

Integrated Pest Management (IPM) Strategies in Grain Storage: A Case Study of Food Corporation of India (FCI), Hapur

SHIVAM KUMAR SAGAR¹, DR. MAMTA VERMA²

¹PG Student, Department of Zoology, SSV P.G. College, Hapur, Uttar Pradesh, India

²Assistant Professor, Department of Zoology, SSV P.G. College, Hapur, Uttar Pradesh, India

*Abstract- Stored grain pests are a major cause of post-harvest losses in India, affecting both grain quality and food security. This study evaluates the effectiveness of Integrated Pest Management (IPM) strategies implemented at the Food Corporation of India (FCI) storage facility in Hapur, Uttar Pradesh. The research adopted a mixed-method case study approach using field observations, staff interviews, and analysis of storage conditions. Major pests identified included rice weevil (*Sitophilus oryzae*), lesser grain borer (*Rhyzopertha dominica*), and red flour beetle (*Tribolium castaneum*). Results showed that pest infestation levels were significantly lower in IPM-managed storage areas compared to uncontrolled storage conditions. Preventive measures such as sanitation, moisture control, scientific stacking, and regular monitoring reduced pest occurrence and improved grain preservation. Chemical control methods showed higher immediate effectiveness, while non-chemical methods provided safer but slower pest suppression. The study concludes that IPM is an effective and sustainable strategy for grain storage management, although improvements in monitoring systems, infrastructure, and staff training are still required. The findings support the adoption of integrated and environmentally safe pest management practices in large-scale grain storage systems.*

Keywords- *Integrated Pest Management, Grain Storage, Food Corporation of India, Stored Grain Pests, Post-Harvest Losses, FCI Hapur*

I. INTRODUCTION

India is one of the world's largest producers of food grains, making efficient grain storage systems essential for ensuring food security and minimizing post-harvest losses. Stored grains are highly vulnerable to infestation by insects, rodents, fungi, and mites, which can significantly reduce grain quality and quantity. Traditional grain storage practices rely heavily on chemical pesticides and fumigation, which

may lead to pesticide resistance, environmental contamination, and health hazards.

Integrated Pest Management (IPM) is considered a sustainable alternative that combines preventive, biological, cultural, mechanical, and chemical control methods to manage pests effectively while minimizing environmental risks. The Food Corporation of India (FCI) plays a major role in grain procurement and storage across the country. Therefore, evaluating IPM practices in FCI storage systems is important for improving long-term grain preservation and reducing economic losses.

This study focuses on the implementation and effectiveness of IPM strategies at the FCI storage facility in Hapur, Uttar Pradesh.

II. OBJECTIVES OF THE STUDY

1. To identify major storage pests present at FCI Hapur.
2. To evaluate the effectiveness of IPM practices in reducing pest infestation.
3. To assess the role of sanitation, monitoring, and environmental conditions in pest control.
4. To compare chemical and non-chemical pest management methods.
5. To suggest improvements for sustainable grain storage management.

III. MATERIALS AND METHODS

The study adopted a descriptive and analytical case study design focused on the Food Corporation of India (FCI) storage facility at Hapur, Uttar Pradesh.

Data Collection:- Both primary and secondary data sources were used.

Primary Data

- Field observations
- Storage inspections
- Structured interviews with FCI staff
- Assessment of pest infestation levels
- Monitoring of storage hygiene and environmental conditions

Secondary Data

- Official FCI reports
- Government publications
- Research journals and scientific literature

Major Pests Identified

- Rice weevil (*Sitophilus oryzae*)
- Lesser grain borer (*Rhyzopertha dominica*)
- Red flour beetle (*Tribolium castaneum*)

Data Analysis

Qualitative data were analyzed through thematic interpretation, while quantitative data were analyzed using percentages and comparative analysis.

IV. RESULTS AND FINDINGS

Pest Infestation Levels: - Pest infestation was significantly lower in IPM-controlled storage areas.

Pest Species	Controlled Areas (%)	Uncontrolled Areas (%)
Rice Weevil	8%	21%
Grain Borer	6%	18%
Flour Beetle	5%	15%

Effectiveness of Preventive Measures

- Regular cleaning reduced infestation by approximately 30–35%.
- Scientific stacking improved storage efficiency by 25–30%.
- Moisture control below 12% reduced pest growth.

Comparative Effectiveness of Control Methods

Method	Effectiveness	Limitation
Chemical Control	85%	Residue risk
Non-Chemical Control	65%	Slower action

Storage Conditions

Environmental conditions influenced pest development.

Parameter	Observed at Hapur	FCI Ideal Condition
Moisture Level	11–13%	<12%
Temperature	25–32°C	20–25°C
Ventilation	Moderate	Adequate

Key Observations

- Covered godowns showed lower infestation than open CAP storage.
- Monitoring and early detection improved pest management efficiency.
- Staff had basic knowledge of pest management but limited advanced IPM training.

V. DISCUSSION

The study demonstrates that IPM strategies significantly improve grain storage efficiency by reducing pest infestation and minimizing post-harvest losses. Preventive methods such as sanitation, moisture regulation, and routine monitoring played a major role in pest suppression.

Chemical methods provided rapid pest control but raised concerns regarding chemical residues and environmental safety. Non-chemical approaches were environmentally safer but less immediately effective. Therefore, integrating multiple pest management approaches was found to be the most sustainable strategy.

The findings support previous research emphasizing that successful grain storage depends not only on pest control but also on infrastructure quality, monitoring systems, and staff awareness.

VI. CONCLUSION

The study concludes that Integrated Pest Management is an effective and sustainable approach for controlling stored grain pests at FCI Hapur. IPM practices reduced pest infestation, improved grain preservation, and minimized post-harvest losses. However, improvements in infrastructure, staff training, and monitoring systems are required for better long-term implementation.

Adopting IPM on a larger scale can contribute significantly to food security, environmental sustainability, and efficient grain storage management in India.

VII. RECOMMENDATIONS

1. Strengthen IPM implementation across all storage facilities.
2. Introduce advanced pest monitoring technologies.
3. Improve storage infrastructure and ventilation systems.
4. Reduce overdependence on chemical pesticides.
5. Conduct regular staff training programs on IPM practices.
6. Promote eco-friendly and biological pest control methods.

REFERENCES

- [1] Food Corporation of India (FCI). Storage and Preservation of Food Grains. Government of India.
- [2] Research articles on stored grain pests and Integrated Pest Management.
- [3] Government publications related to grain storage systems and post-harvest management.