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Conventional Techniques for Detection of Insect's Pest in Stored Grains

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SUMMARY

Insect causes a major loss in stored food grains that affects the marketability and nutritional values. Early detection and monitoring of pest in stored food grains is good for applying corrective actions. Some conventional techniques like Visual inspection, probe sampling, insect trap, Berlese funnel, visual lures, pheromone devices etc., are some of the popular methods largely used in commercial granaries or grain storage establishments.

INTRODUCTION

India is an agricultural country where GDP is mainly based on its agriculture products. Food security is an important issue as the population of the country is rapidly increasing. Due to a gradual decrease in land and natural resources, ensuring the availability of food to the increasing population will be a major challenge in future. Nearly 60% of the grains, annually produced in the country are retained by the farmers for their own food, cattle feed, seed etc. the farmers generally store their grain in traditional storage structures. It would be possible by the efficient use of agricultural produce and reducing the pre and post harvest losses. During field and post harvest operations there is a post harvest loss of 20-40%. Among these 55% losses occurs during storage (World Bank, 2011). The damage of food grains worldwide was estimated to be 10-40% (Asrar *et al.*, 2016). In India, the storage losses for cereals was (0.75-1.21%), Pulses (1.18-1.67%) and oilseeds (0.22-1.61%). The damage of the stored grains is mostly caused by insect pests, rats and moulds etc. Among them the insects contribute a larger part in damaging the stored products with 30% of total loss. The losses by the insects can be reduced by regular supervision and by proper sanitization. Several conventional detection techniques have been developed for the detection of insects in stored food grains both internally and externally.

Different conventional detection techniques used for detecting the insect pest in stored grains:

Several conventional detection methods are used in grain storage establishments in which they are described below.

1. Insects presence:

Visual inspection method:

This method is a qualitative, subjective and uniform in nature. In this technique the presence of eggs of stored grain pest, adult insects and infested grains can be seen by the naked eyes in the storage bags. This method is suitable when the stored grains quantity is less.

Probe sampling and sieving:

This method is widely used, in this method grains are drawn amounting 0.5-1 kg by probe from the stored bins/bags. Screening of insects from grains is done by using sieves. This method is laborious and time consuming.

Traps:

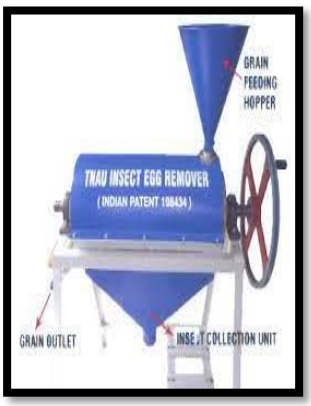
These trap devices are used in timely detection and monitoring of insect infestation in stored food grains. As insects wanders towards air, it is used as the concept of this design. This was discovered by TNAU. Two in one probe is highly efficient due to a combination of probe and pitfall trap. This trap is mostly used for the pulse beetle because they always wander on the surface of the grains. Beetles are captured alive in this trap, which may be facilitated by releasing of the pheromone for attracting more insects.An indicator device consists a perforated cone shaped cup with a lid at the top, is fixed at the bottom with a container and circular dish coated with a sticky material (Mohan and Rajesh, 2016). Automatic insect removal bins are used remove the insect and crushes the eggs laid by them. Efficiency of this trap is nearly 90% and maximum numbers of insects are removed within 10 days.

The UV light traps were embedded with an ultra violet light rays of 250 nm are used in storage godowns at 1.5m above the ground level. This traps are mostly useful in trapping different kinds of stored grain insects like

lesser grain borer (*Rhyzopertha dominica* F.), rice weevil (*Sitophilus oryzae* L.), red flour beetle (*Tribolium castaneum* Herbst), saw toothed grain beetle (*Oryzaephilus surnamensis*) etc.

Two in one probe

Indicator device



Insect egg removal

UV light trap

Visual lures:

Light comes under visual lures which is used for detection, monitoring and management of insects in stored food grains in warehouses, godowns, elevators etc. It is a clean form of technology and uses three types of lights: incandescent, fluorescent and ultraviolet. In this case insects would attract and move towards the light of wavelength between 280-600 nm and some coloured objects due to their explicit reflectance (Neethirajan et al., 2007).

Pheromones:

These are the chemicals secreted by insects used in traps to control insect population. There are different kinds of pheromones i.e., sex pheromones, aggregation pheromones. These are used for the communication among insects. Trap of different materials were used on adhesive coated surface or a funnel shaped structure to catch the insects.

2. Detection of insect's density:

Berlese funnel method:

This consists of a standard funnel apparatus with mesh screen. Here below the incandescent light the grain samples are kept in a funnel for 8hrs and a jar containing alcohol/ water is used for capturing the insects. Funnels are equipped with screen bottom small enough to retain the grains and large enough to allow passage of the insects through it. It uses dry heat to remove the insects from the grains. Dry heat warms the grains and compels the insects to move opposite to heat in a funnel (Neethirajan et al., 2007).

Uric acid method:

The main element of insect's excreta has been recommended as a tracing element of insect infestation in stored food grains is Uric acid. This method detects the entire period of store indirectly. Different methods were developed to determine the uric acid level: by paper chromatographic, fluorometric, colorimeter, gas liquid chromatography, thin layer chromatography. As per BIS colorimeter method is used mostly for uric acid measurement to determine the level of infestation.

Hidden infestation detector:

It is very simple and low cost device used to detect the hidden infestation in the grains. It consists of three circular plates placed over one another. The top and middle plates are hinged for easy operation during lifting. The base plate is covered with ninhydrin treated filter paper. Sorghum infested with S. oryzae, wheat with angoumois grain moth (*Sitotroga cerealella*) and green gram with cowpea weevil (*Callosobruchus maculatus*) were tested with this detector. Holes of middle plate were filled with grain samples of about 20% moisture content.

The top plate was pressed to crush the grains. Filter paper stained the infested grains, which were counted and percentage of infestation was estimated by comparing with other methods.

CONCLUSION

Several methods are available to detect the insect infestation in stored food grains. Among conventional methods, visual inspection is a simple, direct and inexpensive method but not suitable for bulk storage, detection of hidden and low-density infestation; besides being time consuming. There is a need for such a potential technology which caters automation, high efficiency in bulk storage, less human power and little or no destruction of the commodity.

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