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# INSECT PESTS OF STORED AGRICULTURAL PRODUCTS & THEIR CONTROL

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**Introduction.** Every cultivator is aware of the fact that it is not alone the crop growing in the fields which suffers from insect attacks but that insects of different kinds also do harm to stored agricultural products. It is well-known that preservation of grains, pulses, etc., for seeds and other purposes is often a serious problem among farmers everywhere. Commodities like grains, pulses, oil seeds and various dry vegetable products are the chief materials which suffer from such damage and the injury so caused is often very substantial. Farm granaries, provision and grocery depots, drug stores and flour mills are the chief haunts of these insects. It must, however, be noted that the great majority of them are quite different in their food habits from those affecting growing crops, and their activities are almost exclusively confined to stored products. A very brief account of the more important store insects with some directions for their control is given below.

**Important Store Pests.** The important insects affecting stored products of different kinds are the representatives of only two insect groups, viz., the *Beetles* and the *Moths* and between these two, beetles are far more represented and of greater importance than the moths. Beetles are also comparatively more destructive because of the fact that both the larva and the adult beetle attack the stored product while among the moths it is only the larva or the caterpillar that does the damage. The following are the most important and well-known beetles.

**Beetles.** (1) *Rice Weevil* (i) This is a small dark brown creature, one-eighth of an inch in length with a cylindrical body and a prominent curved snout. It is a very well-known insect found every where; though it is specially bad on rice it is also found on other grains like wheat, maize, sorghum, and their products.

(2) *The red flour beetle* (ii) This is a small elongate flattish red beetle about one-sixth of an inch in length. It is an extremely common creature and is found to infest almost all stored products like grains, oil seeds, etc.; it is a special pest of articles, like rice, wheat flour, pulse powder, biscuits, bran, etc. The elongate white larvae are found in infested material. This insect is also fond of museum specimens like dry insects, and insect collection boxes not properly disinfested often become subject to the infestation of this insect.

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(i) *Calandra oryzae*, L. (ii) *Tribolium castaneum*, H.

(3) *The paddy borer beetle* (iii) A dark brown beetle measuring about one-sixth of an inch with a stout globular head. Though not so common as the two insects noted above, it occasionally becomes a serious pest of stored paddy; the adult beetles and their young ones bore through the husk of the grain, feed on the contents and turn it into chaff. It is also sometimes found in other grains with other beetles.

(4) *The drug store beetle* (iv) This is a minute brown beetle found boring into all kinds of dry stores like turmeric, ginger, coriander, etc., vegetable drugs of different kinds and practically all dry vegetable matter. It also attacks books and records boring minute round holes in them.

(5) *The tobacco borer beetle* (v) This is a well-known and widely distributed pest of dry tobacco in all forms such as cigarettes, cigars, etc. It is almost very similar in appearance to the drug store beetle and with its hairy whitish grub bores into dry tobacco. It is also known as the 'Cigar-borer' beetle.

(6) Pulse beetles (vi) These are small active roundish beetles about ¼" long; the body is abruptly rounded behind and the hind legs are stout at the base. These beetles are easily recognised and are closely associated with pulses of all kinds; their eggs are found laid as minute white scales on infested seeds and the grubs bore into them by cutting a neat hole. These are often serious and cause appreciable loss to cowpea, grams, lablab, etc.

**Moths.** As stated above these are very few compared to beetles and the important ones are (1) The Paddy moth (a) This is a very small shining insect found flying in numbers inside infested granaries and causing considerable damage to stored paddy: it is also found in maize and cholam stores. As stated above, it is the caterpillar of the moth that bores into the grain and turns it into chaff.

(2) *The Meal worm moths* (b) Two or three different species are found in S. India; the caterpillars of these infest flours, dry nuts, grains of different kinds and dried vegetable stuffs. They remain inside tubular galleries made up of the powdery matter, the loose grains, etc., being all webbed together in a connected mass; this infestation is very commonly noted on badly preserved wheat and other flours, rice, cholam, cashew-nut, groundnut, etc.

**General life habits of store pests.** Almost all the insects noted above are more or less similar in their life habits. They breed and multiply so rapidly that all the different stages are found on the same food material, and once infested the material is very badly damaged in a very short time. The pests get dispersed very easily from place to place with consignments of infested material conveyed by road, rail or waterway.

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(iii) *Rhizopertha dominica*, F. (iv) *Sitodrepa panicea*, L. (v) *Lasioderma serricorne*, F. (vi) *Bruchus* spp. (a) *Sitotroga cerealella*, O. (b) *Corcyra cephalonica*, H. and *Plodia interpunctella*, H. are the two chief species.

**Control measures.** The effective measures for controlling insects affecting stored products and for preventing damage and loss are thorough cleanliness and proper treatment of the material before storage. In the way of preventive measures there are three fundamental points to be remembered.

(1) *Proper condition of the cellar, bin or vessel before storage.* Before a consignment is stored, the store house or any vessel in which it is going to be stored should be made thoroughly clean and free from any traces of loose grain, chaff, bran, etc; the corners and bottom of the vessels and any cracks in them which often retain bits of matter should be well cleaned. If this is not done the infection that would linger will spread and spoil the stored material,

(2) *The proper condition of the product to be stored.* The grain, pulse or other products should be thoroughly dried and made free from husk chaff or any extraneous matter which would carry the infection into the store room or vessel. No useful purpose is served in storing already infested seed in a cellar or bin, however clean the latter may be.

(3) *The proper condition of the material and the container after storage.* Once the material has been stored, the granaries, bins or vessels should be completely closed up and remain insect proof; otherwise they are liable to get infested sooner or later. Even the best lot of seeds, kept in very clean vessels, will get infested if kept exposed; baskets, open pots or jars or loose gunny bags do not keep seeds in good condition. If these three fundamental conditions are attended to properly it means that infection is prevented through all the three important channels, viz., the store room, the stored product and later exposure. In this way, a considerable degree of relief can be experienced from store pests.

It is, however, found that in some cases stored products, even after bestowing such attention as described above become infested with beetles or moths when examined after sometime. This is due to the fact that the products before storage frequently contain the minute eggs or larvae of some of these insects which might have escaped our notice and withstood the ordinary mechanical methods of drying, cleaning, etc., and multiplied in storage. To guard against such a contingency, valuable lots of grains, pulses, etc., may be given some special treatment which would destroy all traces of insects lurking in them before storage. One of the best known methods in this direction is what is known as " Fumigation " by an insecticide.

**Fumigation.** This is the process of subjecting insect infested material to the fumes of a poisonous gas which would destroy all traces of insect life in the material to be stored. It has been found that stored products remain perfectly free from insect attacks if they are fumigated and preserved in clean insect-proof containers. It must be remembered, however, that fumigation does not make stored products immune to further attack if they are not properly preserved

after the process. The fumigant commonly used at present for such purposes is a liquid called carbon-bi-sulphide. The process is as follows:—The material to be fumigated is put into any vessel or container which can be tightly closed after the operation. A measured quantity of the chemical is poured on some cotton wool kept over the grain or other material inside the box and the same immediately closed. The box is left closed for 24 hours for the insecticide to act and then it is opened and the fumigated stuff freely aired and stored in insect-proof containers. The usual dose is one ounce of the liquid to every fifteen cubic feet of area enclosed and the period is generally 24 hours. During this period the carbon-bi-sulphide inside the box evaporates and the heavy gas penetrates the seeds and destroys all insect life. In carrying on fumigation with carbon-bi-sulphide which is an evil-smelling inflammable liquid some precautions have to be taken and only trained hands should do the work. The chief precautions are—Do not bring any lights near carbon-bi-sulphide or the fumigation chamber during the process. Do not take a bottle of carbon-bi-sulphide near a fire or naked light nor allow it to get exposed to the sunlight or become heated. Store the chemical in a properly stoppered bottle and under lock and key. Fumigation with carbon-bi-sulphide should be done in a place where no one can get access during the process. The gas is also poisonous to human beings and as such one should leave the bin or room immediately after pouring the liquid and closing the room. If the dose and the time limit are properly adhered to, the fumigated material will not suffer in any way—either for seed purposes or for consumption. There are also other fumigants now tried in western countries. These include hydrocyanic acid gas, sulphur fumes and ethylene dichloride; it is claimed that ethylene chloride has properties which make it not only a very effective fumigant but also a safe substance to deal with.

There are various other methods such as the use of hot air and metallic mercury, storage in underground cellars, etc., to defeat granary pests; the employment of hydrated lime in preserving seeds, of beans, peas and other pulses from beetle attack; covering seeds, etc., with a layer of sand to prevent beetle breeding; spraying the seeds and give a protective film of oil or emulsion to keep away moths and beetles; use of naphthalene in the preservation of seed grains, etc. We also meet with various other local methods of storage and different kinds of vessels, bins, granaries, etc., devised and used for the purpose in different tracts; but very few of them are known to be very effective or reliable in keeping away store pests. For all general needs, however, the instructions given above regarding the preliminary treatment and proper storage of the products will be found quite sufficient. As stated above, a great deal depends upon general cleanliness and the carrying out of the preventive measures suggested above.