adoption of Control Measures in Taluka Nasirabad, District Qambar Shahdadkot

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Abstract

The present research was conducted in Nasirabad taluka of Qambar Shahdadkot district through a survey. The aim was to assess farmers' awareness of locust pest issues and their adoption of control measures. A purposive sampling method was used, with a total of 125 farmers surveyed, selecting 25 from each Union Council. Results revealed that the majority of respondents (56%) were aged 41 and older, 60% had received only a primary level of education, and 72% had over 21 years of farming experience. Additionally, 56% of the farmers owned 5 acres of land. Alarmingly, 89.6% lacked knowledge of traditional pest control methods, such as killing locust swarms and tricking hoppers. Moreover, 81.6% of farmers were unaware of chemical control methods, including organophosphate insecticides. The data indicated that 50% of farmers had not adopted traditional control methods at all, and 100% did not use sound-based deterrents or nets sprayed with garlic or neem oil. Furthermore, 80% had not implemented biological control measures involving neem, and all were unfamiliar with other biological methods like linseed oil or the use of natural locust predators. Importantly, 100% of farmers reported no adoption of chemical control methods. Awareness of agricultural resources was also low: 45.6% were unaware of agricultural extension workers, 40% of pesticide agents, 47.2% of neighboring farmers, and 46.4% of social media as a source of information. A significant majority, 94.4% and 92.8%, were very unaware of NGOs and training opportunities, respectively. Furthermore, 75.2%, 59.2%, and 56.8% of growers did not find agricultural extension workers, neighbors, or social media effective sources of information. In contrast, 72.8%, 99.2%, and all farmers rated pesticide agents, NGOs, and training programs as very poor sources of information.

Keywords: Locust, Adoption, Diffusion, Sources of Information

INTRODUCTION

Locusts" refers to insect species capable of forming massive swarms that can devastate grasslands and crops, significantly threatening global food security. Throughout history, humans have faced the challenges of locust plagues. Locusts belong to the Acrididae family within the Orthoptera order, which includes 6,787 recognized species. Unlike other grasshoppers, locusts can switch between a solitary phase and a gregarious phase characterized by group movement (Marion, et. al., 2021). While swarming, locusts can destroy 80-100% of the vegetation they encounter, affecting up to 10% of plant communities and causing soil degradation (Rousseau, 2020). A single desert locust can consume food equal to its body weight in a day, with swarms potentially devouring as much as six elephants' worth of food (Suraj, S, et. al.

2021). Joshi et al. (2020) examined locusts, which are a group of short-horned grasshoppers belonging to the Acrididae family (Order: Orthoptera). Accordingly, these distinctive insects have posed a significant threat to agriculture since the dawn of human civilization, as they can alter their habits and behavior when present in large swarms. These voracious insects consume anything edible in their path, posing a significant obstacle to achieving global food security, especially during times of food scarcity. As members of the Acrididae family, locusts are distinguished by their powerful hind legs and are essential to ecosystems as they promote plant growth and contribute to nutrient cycling (Jihan, et. al. 2022). However, their behavior can also disrupt biological processes like carbon irrigation rotations, leading to increased runoff and soil erosion. The migratory locust (Locusta migratoria) and the desert locust (Schistocerca gregaria) are among the most studied due to their widespread distribution and economic impact (Meena et al., 2021).

Stanley (2018) highlighted that while the impact of locusts on humans is well-documented, humans also exert an indirect influence on locust populations. For example, targeted treatments have been applied to breeding areas of the red locust, Nomadacris septemfasciata. At low densities, grasshoppers and locusts play a vital role in maintaining the health of grassland ecosystems. Locusts can travel up to 3,000 miles at speeds of 10-12 miles per hour, changing their physiology and behavior to form cohesive swarms. Outbreaks have resulted in significant environmental and economic costs, prompting the development of various control mechanisms on both local and global scales. As desert vegetation becomes greener, locusts can enter a gregarious phase, necessitating immediate funding and initiatives to curb their populations before they escalate (Suraj, et. al. 2021). The Food and Agriculture Organization (FAO) has established guidelines for monitoring desert locust populations. The first recorded sighting of desert locusts in Nepal occurred about sixty years ago, leading to the development of various management strategies by national and international organizations to mitigate their impact on food security (Ahmed et al., 2018).

While prevention techniques can be effective, they are often complex, requiring meteorological expertise to track locust behavior based on wind and rainfall patterns. Pesticides have been widely employed for immediate relief from infestations, with ultra-low-volume (ULV) spray proving to be particularly effective. In terms of nutrition, locusts are comparable to or even richer than traditional meat. They are low in cholesterol and high in essential fatty acids, making them beneficial for heart health. Locusts contain higher levels of certain amino acids, calcium, iron, zinc, and vitamins compared to regular meat. Research has shown promising results when using locusts as feed for pigs and fish, and they could be processed into oil, chitin, and nutraceutical products. However, concerns regarding insecticides, allergies, and microbiological contamination must be addressed (Cullen et al., 2017).

Globally, efforts are underway to establish regulatory frameworks for the sale and production of locusts and other edible insects. Promoting public awareness of their nutritional value and developing technology for efficient collection and processing can help harness their benefits. While locusts can transition between solitary and swarming phases, solitary locusts play a crucial role in maintaining grassland health by recycling nutrients and supporting various animal species (Egonyu et al., 2021). The purpose of this study was to assess whether farmers in the Nasirabad district of Qambar Shahdadkot are aware of the locust problem and if they have adopted appropriate management strategies.

- To assess farmers' awareness of locust pest issues.
- To evaluate the extent to which farmers adopt various locust control measures.
- To gather farmers' opinions on the locust pest problem within the study area.

METHODOLOGY

The research employed a carefully considered methodology to ensure reliable data collection and analysis, leading to scientific conclusions. The study was conducted in the agricultural region of Taluka Nasirabad, District Qambar Shahdadkot, selected for its fertile soil and cotton production. Five Union Councils were purposively chosen: UC Muradi, UC Dera, UC Miandad Chinjiri, UC Abad, and UC Chaudero. A purposive sampling technique was utilized, selecting a total of 125 farmers, with 25 from each Union Council. This approach allowed for in-depth data extraction relevant to the population studied (Pandey & Pandey, 2015). A well-structured questionnaire was created addressing three main objectives. Data were collected through face-to-face interviews with farmers during field visits. The survey method was chosen for its efficiency, organization, cost-effectiveness, and reliability, though it had limitations in capturing unplanned information. Primary data were gathered via the questionnaire, while secondary data came from various sources. The study utilized a descriptive survey design, suitable for gathering perceptions on social issues and describing current conditions. Data were organized into a coding sheet and analyzed using the Statistical Package for Social Sciences (SPSS) to calculate percentages, frequencies, means, and standard deviations.

RESULTS

Control Strategies

Growers in Taluka Nasirabad were surveyed about their knowledge of locust control strategies using a five-point Likert scale. The findings revealed that a significant majority (89.6%) lacked knowledge of traditional methods, including killing locusts, ploughing egg-infested fields, and trapping hoppers in pits. Additionally, while 55.2% of growers had a moderate understanding of traditional methods involving loud sounds and acoustic or electronic devices, a staggering 83.2% were unaware of biological control methods like neem. All respondents (100%) reported no knowledge of other biological methods, such as linseed oil, garlic extracts, green muscle, and natural predators like generalist robber flies. Furthermore, 81.6% of growers were completely uninformed about chemical control methods, particularly insecticides from the organophosphate class, which affect cellular immunity.

Table: 1.
Control Strategies for Locust Pest in Taluka Nasirabad

S#		Description	Mean	SD
1	Traditional methods/ Mechanical method	Killing orchestras, Ploughing the egg infested field, Trapping the hoppers in pits	1.10	0.34
		Loud sounds, Acoustic and electronic devices	3.50	0.69
2	Biological methods	Use spray with garlic Neem oil	2.65	0.82
		Neem	1.71	0.52
		Lineseed oil	1.00	0.00
		Garlic oil	1.00	0.00
		Green muscle	1.00	0.00
		(Diptera	1.00	0.00
		Locust enemies such as generalist thief flies		
		Locust's natural enemies like generalist robber flies	1.00	0.00

		Green guard & green muscles	1.00	0.00
		Ultra-low volume spray with oil	1.00	0.00
3	Chemical control	Chemical insecticides	1.00	0.00
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		(Diptera	1.00	0.00
		Locust enemies such as generalist thief flies		
		Locust's natural enemies like generalist robber flies	1.00	0.00
		Green guard & green muscles	1.00	0.00
		Ultra low volume spray with oil	1.00	0.00
3	Chemical control	Chemical insecticides	1.00	0.00

Likert scale: 1= Not at all, 2= To some level, 3= Moderate level, 4= High level, 5= Extremely High level

Adoption Level

The survey also assessed the level of adoption of these control strategies among growers in the region. The results indicated that half (50%) of the growers did not adopt traditional methods like killing locusts, ploughing infested fields, or trapping hoppers. Moreover, all respondents (100%) did not utilize speaker echoes, electronic devices, or nets sprayed with garlic or neem oil. Regarding biological control methods, 80% of growers had not adopted options such as neem, and all (100%) had not implemented any methods involving linseed oil, garlic extracts, or natural locust predators. Notably, all (100%) of the growers also reported no use of chemical control methods.

Table 2.
Adoption of Control Strategies for Locust Pest

S#		Description	Mean	SD
1	Traditional methods/ Mechanical method	Killing orchestras, Ploughing the egg infested field, Trapping the hoppers in pits	1.10	0.34
		Loud sounds, Acoustic and electronic devices	3.50	0.69
2	Biological methods	Use spray with garlic Neem oil	2.65	0.82
		Neem	1.71	0.52
		Lineseed oil	1.00	0.00
		Garlic oil	1.00	0.00
		Green muscle	1.00	0.00
		(Diptera	1.00	0.00
		Locust enemies such as generalist thief flies Locust's natural enemies like generalist robber flies	1.00	0.00
		Green guard & green muscles	1.00	0.00
		Ultra-low volume spray with oil	1.00	0.00
3	Chemical control	Chemical insecticides	1.00	0.00

Likert scale: 1= Not at all adopted, 2= To some level adopted, 3= Moderate level adopted, 4= Partially adopted, 5= Extremely fully adopted

Knowledge Assessment

Farmers in Taluka Nasirabad were surveyed to assess their knowledge of various control measures for locust pests. The results revealed that all (100%) growers had no knowledge of control methods involving arthropod predators of nymphs and adults.

Additionally, all respondents (100%) reported being unaware of biological agents such as microsporidia, fungi, and bacteria.

Table 3.
Level of awareness of farmers regarding different control measures of locust pest

S#	Level of knowledge of farmers regarding different control agents of locust pest		Likert scale						
	Control Agent	**Mode of Action**	**1 %**	**2 %**	**3 %**	**4 %**	**5 %**	**Mean**	**SD**
1	**Arthropods**								
	Predators of nymph and younger locust	Conservation of natural enemies	100.00	00	00	00	00	1.00	0.00
2	**Microsporidia** Nosema locust canning	Innundative augmentation	100.00	00	00	00	00	1.00	0.00
3	**Fungal**								
	Metarhizium flavoviridae gams	Inundative augmentation	100.00	00	00	00	00	1.00	0.00
	Beauveria bassina	Inundative augmentation							
4	**Bacterial** Bacillus thuringiensis (Bt) Berliner Bacillus sphaericus meyer	Inundative augmentation	100.00	00	00	00	00	1.00	0.00

Likert scale: 1= Not at all, 2= To some level, 3= Moderate level, 4= High level, 5= Extremely High level

Level of Adoption of Farmers Regarding Control Measures for Locust Pest

The same growers were asked about their adoption of control measures for locust pests. The findings indicated that all (100%) growers had not adopted any control measures related to arthropod predators of nymphs and adults. Furthermore, all (100%) respondents reported not adopting methods involving microsporidia, fungi, and bacteria.

Sources of Awareness

The survey also aimed to identify the sources of awareness among farmers concerning locust pest control. Results showed that 44% of growers were unaware of agricultural extension workers, 40% were unaware of pesticide agents, and 48% were unaware of their neighbors' farming practices. Additionally, 48% of growers were not aware of information available through social media. A significant majority (96%) were very unaware of NGOs and training programs related to pest control.

Table 5.
Sources of awareness regarding locust pest control

S#	Sources of awareness	LIKERT SCALE					Mean	SD
		1 %	**2 %**	**3 %**	**4 %**	**5 %**		
1	Agricultural extension worker	12.00	44.00	40.00	4.00	00	2.34	0.69
2	Pesticide Agent	56.00	40.00	4.00	00	00	1.51	0.60
3	Neighbor farmer	8.00	48.00	40.00	4.00	00	2.38	0.72
4	Social media	4.00	48.00	36.00	12.00	00	2.61	0.76
5	Trainings	92.00	8.00	00	00	00	1.07	0.28
6	NGOs	88.00	8.00	4.00	00	00	1.07	0.30

Likert scale: 1= Very un-aware 2= unaware 3= Neither aware no unaware 4= Aware, 5= Very aware

Effectiveness of Information Sources

Regarding the effectiveness of information sources, the results indicated that a majority of growers viewed agricultural extension workers (76%), neighbor farmers (60%), and social media (56%) as ineffective sources of information. In contrast, a large majority found pesticide agents (72%), NGOs (96%), and training programs (96%) to be very poor sources of information in Taluka Nasirabad.

Table 6.
Effectiveness of the sources of information regarding locust pest control

S#	Sources of effectiveness	LIKERT SCALE 1 %	2 %	3 %	4 %	5 %	Mean	SD
1	Agricultural extension worker	4.00	76.00	20.00	00	00	2.15	0.47
2	Pesticide Agent	72.00	24.00	4.00	00	00	1.28	0.46
3	Neighbor farmer	12.00	60.00	28.00	00	00	2.17	0.61
4	Social media	5.00	64.00	28.00	00	00	2.30	0.58
5	Trainings	100.00	00	00	00	00	1.00	0.00
6	NGOs	96.00	4.00	00	00	00	1.02	0.26

Likert scale: 1= very poor 2= un-potential 3= Neutral 4= Effective 5= very effective

Constraints in the Adoption

The results indicated that a significant majority of growers in Taluka Nasirabad experienced high levels of constraints in adopting locust pest control measures. Specifically, 68% cited a lack of awareness, 64% reported difficulties in using available technology, 72% noted the unavailability of advanced technology, and 84% mentioned a lack of skills and training as major obstacles.

Table 7.
Constraints in the adoption of locust pest control measures

S#	Constraints	1 F	2 F	3 F	4 F	5 F	Mean	SD
1	Lack of awareness	00	00	12.00	68.00	20.00	4.10	0.51
2	Technology difficult to use	00	00	8.00	84.00	8.00	4.15	0.56
3	Lack of availability of advance technology	00	00	12.00	64.00	24.00	4.14	0.57
4	Lack of skills	4.00	00	8.00	72.00	16.00	4.06	0.59
5	Lack of training	00	00	8.00	68.00	24.00	4.13	0.53

Likert scale: 1= Not at all, 2= To some level, 3= Moderate level, 4= High level, 5= Extremely High level

Research Findings

The research revealed that most growers lacked knowledge of traditional locust control methods, such as removing swarms, cultivating egg-infested fields, and trapping hoppers in pits. While a moderate number of growers were aware of using speaker sounds and electronic devices, the majority had no knowledge of chemical control methods, including organophosphate insecticides. Additionally, most growers did not adopt traditional methods for locust management, and none utilized chemical control strategies. Awareness among growers regarding agricultural extension workers, pesticide agents, neighboring farmers, and social media was notably low. The results also indicated that growers faced significant constraints, including a lack of awareness, difficulties in using technology, unavailability of advanced technology, insufficient skills, and inadequate training.

RECOMMENDATIONS

To enhance locust management, it is crucial to raise awareness among growers. The agricultural extension department should engage with farmers and provide

comprehensive training on locust control methods. Trainers should focus on effective practices, including the use of chemicals like Lambda-cyhalothrin and timing sprays between 4 AM and 6 AM, alongside traditional control methods such as Beferonil spray. The government should prioritize aerial spraying, which has proven more effective than ground methods, and invest in aerial spraying technologies like helicopters and airplanes. Although the Sindh government has supplied technical machines at the taluka and district levels, growers need better access and awareness of this technology. Implementing Integrated Pest Management (IPM) is the best approach for controlling desert locusts. This method emphasizes the careful use of chemical pesticides while considering environmental and biological health, particularly in the locust's native habitat. Sindh must remain prepared with effective management strategies, including IPM, to mitigate losses from locust invasions.

There is a need to transition from traditional practices to modern methods for controlling large locust swarms. Biological techniques, such as Green Muscle and botanical oils like linseed and neem, are safe and environmentally friendly alternatives. However, chemical insecticides may still be necessary in urgent situations. Ongoing development of more efficient, resistant, and eco-friendly pesticides is essential. It is crucial to ensure that pest control strategies do not contribute to environmental pollution or harm public health, animals, or beneficial insects. A balanced approach that goes beyond mere chemical use is vital for effective locust management.

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