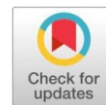


Original Research Article

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Farmers' adoption towards tradition practices for wheat grain storage in Haryana



Ruby Garg¹, Sunita Yadav¹, Rati Mukteshwar^{*2}, Amit Kumar³, Subhash Chander⁴ and Savita Kumari⁵

¹Department of Entomology, CCS HAU, Hisar, Haryana, India

²Department of Agricultural Extension Education, CCS HAU, Hisar, India

³Department of Sociology, CCS HAU, Hisar, Haryana, India

⁴Division of Agriculture, MMDU, Ambala, India

⁵Department of Basic Science, YSPUHF, Solan (HP), India

ABSTRACT

Food security is challenged by many issues i.e. poverty, illiteracy, lack of technology innovation and damage by insect-pests. Survey was carried out in Sirsa, Hisar and Bhiwani which are major wheat-growing districts of Haryana, India. A total of 300 farmers from 30 randomly selected villages were interviewed with the help of well-structured questionnaire. It was evident from the data that high percentage of farmers was aware of wheat stored grain insect-pests and was able to identify the insect pests of stored wheat grains. It was reported that metal bins were the most preferred structure for wheat storage followed by gunny bags, though the lack of scientific storage was the major problem during storage. It was evident that the adoption of ancient management practices was common among the farmers along with chemical treatments. The study revealed that most preferred management practice among the farmers to control the insect-pest was sanitation and drying the grains. The study also concluded that farmers faced many problems during storage but loss due to rats and insect-pests were the major constraints during storage.

Keywords: Constraints, Insect-pest, Post-harvest losses, Storage, Survey, Wheat.

INTRODUCTION

According to the Food and Agriculture Organization (FAO) "Food security exists when all the people, at all the times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [1]. Food security is governed by multiple factors including poverty, illiteracy, lack of technology innovation and damage by pests [2]. In spite of several government policies, the problem of food security poses a major challenge around the world and the deterioration of grains in storage conditions due to the activity of pests, contributes to the issue. Stored grain insects can cause post-harvest losses, estimated from 9 per cent in developed countries to 20 per cent or more in developing countries [3]. The estimated cost for the damage due to insect pests in stored foods may extend up to 17.7 billion dollars per year due to which world economy is negatively impacted [4]. Wheat (*Triticum aestivum* L.) is the main cereal crop in World and plays major role in accomplishing the food security goals. India is the second largest producer of wheat in the world with area sown over 30.60 million hectares with total production of 98.38 million tones [5]. Wheat crop is relatively safe from insect-pests in the field but suffer relatively higher losses during storage as seed. Besides rendering the grain unfit for human consumption, infestation may even downgrade the nutritional value of grains. Infestation also enhances the cost and efforts to grow, harvest and store food

grains. The Food and Agriculture Organization (FAO) estimates that globally food production need a revolutionary change by increasing it more than 40 per cent by 2030 and 70 per cent by 2050. This will lead in addition of 0.2 billion hectares of land to the current 1.4 billion hectares being cultivated. The cultivable area is limited which means we have to produce more from same area of land and also minimize the postharvest losses. This signifies the importance of grain storage to reduce losses. The Government of India (GOI) had the target to double the income of the farmers by financial year 2022-23 that can be achieved by reducing the post-harvest losses to minimum level. The goal can be achieved by adopting improved management practices, storage structures, methods of grain storage and educate the farmers to reduce the losses during storage of wheat. Traditionally, the farmers store their produce in bags and cemented underground stores. The success of any technology largely depends on its effective adoption and utilization in the field [6] and [7]. All these storage facilities are highly prone to attack by insects, fungi and environmental agents. Different Governmental campaigns and efforts of NGOs had increased the adoption of metal bins by farmers. But the gap between the adequate technology adoption still exists due to several reasons i.e. lack of mechanization, lack of irrigation facilities, lack of market facilities [8] and [9]. However, there is very little awareness among the farmers regarding the importance of air tightness of the structure and other sanitation aspects of the metal bins. Therefore, dissemination of knowledge regarding the methods of skillful storage to avoid quantitative and qualitative losses is necessary.

METHODOLOGY

The research was carried out in the major wheat growing districts of India's Haryana province.

**Corresponding Author: Rati Mukteshwar*

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Sirsa, Hisar and Bhiwani were surveyed to collect information about major insect-pests infesting wheat grains during storage, length of storage period, quantity of wheat stored, preventive and curative measures taken to combat stored grain insect pest and other problems that were experienced during storage. A multi-stage stratified random sampling technique was followed to collect the data. For conducting survey, 5 blocks from each district and 2 villages from each block were selected. Ten villages from each district and 10 farmer families from each village were randomly selected and were interviewed to collect information on different questions of the questionnaire. Thus, a total of 300 farmers were interviewed for this study. Survey, observational procedures and conducting experiments are three processes to collect the primary data. At present, the data was collected by a well-structured interview schedule. Frequency, percentage, means, weighted mean and rank order were calculated for the analysis and interpretation of data.

RESULTS AND DISCUSSION

1. Farmers' knowledge level towards wheat stored grain insect-pests

It was noted from the data presented in Table 1 that large number of respondents (total score 504) 'Do storage of wheat' with weighted mean score (WMS) value of 1.68. Total 555 respondents had 'Awareness of wheat grain insect-pests' with WMS value of 1.85 but less number (Total score 495) were 'Able to identify them' with WMS of 1.65. The importance of wheat as staple food in the Indian dietary system was also emphasized by [10].

Table 1.1: Farmers' knowledge level towards wheat stored grain insect-pests

S. No	Statements	TS	WMS
1	Do you know about storage practices of wheat grains?	504	1.68
2.	Do you know of wheat stored grain pests?	555	1.85
3.	Do you able to identify the pests of wheat?	495	1.65

*All values are in terms of percentage

TS=Total score, WMS=Weighted mean score

2. Farmer's awareness regarding different aspects of infestation caused by insect-pests during wheat storage:

Data pertaining to the awareness of farmers towards the different aspects of infestation depicts (Table 2) that 'Most favorable season for infestation' with 'Rainy' season having the highest WMS, 1.61 followed by 'summer' with WMS value of 1.43. 'Winter' and 'Spring' were the least preferred season for infestation of wheat with WMS value of 1.42 and 1.40 respectively. The major source of infestation of wheat was 'Transportation' and 'Carried over commodities, waste and rejects', both having same WMS value 1.41 followed by, 'Alternative hibernation sites and hosts' and 'Fields' with WMS 1.40. 'Agricultural machineries' and 'Processing plants' and 'Farm grain stores and re- used sacks' were less effective source of infestation with WMSs 1.33 and 1.25, respectively. The result of the study was also supported by [11], [12] and [13]. It was reported from the data that major responsible factor of infestation was 'Insects' with WMS 1.62 followed by 'Moisture' and 'Rats' with WMSs 1.55 and 1.46, respectively. It was reported that 'Powder formation' was the type of infestation reported by maximum number of respondents with WMS 1.52. It was followed by 'Broken grains', 'Grains with holes' and 'Chaffy seeds' with WMSs of 1.50, 1.49 and 1.40, respectively. It was reported that minimum number of respondents observed 'Black mould development' and 'Oily nature of food grains' with WMSs of 1.23 and 1.17, respectively.

Table 2.1: Farmer's awareness regarding different aspects of infestation caused by insect-pests during wheat storage

S. No	Statements	WMS
Most favourable season for infestation		
1	Summer	1.43
2	Rainy	1.61
3	Winter	1.42
4	Spring	1.40
Knowledge of the sources of infestation		
1	Fields	1.40
2	Carried over commodities, waste and rejects	1.41
3	Agricultural machineries	1.33
4	Processing plants, farm grain stores and re- used sacks	1.25
5	Transportation	1.41
6	Alternative hibernation sites and hosts	1.40
Major responsible factors for infestation		
1	Insects	1.62
2	Moisture	1.55
3	Rats	1.46
4	Others	1.16
Type of infestation caused by insect and pests		
1	Broken grains	1.50
2	Grains with holes	1.49
3	Chaffy seeds	1.40
4	Powder formation	1.52
5	Black mould development	1.17
6	Oily nature of food grains	1.23

WMS=Weighted mean score

3. Farmers' knowledge towards storage structures used for wheat grains

The data pertaining to the knowledge of the farmers towards the structures used for storage of wheat grains (table 3) elicits that 'Metal bins' were the most preferred type of storage structure for wheat grains with WMS 1.69 followed by 'Gunny bag' with WMS 1.60. 'Bulk storage' was the least preferred type of storage with WMS 1.14. It was reported that very few respondents used 'Pucca-bhukari', 'Kothi' and 'Kuthla' for wheat grain storage with WMSs values of 1.07, 1.06 and 1.03, respectively. The results of the study were also emphasized by [14] and [15]. The data presented in table shows that 'More life span' was the reason for most preferred storage structure with WMS 1.60 followed by 'Lower insect pest damage' and 'Lower rat damage' with WMSs 1.57 and 1.54, respectively. It was followed by 'Easy handling', 'Lower moisture damage', 'Less cost of storage' and 'High capacity of storage structure' with WMSs values of 1.43, 1.41, 1.40 and 1.37, respectively. The results were in line with [16] and [17].

Table 3: Farmers' knowledge towards storage structures used for wheat grains

S. No	Statements	WMS
1.	Metal bins	1.69
2.	Gunny bag	1.60
3.	Bulk storage	1.14
4.	Pucca-Bhukari	1.07
5.	Kuthla	1.03
6.	Kothi	1.06
Reason for preferred storage structure		
1.	More life span	1.60
2.	Less cost of storage	1.40
3.	High capacity of storage structure	1.37
4.	Lower rat damage	1.54
5.	Lower insect-pest damage	1.57
6.	Lower moisture damage	1.41
7.	Easy handling	1.43

WMS=Weighted mean score

4. Farmers' knowledge of different type of management practices

The data presented in table 4 indicates that respondents had high knowledge of 'Physical and mechanical' management practice with WMS 1.80 followed by 'Natural methods' and

'Chemical methods' with WMS 1.73 and 1.62, respectively. The data showed that 'Drying and disinfestations' was the most preferred physical method followed by respondents with WMS 1.79 followed by 'Air tight storage', 'Use of improved storage structures' and 'Coating with clay and oil' with WMS of 1.52, 1.41 and 1.12, respectively. It was reported that among chemical methods 'Treatment of grain by fumigation' was the most adopted method with WMS 1.88 and very few respondents used 'Treatment of grains with contact insecticides' with WMS 1.12. It was indicated by the data that 'Aluminium phosphide' was the most preferred chemical insecticide with WMS value of 2.

Table 4: Farmers' knowledge of different type of management practices

S. No.	Items	WMS
Knowledge of different type of management practices		
1.	Physical and mechanical	1.80
2.	Natural methods	1.73
3.	Chemical methods	1.62
Physical or mechanical methods preferred		
1.	Drying and disinfestations	1.79
2.	Coating with clay or oil	1.12
3.	Use of improved storages structure	1.41
4.	Air tight storage	1.52
Procedure followed for chemical method		
1.	Treatment of grain with contact insecticide	1.12
2.	Treatment of grain by fumigation	1.88
Chemical used for fumigation		
1.	Methyl bromide	1.00
2.	Aluminium phosphide	2.00

WMS=Weighted mean score

5. Major constraints faced by farmers during wheat storage

The data presented in table 5 indicated that major constraint faced during wheat storage by respondents was 'Loss due to rat damage to grains' with WMS 1.73. It was followed by 'Loss due to insect & pest damage to grains', 'Lack of knowledge about scientific storage methods', 'Costly storage method', 'Lack of storage space availability' and 'Non-availability of insecticides at village level' with WMS 1.66, 1.53, 1.49, 1.41 and 1.40, respectively. These results were supported by [18] and [19].

Table 5: Major constraints faced by farmers during wheat storage

S. No	Statements	WMS
1.	Loss due to rat damage to grains	1.73
2.	Loss due to insect & pest damage to grains	1.66
3.	Lack of knowledge about scientific storage methods	1.53
4.	Costly storage method	1.49
5.	Lack of storage space availability	1.41
6.	Non availability of insecticides at village level	1.40

WMS=Weighted mean score

CONCLUSION

Crop management practices are confined to the farmer's field but post-harvest modern and scientific storage techniques are neglected. It is necessary to aware the farmers regarding the post-harvest problems i.e. factors of infestation, the type of damage caused by insect-pests, types of storage structures preferred and management practices. Ancient storage practices are prevalent among the farmers but adequate knowledge about scientific storage methods are lacking. The best way to reduce the losses in wheat during storage is to increase the farmers' participation towards the implementation of safe, healthy and scientific storage practices.

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