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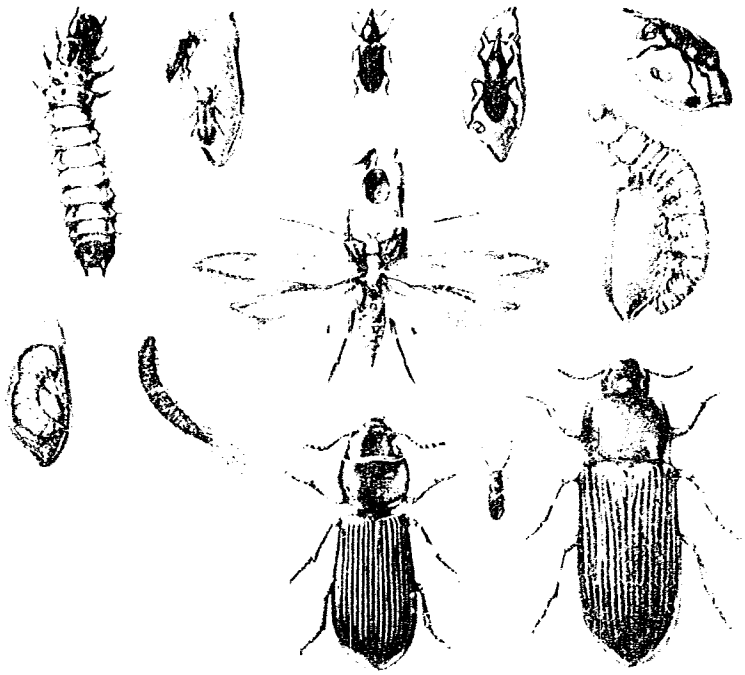
INSECT PESTS OF STORED CEREALS AND DRIED FRUITS in AFGHANISTAN



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Insect Pests of Stored Cereals and Dried Fruit in Afghanistan

The following report was sponsored by the Plant Protection Association of Afghanistan under the Chairmanship of Mr. Abdullah Fiazyar to further the knowledge of the problems and insect enemies affecting Afghan agriculture.

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Introduction

Purpose of the stored products pest survey was to look at the different representive areas of Afghanistan and to make a comprehensive investigation of the extent, kinds, and seriousness of insects damaging stored cereals and dried fruits. Various reports and occurences of damages have been reported from many areas in past years and this is the first attempt to investigate these damages, in a systemic manner, on a country-wide basis.

In the winter of 1972/1973 a report of a serious infestation in raisin shipments from Afghanistan to China were received from the PACCA Project and the matter was brought up in a meeting of the Plant Protection Association of Afghanistan. It was decided at this meeting that a investigating committee of entomologists look into the problem to see if assistance could not be given to the nine private raisin processors in the country to keep their products free of insect infestations. From this start the project expanded into stored cereal products and other dried fruits.

The following section is a listing of the times, commodities and area visited for the purpose of the survey and the insects found.

Insect Species, Their General Account Hosts and Areas of Infestation

During the course of this survey of stored product pests and also in previous collections by the authors, sixteen species of insects have been identified. Among these, fourteen insects were beetles belonging to seven different families, one was a moth borer (Indian meal moth) and one was a termite. Among the beetles, three were primary pests, namely the granary weevil, the lesser grain borer, and the khapra beetle, which bore and feed inside the grain and the rest were secondary pests, which feed upon the broken or crushed grain. The moth larva collected also belong to the secondary pest group, which feeds from outside the stored product. The termite can devour the grain as a whole. A description of each insect along with its host and the areas of its distribution are given below:

1. Granary weevil (Sitophilus granarius L.) Coleoptera: Curculionidae.

It is a small chestnut brown or blackish beetle with head prolonged into a snout. It has no wings under its wing covers and thus it can not fly far. Both the grub and the adult beetle lives for 7-8 months.

This beetle was collected from wheat at Bolan (LashkarGah), Hada (Jalalabad), Daronta (Jalalabad) and Paktia warehouses. No specimen of the rice weevil, Sitophilus oryzae was collected from any place during this survey.

2. The lesser grain borer (Rhizopertha dominica Fab.)

Coleoptera: Bostrichidae.

It is one of the smallest beetle injurious to stored grain. Its head is turned down under the thorax. The beetle is a strong flyer and spreads rapidly. Both the adult and the larvae feed inside the grain and only outer shell is left after its feeding. The adult beetle is dark brown or black in colour with a roughened surface.

It was collected from wheat, maize and barley at Kandahar, Bolan (LashkarGah), Herat and Hada (Jalalabad) grain godowns. It is one of the most serious pest of stored grain in Afghanistan.

3. Bamboo borer (Dinoderus minutus F.) Coleoptera: Bostrichidae.

Though it is a primary pest of dry bamboo, it is sometimes found in stored grain associated with the lesser grain borer as both belong to same family of insect. In shape and colour it is identical with the lesser grain borer but it is slightly larger than the latter and has comparatively smoother body. But it has a lesser economic importance under temperate climate.

It was collected from wheat at H

4. Confused flour beetle (Tribolium confusum Jacq. de Val)

Coleoptera: Tenebrionidae.

It is a shiny, reddish brown, flattened and oval bodied beetle. The head and upper part of thorax are densely covered with minute punctures. It does not bore the grain but feeds on the broken or crushed grain. It is a serious pest of wheat flour and wheat product. In population, it is the most abundant and injurious pest of stored grain. The life of the adult beetle is about a year.

It was collected from wheat, maize and barley from the grain stores and warehouses at Kandahar, Bolon, Marja and Girishk (LashkarGah), and Daronta and Hada (Jalalabad).

It was also found in a wheat sample received from Paktia. No specimen of red flour beetle (Tribolium castaneum Hbst.) was found during this survey.

5. Black flour beetle (Tribolium madens Charp.)

Coleoptera: Tenebrionidae.

It is an allied species to confused flour beetle. It can be recognised by its larger size and black body. It is found in association with other species of tribolium or flour beetle but it is much less common and is not a serious pest.

A single specimen of this species was collected from wheat at Daronta (Jalalabad) warehouse.

6. Brown flour beetle (Tribolium destructor Uyttenb)

Coleopterr: Tenebrionidae.

Like the above species, it is also an insignificant pest but is sometimes found in association with other flour beetles. In shape and colour it is similar to confused flour beetle.

A single specimen was found in wheat sample collected from Hada (Jalalabad) grain store.

7. Long headed flour beetle (Latheticus oryzae Waterhouse)

Coleoptera: Tenebrionidae.

It is a slender, flattened beetle, slighly less than one eighth of an inch in length and it is somewhat similar in shape to confused flour beetle but it is smaller in size and pale yellow in colour instead of reddish brown. Its antennal segments are more condensed than those of confused flour beetle. At some places, its attack was as serious as that of confused flour beetle.

This species was collected from wheat, barley and maize at Kandahar, Hada (Jalalabad), but its infestation was more severe in maize at Hada Farm grain store.

8. Khapra beetle (Trogoderma granarium Everts)

Coleoptera: Dermestidae.

The adult beetle is small, and it is about one eighth of an inch long. The female is twice the size of the male. It is pale red-brown or black in colour. Larvae are yellowish brown and clothed with long reddish brown hairs; about one sixth of an inch long. The larvae may live for months without food. This beetle is poor in locomotion. The damage to grain is done by the larvae, while the adult beetle is harmless.

This beetle was collected from Kandahar, Bolon, Marja and Girishk (LashkarGah), Herat and Hada Farm (Jalalabad), attacking wheat and barley.

9. Saw-toothed grain beetle (Oryzaephilus surinamensis L.)

Coleoptera: Cucujidae

This insect is called saw-toothed grain beetle, because it has a of row six saw-like teeth on each side of the thorax. It attacks stored grains, dried fruits and flour. The adult beetle lives for 6-10 months. This insect is a secondary pest of grain like the flour beetles.

This beetle was collected from Bolon (LashkarGah) attacking wheat and from Kabul infesting rice. Reports of its attack in raisin at Kabul were also received.

10. Merchant grain beetle (Oryzaephilus mercator L.)

Coleoptera: Cucujidae.

This beetle is similar in shape and structure to saw-toothed grain beetle but is slightly smaller. It was collected from Kandahar Warehouse on wheat.

11. Rusty grain beetle (Laemophloeus Cryptolestes) ferrugineus Steph. Coleoptera: Cucujidae.

It is not a primary pest of grain and the adult is unable to survive in sound and uninjured grains. It is a minute, flattened, oblong, reddish-brown beetle. The elongate antenna of the male beetle are not more than half of the body length. It is frequently found in enormous number associated with other grain beetles. The larvae usually feed on the germ of wheat grain. They sometimes feed on dead insects.

This insect was collected from Kandahar and Darunta (Jalalabad) Warehouses in wheat. Its population at Kandahar was fairly high.

12. Flat grain beetle (Laemophloeus pussillus)

It is one of the smallest beetle found in stored grain. It is similar to rusty grain beetle in shape, appearance and habit. It can, however, be distinguished by the length of its antenna, which is two third of its body instead of half as in case of rusty grain beetle. It is frequently found associated with granary weevil. It is scavanger by habit and prefers grain which is out of condition.

It was found in the infested wheat sample received from Paktia Government Warehouse in 1971.

13. Meal worm, (Coleoptera: Tenebrionidae) darkling beetle. (Species not identified).

It is broadly oval beetle, about half an inch long, velvety black body and reddish antennae. It is particularly attracted to damp stores.

It was collected from raisin bag at Chare Kar.

14. Drug store beetle (Stegolium paniceum L.)

Coleoptera: Anobiidae).

It is about one-tenth of an inch long, cylindrical and uniformly light brown beetle with fine pubescence on the body and the head bent downward. It is a general feeder, attacking stored food, seeds and other materials.

It was collected from broad bean seeds at Kabul.

15. Indian meal moth (Plodia Interpuntella Hbn.)

Lepidoptera: Phycitidae).

The larvae of this moth feed upon grains, grain products dried fruits, nuts and a wide variety of food stuff. When full grown, the larvae are about half an inch long, dirty white with a pinkish tinge. It makes a web when fully grown and leaves behind a thread when it crawls. The adult moth is very handsome. Its forewings are reddish brown with coppery luster at the hinder portion and whitish grey at the front end.

Its larvae ware found attacking dried apricot, and dates in commercial stores at Kandahar and raisins at Kabul. It was also found infesting maize at Marja (LashkarGah) Warehouse in 1968.

16. White ants or Termite (Microcerotermes Sp.)

(Isoptera: Termitidae)

White ant is a well known house hold as well as field insect although all objects containing cellulose. Food grains are also eaten by these insects if they get access to the godowns through crevices and crevices in the buildings. It is the worker cast of this insect which eats food grain and woody material.

The damage of white ant was found in farmer warehouses of Marja and Nad-i-Ali attacking wheat.

CONTROL OF INSECT PESTS OF FOOD GRAINS AND DRIED FRUITS

The food grains are liable to insect attack in the field itself before the harvest of the crop. But there are very few species of insect, which are capable of damaging the grain in the field or on the threshing floor. Most of the stored grain pest are either already present in the warehouses or get entry into the stores from out side. In Afghanistan, besides the food grains, dry fruits, such as raisins, apricot almond, pistachio etc. also present a problem of storage pests. The pests of dry fruits breed inside the stores and none of them attack in the field. The control of stored product pests can be divided in two parts: (a) by adopting preventive method before storing grains or dry fruits and (b) by using chemicals to kill the insects of infested material. Details of each of the two systems of control are given.

(a) Preventive methods:

1. The grain should be harvested as dry as possible. After threshing, the grain should be thoroughly dried in the sun. The grain intended for long storage should have less than 10 per cent moisture content.

2. The empty granaries or warehouses should be thoroughly cleaned and the crevices burnt before storing fresh grains. The walls and floors should also to be thoroughly sprayed with 1% lindane or 1% DDT or 0.2 - 0.4% of Bayrhion or 3% Malathion. The best way of disinfesting any storage room is fumigation with Hydrocynic acid gas, but it requires expert supervision and should not be handled by common man.

3. To prevent seed grain from insect damage the insecticide can be mixed with it before storage, because there is no risk of poisoning. This method can, however, not be adopted for the grain meant for human or cattle consumption. The insecticides used for mixing with seed grain are DDT or BHC at 50 grem of 5% dust per 100 kg. of grain.

(b) Remedial measures:

Killing of store pests from the infested stock can not be effected by the use of stomach or contact poisons as the material will become unfit for human or cattle consumption. Fumigation is the only practical and sure method of controlling insects of stored products.

Most of the fumigants are supplied in liquid form which produce gas after vaporisation. Some of them may catch fire after exposure to air. Moreover, fumigation has to be in airtight bins or compartments, so that there should be no leakage of the gas which can prove fatal to the operators. The common fumigants used against store pests are:

1. Carbon tetrachloride, mixed with carbon disulphide (80:20).

2. Carbon tetrachloride mixed with ethylene dichlride and ethylene dibromide (60:30:10).

3. Ethylene dibromide mixed with methyl dibromide (70:30).

These fumigants can be used only in air tight compartments and stores by skilled hands and are not recommended for common use.

In recent years, a safe fumigant, known as "Phostoxin" has become available which can be used safely by ordinary persons. This fumigant is in tablet or pellet form, packed in airtight moisture proof containers. It consists of aluminum phosphide and ammonium carbamate. When dropped in grain and exposed to air, the tablet produces hydrogen phosphide (phosphine) gas, which is poisonous to insects. After disintegration aluminium hydroxide a harmless chemical is left as residue. The gas evolution takes place 3-4 hours after exposure to air and thus it is safe to operators. Decomposition of gas is complete in 3-5 days.

Dosage Rate of Phostoxin:

Phostoxin is available in the form of tablets weighing 3 grams releasing 1 gram of hydrogen phosphide and in the form of pellets weighing 0.6 gram giving 0.2 gram of the gas. The dosage depends on the type of the storage, pest to be controlled and the temperature inside the store house. The dosage under different kind of storage are as follows. The pellets should be used five times the number of tablets recommended.

1. Silos 2-5 tablets per tonne of grain or 60-150 tablets per 1000 bushels of grain.

2. Loosely piled grain or other commodity in warehouses:

(a) Covered with plastic sheets: 2-6 tablets per tonne.

(b) Non - covered with plastic sheets: 6-12 tablets per tonne.

3. Packed commodities (bagged grain etc.) under plastic sheets 1/2 - 1½ tablets per cubic meter.

4. Space fumigation: (flour mills or warehouses)

1/2 - 3/4 tablets per cubic meter or 15 - 20 tablets per 1000 cubic feet space.

5. Raisin bag treatment: One pellet per 12 kg. box. The pellet should be kept in a porous envelop preferably made from blotting or filter paper.

Note: 1. Compounds of hydrocynic acidgas, mentioned under a (2) and other compounds noted under b(1, 2&3) are not available, at present in Afghanistan. But they are being used for fumigation against insect infestation in stored products in other countries.

2. While using phostoxin for controlling stored grain or dried fruits, the rooms or bins should be opened after 5 days of treatment to expel the phosphine gas, which is poisonous to human beings. The treated material should then be exposed to sun to eliminate all traces of the gas, to make it completely safe for human or cattle consumption.

CONCLUSION

Modern silos have been built at Kandahar, Herat, Pul-i-Khumri and Kabul for the Afghanistan Government Food Department. These should be a great help in protecting government food grain stores. Previous warehouses in these localities were very poor with mud plastered walls and stone and dirt floors.

Insect infestations are impossible to satisfactorily control in this type building with any known kind of chemical control agent.

Many other grain storage buildings are inadequate including the new all metal buildings, because they are not rodent proof or air tight enough to fumigate for insect infestations. Grain storage building must have solid rodent proof floors and be capable of being made air tight enough for fumigation. Successful fumigations have been carried out in Afghanistan using phostoxin a German product made by Degesch, Frankfurt am Main.

This is the only chemical that is to be recommended for insect fumigation in stored products in Afghanistan. There are no adequate facilities or safety equipment at present in this country for fumigation with methyl bromide and other fumigants.

Imported grain from other countries has created problems in Afghanistan by being infested with greater or lesser amounts of insect life and weed seeds upon its arrival. This has introduced various species of insects and weeds.

to many locations in the country, however the very low humidity found in most areas of Afghanistan have not favored a high loss, most of the damage observed on imported wheat has happened on ship board or in transit through Pakistan.

Private grain and dried fruit storages were generally insect free. This can probably be explained by the rapid and regular movement of the products and the short duration that private commodities are in storage. Government stores were most frequently found to be infested. This could generally be explained by the commodities being left too long in poor and previously insect infested warehouses.

One basic fact should be remembered "Clean products stored in clean, insect and rodent free buildings will have little or no loss".

Rats and mice were found to be as serious or more serious than insects in cereal losses. In all storages examined evidence of rodent activity was observed. Control of rodents where there is poor or non-existant sanitation is impossible. Rats and mice will not feed on poison bait if there is an unlimited and unrestricted supply of unpoisoned commodities available.

Loss from rats and mice on stored products in Afghanistan were estimated on this survey to run to 3.0 to 4.0 percent country wide.

Losses from insect infestations were estimated in the range of 2.0 to 3.0 percent. This year estimated wheat yield for Afghanistan is 3.6 million tons.