

HOW TO STOP
Weevil Damage
in STORED GRAIN

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CONTENTS

	PAGE
PREVENTION	3
FUMIGATION WITH CARBON BISULFID.....	3
COMMERCIAL FUMIGANTS	6
ADJUST DOSAGE TO TEMPERATURE AND GRAIN... 7	7
HYDRATED LIME.....	7
PYRETHRUM POWDERS	8
TREATMENT OF EAR CORN.....	8
MERCURY FUNGICIDES.....	8
INSECTS MAY CAUSE HEATING.....	8
NOT ALL INSECTS INJURIOUS.....	8

How to Stop Weevil Damage in Stored Grain

By M. D. FARRAR¹

IF NO PREVENTIVE or control measures are taken, grain held for any length of time in farmer's bins is almost sure to become infested with insects, with consequent loss in value of the grain for seed, for feeding, or for market. The germinability, the weight, the quality, and consequently the commercial grade of the grain, all are reduced by infestation with insects.

Prevention. The best measures for controlling stored-grain insects and preventing damage are cleanliness and fumigation. Preventive measures must be taken before the grain is in the bins.

Most insect damage is due to the fact that bins are not thoroly cleaned before the grain is stored. Bins should be thoroly cleaned out, and all waste grain removed from the cracks, corners, and floors of the bins, on the outside as well as the inside.

If a bin has been infested, spray it thoroly with ordinary or, better, deodorized kerosene or a spray consisting of the following ingredients. This spray will cover adequately about 50 square feet of bin surface per gallon, and will leave no undesirable odor:

	10 gallons	100 gallons
Dormant tree spray oil.....	1 gallon	10 gallons
Lye.....	3 ounces	2 pounds
Water	9 gallons	90 gallons

In order to reduce infestations in the field, grain should be combined or threshed as promptly as possible. In southern Illinois, in years following mild winters, a considerable amount of grain in the shock may be infested in the fields if it is not promptly threshed.

Once the grain is in the bin and has become infested with insects, fumigation is the only practical method of stopping damage.

FUMIGATION WITH CARBON BISULFID

Carbon bisulfid is the best fumigant, all things considered, for farmers' grain bins, or for piles of feed that can be kept in a tight room or container, but it is poisonous to man, and highly explosive, and

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must be cautiously used. It is a nearly colorless, ill-smelling liquid that changes to a gas very rapidly when exposed to the air at ordinary temperatures. The gas is much heavier than air and sinks to the bottom of any container in which it is used. It is deadly to all forms of insect life if used in sufficient strength and at temperatures in which the insects are active.

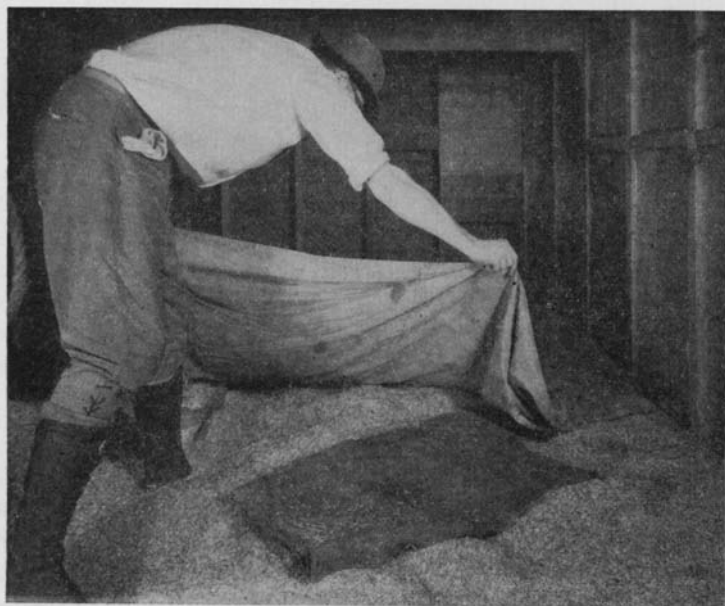
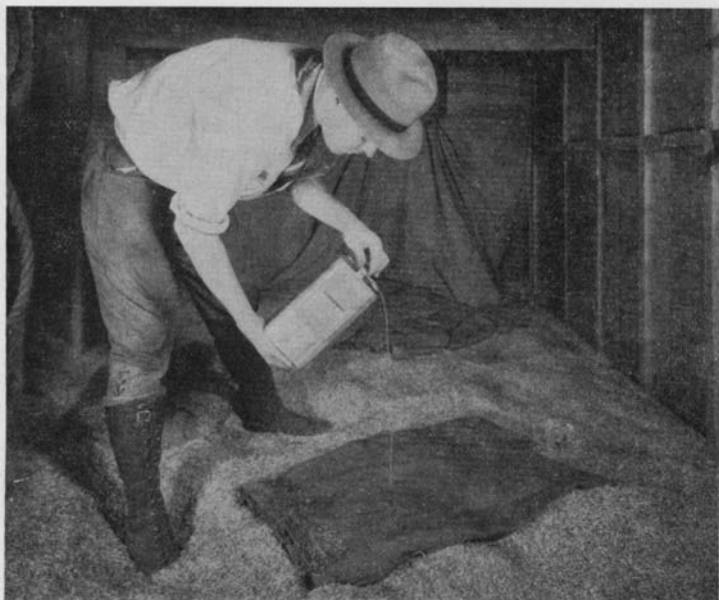
Carbon bisulfid can be obtained from many of the larger dealers in insecticides or chemical companies at prices ranging from 6 cents to 12 cents a pound, depending on the quantity purchased.

Have bins tight. To use this gas, first have the sides and bottoms of the bins, rooms, or containers to be fumigated as nearly airtight as possible. (The average grain bin is very far from airtight.) Never attempt to fumigate a room or bin with large cracks or openings in the bottom or sides.

Rate. Carbon bisulfid should be used at the rate of 1 pound to each 100 cubic feet of space in large tight bins or 1 pound to each 80 bushels of grain. In small bins where there may be some leakage, use 1 pound to each 50 bushels of grain. Where there is sure to be some leakage, or where bins are more than five feet in depth, the amount



Before fumigating the grain, level it off in order that the very heavy gas given off by carbon bisulfid will penetrate uniformly down into the grain.



Place burlap sacks on the surface of the grain, and pour on these sacks enough carbon bisulfid to fumigate the bin. Then cover grain and sacks with a tarpaulin or blanket to confine the gas. Leave the bin at once.

of carbon bisulfid must be increased from one-half to double the usual dosage.

Application. The best results with carbon bisulfid will be obtained at temperatures of 75° to 90° F. Do not attempt to fumigate when the temperature is below 60° F. or over 100° F. The liquid may be applied directly to grain that is not to be used for planting, but better results will be obtained by spreading burlap sacks on the grain and then pouring the carbon bisulfid on them. This gives a rapid evaporation which is more effective than when the liquid is exposed in pans on the surface of the grain. While not necessary, it is better to cover the grain with a tarpaulin or blanket. Keep the room closed for 36 to 60 hours. This treatment will not injure the milling qualities of grain and will leave no poisonous residues on feeds.

Small lots. Small quantities of seeds may be fumigated in tight barrels. Never pour the liquid directly on the seeds to be used for planting, as it is likely to injure the germinating qualities. Seeds will not be injured by fumigation at a strength of 1 pound of carbon bisulfid to 100 cubic feet of space, but they should not be exposed to the gas for more than 36 hours.

Caution. This gas is poisonous to human beings, but because it is heavier than air it does not rise quickly and there is little likelihood of harm from its use if it is properly handled. Always leave the bin or room as soon as possible after applying the liquid. Always ventilate thoroly before entering any place that has been fumigated.

The inflammable nature of carbon bisulfid must always be kept in mind. When mixed with air it is very explosive. Smoking where this gas is being used is extremely dangerous. Even a spark caused by striking a nail with a hammer is sufficient to cause an explosion. Carbon bisulfid liquid boils at 115° F. and should not be applied to grain that has heated over 100° F. Grain with a temperature over 100° F. should be shifted and cooled before fumigation with carbon bisulfid.

COMMERCIAL FUMIGANTS

Ethylene-dichlorid - carbon-tetrachlorid mixture. A 3-to-1 mixture of ethylene dichlorid and carbon tetrachlorid is a satisfactory grain fumigant that creates no fire hazard. It may be substituted for and used in the same manner as carbon bisulfid at temperatures of 70° F. and higher. The mixture evaporates slowly and forms

a heavy penetrating gas. From 50 to 80 pounds per 1000 bushels of grain are required. It can be purchased in 50- to 500-pound lots for 6.5 cents to 12 cents per pound delivered.

Chloropicrin (tear gas). For use in elevators or on farms equipped with machinery for moving grain, chloropicrin is a suitable fumigant for killing insects in stored grain. The liquid may be poured into the grain stream when the grain is being moved and carried to the bin where it will be mixed with the grain. When, however, the chloropicrin is used in the same manner as carbon bisulfid, by sprinkling it on the top of the grain in a bin, it is necessary for the operator to wear a gas mask *having a chloropicrin canister*, because of the irritating quality of the gas.

Chloropicrin is nonexplosive and consequently is no fire hazard. It is heavier than air, and penetrates the grain in about the same manner as carbon bisulfid. Two to 3 pounds of chloropicrin per 1000 bushels of grain are required, and the directions of the manufacturer should be followed closely in making the application.

Chloropicrin remains with the grain over a long period (one to three months if the grain is not disturbed), but the odor eventually disappears leaving the grain in good condition for milling. Chloropicrin may be purchased in 1- to 100-pound drums at a cost ranging from about 85 cents to \$1.25 a pound f.o.b. factory.

ADJUST DOSAGE TO TEMPERATURE AND GRAIN

Smaller dosages of fumigant are required to kill all the insects at higher temperatures than at lower temperatures. Also, less is required for corn than for wheat or rye; and less is required for wheat or rye than for barley or oats.

HYDRATED LIME

Soybeans and cowpeas that are held over from one year to another may become infested by one of the pea or bean weevils or by one or two of the common grain moths. Quantities of such seed piled in bins can be protected by covering with a layer of hydrated lime to a depth of about half an inch; or small quantities of such seeds may be protected by mixing one part of hydrated lime with four parts by weight of the beans or peas. The mixing or covering should be done immediately after threshing.

This treatment will not injure the germination value of the seeds.

PYRETHRUM POWDERS

Finely powdered pyrethrum products, of several different makes, containing about .5 percent pyrethrins, are now available. When thoroly mixed with small grain at the rate of 1 pound of powder to 8 bushels of grain, these powders give excellent protection against insects. The residue is nontoxic to animals, permitting the treated grain to be used normally, even immediately after treatment.

TREATMENT OF EAR CORN

Ear corn may be protected by dipping the ears in an oil emulsion containing 8 percent sulfonated white mineral oil dispersed in water. The dipped ears should not be handled after they are dry. The treatment does not injure germination.

MERCURY FUNGICIDES

Seed stocks of corn or small grains that have been treated with a fungicide containing mercury (such as Ceresan or Semesan Jr.) are relatively safe from attack by insects. Seed so treated may be carried from one season to the next without injury by insects.

Caution. Do not feed this treated seed to livestock or poultry.

INSECTS MAY CAUSE HEATING

Heating of stored grain is caused by excessive moisture. The presence of the moisture may be (and usually is) due to the grain not being dry enough at the time it goes into storage; but it may be due also to insects in large numbers breeding in the grain. When the excessive moisture is due to the presence of insects, fumigation will stop the heating process; but of course when the moisture in the grain is excessive at the time of storage, fumigating will not prevent nor stop heating.

NOT ALL INSECTS INJURIOUS

Not all insects found in grain bins cause damage to grain. Farmers who find insects, the importance of which they are not sure, are invited to send specimens to the Chief Entomologist, Illinois State Natural History Survey, Urbana, for identification.