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The Impact of Emerging Insect Pests in Food Grain Quality

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Introduction

Post-harvest losses are one of the major causes of food insecurity in the developing world. In Africa, at the farm level, producers store their grains for three purposes: for consumption until the next harvest, as seed for planting in the next season and for selling when prices become favourable. Storage losses due to insect pest infestations have been a problem of major concern among small- holder farmers who use traditional storage structures. The majority of framers in India (88%) use traditional storage system that exposes stored grains to storage insect pest, mold and other lose factors. Grain storage pests are major concerns for farmers worldwide but especially in developing countries because large percentage of the crop may be lost to storages pests. Prior to any pest control interventions it is vital to assess the pest status and extent of losses that have occurred or likely to occur during storage. In India studies on grain postharvest storage management practice and associated storage pest are limited to other parts of the world. The average grain losses due to storage pests about 10% of the total grain produced in some case the losses could be rise to 40-50%. Deterioration of stored grains results from the interactions of several factors such as physical, chemical and biological variables existing the overall chains from production to consumptions. Deterioration of grain due to infestations of insects, mites, and fungi is the main post-harvest factor affecting the nutritional quality and marketability of stored grain. In feed mill godown loss in raw material in terms of quantity is due to moisture shrinkage losses, losses due to pest and rodent and improper bagging materials. Control of losses is very important to improve the profitability of feed production. In feed mill godown the biological factors responsible for storage losses in feed ingredient are: Insects, Rodents, Birds and Microorganisms.

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Storage grain pest are classified into two categories

- Primary
- Secondary

- **Primary**: - Primary feeders are those, which are able to damage the whole, undamaged grains. Their lifecycle involved with the whole grain as their young ones bore and feed inside the kernel part of the grain which sometimes creates 'hidden' infestation. Basically insects that damages sound grains are primary storage pests. These can cause very severe damage to the lot and if unnoticed till their population establishment, they are hard to manage. Regular monitoring is the essential step for preventing their damage.
- **Secondary**: - Secondary feeders are generally called as 'bran bugs' because they establish on the grains, which were already damaged either by the primary pests or other miscellaneous damages. They generally survive on broken kernels, debris or higher moisture weed seeds. The immature stages of these insects were found external to the grains and generally cannot initiate the infestation of the whole grains. But once after establishment these are generally contributing to spoilage, but not too severe as primary insects do.

Primary Stoarage Pest

Common name	Pest	Family	Order
Internal Feeders			
Rice weevil	*Sitophilus oryzae, S. zeamais, S. granaries*	Curculionidae	Coleoptera
Lesser grain borer	*Rhyzopertha dominica*	Bostrychidae	Coleoptera
Angoumois grain moth	*Sitotroga cerealella*	Gelechiidae	Lepidoptera
Pulse beetle	*Callosobruchus chinensis, C. maculates*	Bruchidae	Coleoptera
Cigarette beetle	*Lasioderma sericorne*	Anobiidae	Coleoptera
Drug store beetle	*Stegobium paniceum*	Anobiidae	Coleoptera

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Tamarind Beetle	*Pachymeres gonagra*	Bruchidae	Coleoptera
Sweet Potato weevil	*Cylas formicarius*	Apionidae	Coleoptera
Potato tuber moth	*Phthorimoea operculella*	Gelechiidae	Lepidoptera
Arecanut beetle	*Araecerus fasciculatus*	Anthribidae	Coleoptera
External Feeders			
Red flour beetle	*Tribolium castaneum, Tribolium confusum*	Tenebrionidae	Coleoptera
Indian meal moth	*Plodia interpunctella*	Phycitidae	Lepidoptera
Fig moth or almond moth	*Ephestia cautella*	Phycitidae	Lepidoptera
Rice moth	*Corcyra cephalonica*	Galleriidae	Lepidoptera
Khapra beetle	*Trogoderma granarium*	Dermestidae	Coleoptera

- **Secondary Storage Pest**

Common name	Pest	Family	Order
Saw toothed grain beetle	*Oryzaephillis surinamensis*	Silvanidae:	Coleoptera
Long headed flour beetle	*Latheticus oryzae*	Tenebrionidae	Coleoptera
Flat grain beetle	*Cryptolestus minutas,*	Cucujidae	Coleoptera
Grain lice	*Liposcelis divinitorius*	Liposcelidae	Psocoptera
Grain mite	*Acarus siro*		Acari

Some Factors Affecting Insect Pest Infestation

Factors like relative humidity, grain moisture, temperature, light, types of storage containers, storage practices, storage period and fungi are associated with storage losses due to the presence of insects in foodgrains.

The direct & direct damage caused by insects and pests includes the loss of weight and nutrients, reduced germination and contamination of grains with eggs, larvae-pupae and odour.

General Management Practices of Stored Insect Pest

(Saw Toothed Grain Beetle)

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In India several management practices are implemented like physical, mechanical, chemical, biological practices. Some of the general preventive and curative management options are listed below:-

- **Temperature management:** Increasing or decreasing the temperature can alter the insect growth and metabolism. Optimal temperature for most of the storage insects is between 25 and 33º C.
- **Moisture:** Drying of the grains to a moisture range of 10 to 14% based on grain type, avoid majority of the damage. Drying can be done under sunlight or using any developed dryers.Mixing of inert dusts: Inert dusts like clays, sand, ash, minerals, silica (silicon dioxide) are effective in managing the insects by moisture loss of the insect body by abrasion.
- **Irradiation:** Radiations in lower dose can able to kill or sterilizes the common grain pests, and even the eggs deposited inside the grains. Radiations like microwaves, x-rays, etc.
- **Mechanical devices, traps, etc.:** Devices developed for monitoring and mass trapping such as entoleters, which are using in flour mills. Apart from these some other traps like Probe trap, Pulse Beetle Trap, Light traps, Sticky traps, Bait traps and Pheromone were also developed and tested some of the country.
- **Botanicals:** Plant extracts or products having insecticidal properties like Neem leaf powder, black pepper, turmeric powder, Sweet Flag Rhizome powder etc also affective against stored grain pests.
- **Biopesticides:** Some of the commercially available entomopathogenic fungi against field crop pests like Beauveriabassiana, Metarhiziumanisopliae and bacterium - Bacillus thuringiensis (Bt) were tested majorly against stored-grain pests especially beetles
- **Chemical management:** In India, fumigation using phosphine is the only available option as methyle bromide was phased out. Aluminium phosphide (Alphos, Celphos, Phosphume, Quickphos, etc.) recommended for cover fumigation @ 3 tablets of 3 g each per tonne of grain, for shed fumigation @ 21 tablets of 3 g each for 28 cubic metres. 5 to 7 days, the fumigation should be done and made leakage proof. Sand

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snakes are used in case of cover fumigation. Nowadays , precipitate silica is also used against stored pests.

Conclusion

In India damage of food grains due to insect pest is devastating, the total eradication of insect population in feed mill godown in tropical condition is not possible. The degree of infestation can be reduced through effective control measures. Heavily infested ingredients should not be brought into the godown. If infested material enter the godown, it should be kept separate until fumigate to totally eradicate the pests.

Reference

Food and Agriculture Organisation of the United Nations (1973). Analysis of an FAO survey of Post-Harvest food losses in developing countries. FAO, Rome, pp.52-53.

Government of India, 1971. Report of the committee on Post-Harvest losses of foodgrains in India. *Ministry of Food and Agriculture, New Delhi*.

Narayanasamy, P.2009 An insight into traditional grain storage in India. In - Pest management in stored grains. *Satish serial publishing house*.. pp: 11-30.

R. Yasothai, storage losses in feed ingredients by insects and its control. International journal of science, *Environment and technology*, **Vol. 8**, 44-49.

Rajendran, S.2001 Alternatives to methyl bromide as fumigants for stored food commodities. *Pesticide outlook*, **12**: 249-253.

Rajendran, S., and V. Sriranjini. Plant products as fumigants for stored-product insect control. Journal of Stored Product Research, 2008. 44: 126–135.

S.K.Tyagi, P.N. Guru, Aarti Nimesh, Akhoon Asrar Bashir, Pulin Patgiri, Vandana Mohod and Anju B. Khatkar (2019). Post-Harvest Stored Product Insects and Their Management. ICAR- AICRP on PHET, Central Institute of Post-Harvest Engineering and Technology, Ludhiana (Punjab) Technical Bulletin No.: AICRP on PHET/ Pub/ 2019/02

Srivastava, C. and Subramanian, S.,2016 Storage insect pests and their damage symptoms: an overview. *Journal of Grain Storage Research*,Pp: 53-58.