

Indigenous Knowledge in Stored Product Pests Management

Nattudurai G¹, Arulvasu C¹ and Baskar K^{2*}

¹Department of Zoology, University of Madras, Guindy Campus, Chennai 600025, Tamil Nadu, India

²Optimurz Bio and IT Solutions, Shenoy Nagar West, Chennai 600030, Tamil Nadu, India

The crop storage was started in Mesolithic time around 8000 B.C. as per Radio carbon dating. In India wheat and barley were important stored grains since 4500 B.C. Food materials of agricultural and animal origin are stored in different types of storage structures for future consumption or trade purposes. During storage, products were attacked by different type of pest viz., birds, rodents, insects, mites, and microbes. More than 600 species of beetles, 70 species of moths, 355 species of mites, 40 species of rodents, and 150 species of fungi have been reported to be associated with various stored products, including food commodities. During the storage many stored grain insect pests were affected and destroyed the food grains nearly 20-25% [1]. Grains, pulses and oil seeds were infected by primary and secondary insect pests. The abundance of pests leads to fungal contamination due to excess moisture content through the insect faecal matter. Fungi are significant destroyers of foodstuffs during storage, rendering them unfit for human consumption by retarding their nutritive value and sometimes by producing mycotoxins.

The efficient control and removal of stored grain pests from food commodities has long been the goal of entomologists throughout the world. For that many techniques involved to manage and reduction of post-harvest losses. The chemical pesticides application has become a common practice in since 1950s, and has been used extensively to control stored product insect pests. The damage and contamination by insects, mites, rodents and fungi could be prevented by management practices with a minimal use of hazardous chemicals such as methyl bromide and phosphine. Fumigants such as methyl bromide, phosphine, cyanogens, ethyl formate, or sulfur fluoride rapidly kill all life stages of stored product insects in a commodity or storage structure. Fumigation is still one of the most effective methods for the prevention of stored product losses from insect pests. At present the fumigation is generally done by methyl bromide and phosphine. Contact insecticides such as Malathion, Chlorpyrifos, and deltamethrin are sprayed directly on grain or storage structure for protection from insect pest infestation for several months. The use of methyl bromide is being restricted because of its potential to damage the ozone layer. Chemical compounds are used in an irrational way. The uncontrolled application causes unwanted effects such as pesticide resistance in insects, secondary pest outbreak, extinction of natural enemies, consumers' intoxication and lefts of residues in foodstuff. The incidence of insecticide resistance is a growing problem in stored-product protection. Resistance to one or more insecticides has been reported in at least 500 species of insects and mites.

Developing countries have committed to reduce the use of synthetic fumigants by 20% in 2005 and phase out in 2015. Many alternate methods are available for eco-friendly pest management in warehouses. Sands and soil components are used as traditional insecticides in warehouses. Especially red soil mixed with water and coat on top of stored seed as provide protective layer. Sand mix with stored grains will prevent the insect movements and egg laying. Besides this, fossilized remains of diatoms known as Diatomaceous Earth (DE) are also used to protect food grains. Temperature treatment of stored grains is a best physical method which successfully kills several life stages of insects. Most of the stored product insects cannot tolerate extreme temperature, heating and cooling and show heavy mortality. Superheating of food

grains provide extra protection without treating with any insecticide. Second physical method is a low pressure is a pest management tool, and represents a potential nonchemical alternative to fumigants. Low pressure creates a low oxygen controlled atmosphere that kills stored product insects. Third physical method is Ionizing Radiation is an environmentally friendly control of stored grain insects in store houses. Pheromones are used in behavioural control of insects either by applying male specific or female specific pheromonal substances.

One of the most effective and eco-friendly ways of stored product pest management is the use of biopesticides, which includes both microbial and botanical insecticides. Microbial pesticides are in the form of spores or secondary metabolites. The most effective microbial toxin is Bt toxin produced by *Bacillus thuringiensis*. Biological control is a popular method of pest control in store houses. It is a natural process. Most commonly, hymenoptera parasitoids are used to reduce the infestation and damage done by stored grain insects. Besides this, insect pathogens are also employed as biological control agents. Mass release of bio control agents in warehouses may bring down the pest population within a short period.

In traditional methods different types of plant materials such as leaves, fruits, seeds, roots, barks and processed powders or ashes have admixed with stored grains, pulses and other stored products for protection against pest infestation. Recently natural products are highly emphasized as eco-friendly products for the management of pests and fungal diseases. There has been growing interest in the use of plant oils for protection of seed and pulse of agricultural product due to their low mammalian toxicity and non-targeted organism.

Vegetable oils (ground nut, neem, gingelly or sesame oils) and essential oils were used for treatment of stored product pests. The vegetable oils were coated on seed and pulses; the essential oils were used as a fumigant. The plant oils possess antifeedant, oviposition deterrent and repellent activity. The secondary metabolites from essential oils have very complex mixture of monoterpenes, sesquiterpenes and aromatic compounds. The actual chemical composition is a function group of plant products and oils. Neem, *Vitex negundo* (Nochi) powders were admixed with grains and seeds in traditional stored products, which reduced oxygen level. So the plant products repellent or kill the stored product pests.

References

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*Corresponding author: Baskar K, Optimurz Bio and IT Solutions, Shenoy Nagar, Chennai 600030, Tamil Nadu, India, Tel: +91-8110009641; E-mail: eribaskar@gmail.com

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