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INSECT PESTS OF STORED GRAINS AND MILL PRODUCTS

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Insect pests which destroy stored food products of various kinds are among the most serious pests attacking farm products. Injury from this cause is familiar to every farmer and mill man. It is estimated that the loss resulting from the bean weevil alone has cost the farmers of the Northwest more than one million dollars during the past season.

The Bean Weevil (*Acanthoscelides obtectus* Say). This is the most common and destructive pest of stored beans. Injury is easily recognized by the large round holes which the insects make in tunnelling out of the beans. (Fig. 1).

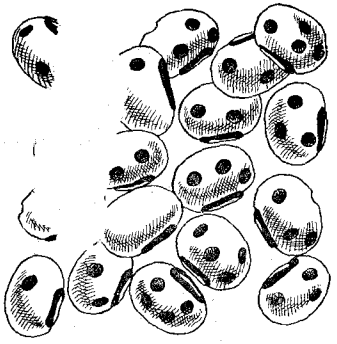

Fig. 1. Beans injured by weevil.

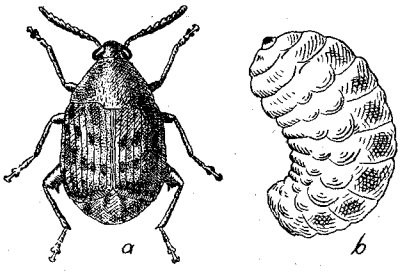

Fig. 2. a. Bean weevil. b. Larva.

Eggs are deposited on the bean pods in the field. The young grub (Fig. 2, b) enters the developing bean and feeds on the inside. After the beans have been stored in the bin, the fully formed adults (Fig. 2, a) emerge. The insects breed in the stored beans and multiply rapidly in storage, so that if no control measures are employed, the beans may be entirely destroyed.

The Pea Weevil (*Laria pisorum* Lec). This insect injures peas exactly as the bean weevil injures beans. The adult closely resembles the bean weevil, but is somewhat larger and is marked differently. The eggs are laid on the peas in the field; the grubs develop in the peas;

and after the peas have been stored the adults emerge. This pest **can not breed** in the stored peas, however, and one practice somtimes followed is to hold over the seed one year in a tight container, when all of the weevils will be dead.

The Meal and Flour Moths. There are two species of moths (the Mediterranean flour-moth and the Indian meal-moth) commonly attacking stored products, which are so nearly alike that for practical purposes they may be discussed together.

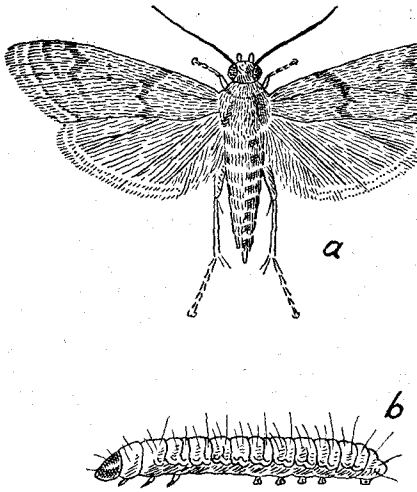

Fig. 3. a. Meal moth. b. Larva.

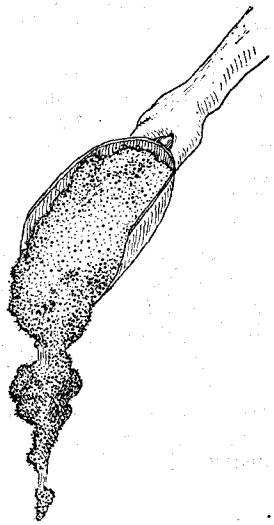

Fig. 4. Work of meal moth

These insects attack meal, flour, and stored grain. The adults (Fig. 3, a) are small, grayish moths, which may be found hiding about grain bins. It is the larval stage (Fig. 3, b) which is injurious. These worms feed upon the stored material, often completely destroying the value of grain for seed, and polluting infested food products with filth. The habit which the larvae have of spinning webs throughout the infested material makes them especially serious. The grain or flour becomes matted together (Fig. 4) so that it cannot be put through the milling processes without great difficulty, and the machinery, conveyors, and spouts are frequently clogged by the masses of webbed material.

The Granary Beetles. Several species of small, dark-colored beetles often do serious injury by feeding upon stored grains and are very troublesome in mills and warehouses. These are injurious in both the larval and adult stages, and as they breed rapidly in the bins, they frequently do serious injury.

TREATMENT

The use of destructive gases is the most effective means of control of insect pests attacking grain and mill products, seeds, etc.

To be effective, fumigation must be carefully and properly done; otherwise results will be unsatisfactory. It is absolutely necessary that the rooms or containers to be fumigated be made as nearly air tight as possible. **Fumigation cannot be accomplished successfully if the gas**

can rapidly escape from the rooms or containers. Small amounts of material may be placed in tight cans or boxes for treatment. Bins and rooms can be made tight by closing cracks with boards and roofing paper. Even old newspapers are effective when carefully used. It is difficult to make a large building gas tight where construction is poor.

The quantity of gases used is based upon the cubic contents of the space to be fumigated. The dimensions of the rooms or containers should be taken, and the cubic contents computed as accurately as is practicable.

Heat

For the destruction of pests in small amounts of grain or similar products kept for culinary purposes in the home, the simplest method is to put the material in a shallow baking pan and place in the oven. To regulate the temperature, a pan of water may be placed in the oven, which should not become hot enough to quite boil the water. One hour of this treatment will kill all stages of the insects causing the trouble.

This treatment will destroy the germination of grains, and therefore cannot be used for seeds intended for planting.

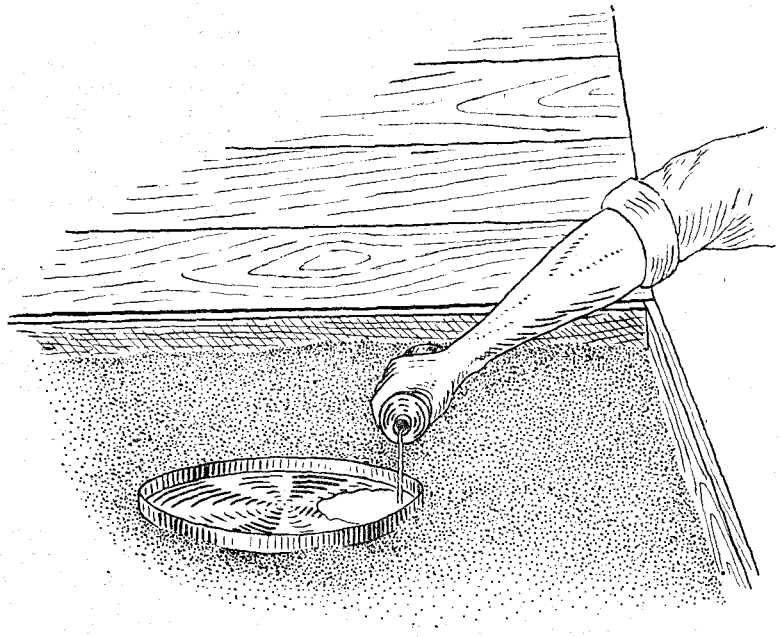

Fig. 5. Placing carbon bisulfide in bin.

Heat is being used very effectively upon a large scale in the treatment of warehouses, elevators, etc. As this method requires the installation of a system of steam pipes, it is too complicated to be discussed here.

Carbon Bisulfide

Carbon bisulfide is the most practical fumigant substance for the treatment of moderate quantities of grain, flour, meal, etc. It can be used for the treatment of seeds intended for planting, and foodstuffs are in no way injured when the gas is properly applied.

This material is inflammable and insurance companies will not ordinarily insure against fire where carbon bisulfide is being used for fumigation.

Application. See that the room or containers are tight enough to hold the gas. The liquid carbon bisulfide may be obtained from any druggist, and 6 pounds should be procured for every 1000 cubic feet of space to be treated.* If the temperature is low or if the gas can leak from the bin, a larger amount will be necessary. **Do not attempt to fumigate if the temperature is below 60° F.** The gas is ineffective below this temperature.

Carbon bisulfide is heavier than air, and tends to settle. The liquid should be placed in shallow pans **on top** of the material to be fumigated (Fig. 5). Where considerable surface is exposed it is well to divide the liquid and place in pans at several points so as to obtain a more even distribution of the gas. As soon as the liquid has been placed in position, immediately close the container. Allow the gas to act for from 24 to 36 hours. The bins or containers may then be opened and allowed to air out. CAUTION. Carbon bisulfide is very inflammable in both the liquid and gaseous forms. **Keep all lights, sparks, or flames away from it.** Do not use in a heated room.

Sulfur Fumes for Empty Warehouses

Sulfur fumes may be used in some cases in place of carbon bisulfide. Empty grain bins, rooms, etc., may be treated with sulfur fumes where it is desired to clean up infestation before storing fresh products.

The stick or flour sulfur should be procured at the rate of 4 pounds to each 1000 cubic feet of space to be fumigated. The sulfur should be placed in a metal pan raised from the floor on bricks. A small amount of kerosene oil is then poured over the sulfur, and this set on fire. Close the bin tightly and keep closed for 24 to 36 hours.

These fumes are injurious to grain, flour, etc.

CAUTION. It is necessary to guard against fire in the use of this treatment.

Cyanide Fumigation

For large quantities of materials in elevators, warehouses. etc., cyanide fumigation is the most desirable treatment. However, this gas is very poisonous and should be used only under the direction of experienced operators. Write to Oregon Agricultural College for information on this subject.

PREVENTIVE MEASURES

Fumigation should not be regarded as a sure cure of stored-product pests. Such treatment should always be accompanied by a general clean-up of the infested premises. Grain bins should be cleaned when empty, carefully swept and the sweepings burned. Storage rooms should be thoroughly cleaned to destroy any hidden worms or moths, and the sweepings destroyed. The use of sulfur fumes, as described above, is recommended for freeing empty storage rooms, bins, boxes, etc., from infestation.

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*For smaller amounts of material, the liquid should be used at the rate of 2 ounces (about 4 tablespoonfuls) for each bushel capacity of the bin.