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Michigan State University Extension Service

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Seed Treatment

for field crops

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PRINCIPLES AND PRACTICES

Seed treatment is the process of applying chemical substances to seeds in order to reduce, control or repel seedborne and/or soilborne organisms before, during and following seed germination. Chemical treatment of seeds is accepted as a sound agronomic practice for seeds of many field and garden crops and is frequently a routine part of seed processing.

Pests Controlled by Seed Treatment

1. **Fungi and bacteria** — causing seed rots, seedling blights and smuts. These pests may be seedborne or soilborne.
2. **Soil insects** — such as seedcorn maggot and wireworm.
3. **Storage insects** — including weevils, moths and beetles. However, these are usually controlled by fumigation rather than by seed treatment.

Types of Chemical Action

The activity of seed treatment chemicals falls into 3 principal categories:

1. **Seed surface disinfection.** Chemicals in this group cover the seed and kill or suppress the activity of spores and other disease agents on the seed surface; e.g., streptomycin treatment of bean seed to eliminate blight-causing bacteria.
2. **Seed protection.** Chemicals in this group protect seed before and during germination from diseases and insects that normally are soilborne; e.g., diazinon treatment of bean seed to protect it from seedcorn maggot.
3. **Systemic protection.** Some chemicals penetrate the seed and kill or suppress the activity of pests or pathogens. They may also extend into and

protect the resulting plant; e.g., carboxin treatment for loose smut control in wheat.

FORMULATIONS AND LABELS

Seed treatment chemicals are normally combined with other materials that enhance or maintain their activity. Many formulations contain several inert ingredients in addition to the active ingredients. Inert ingredients act as carriers, binders, wetting agents, sticking agents, emulsifiers, suspending agents and dyes. These materials do not have to be listed on the label since they are added to the formulation to improve appearance, increase coverage and adherence, prevent dusting off or make the formulation easily recognizable.

A seed treatment pesticide may contain one or more active ingredients, and the name and percentage of each must appear on the label of the chemical container. The label should be read and understood before the pesticide is purchased. Some pesticides are safe on seed of certain crops but are toxic to others. Seed treatment formulations are prepared and registered for use only on certain crops and only at prescribed rates printed on the pesticide container. Some seed treatments currently recommended for use on field crops are given in Table 1. Use of the pesticide for crops not on the label or at rates other than those prescribed on the container is a violation of state pesticide regulations. Such regulations protect pesticide users and will assure effective results if carefully followed. **All instructions for use printed on a label must be followed.**

Careful and proper application is essential to safe and effective use of seed treatment chemicals, which are normally formulated for only one type of application. Attempts to apply a slurry formulation as

a dust or as a planter box treatment, for example, will likely be unsuccessful or hazardous. The amount of chemical is also important. Excessive amounts may be toxic and impair germination or seedling development. Rates lower than those specified may not give adequate control. Follow labeled recommendations precisely.

APPLICATION EQUIPMENT

Three basic types of commercial seed treaters are designed to accurately apply measured quantities of pesticides to a given weight or volume of seed.

Liquid Treaters

Liquid treaters are for all formulations not requiring agitation during application. The only pesticides they can apply accurately and safely are true and stable solutions. Liquid pesticides have the advantage of giving good seed coverage and require no agitation during application. All liquid treaters must be equipped with a fume collection system.

Slurry Treaters

Slurry treaters (see Fig. 1) are for formulations that are fluid but are suspensions rather than solutions. Such slurries require agitation during application. Slurry formulations may be prepared by mixing wettable powders or emulsifiable concentrates with water, or they may be purchased in slurry or flowable form. Slurry formulations provide accurate and thorough seed coverage but have the disadvantage of requiring constant agitation during use. If not properly agitated, their application is nonuniform, and they tend to clog treating equipment. Slurry treating machines also must be thoroughly cleaned periodically.

Dust Treaters

Dust treaters are for dry, powder formulations. They add no moisture to the seed and are easy to clean and operate, but they distribute chemicals less uniformly than liquid or slurry treaters. Dust formulations also tend to drift easily and require adequate and controlled ventilation.

On-the-Farm Seed Treatment

While most seed treatment is done by commercial seed processors or at the local elevator, smaller scale, less expensive equipment is also available for on-the-farm treating (see Figs. 2 and 3). The equipment ranges from simple augers into which a metered supply of chemical is pumped to small units that resemble commercial treating equipment.

TABLE 1.

<i>Crop</i>	<i>Recommended chemical</i>	<i>Pests controlled</i>
Oats	Carboxin + Thiram (Vitavax 200—flowable or wettable powder)	False loose smut Seed rots Seedling blights
Barley	Carboxin + Thiram (Vitavax 200—flowable or wettable powder)	Loose smut Seed rots Seedling blights
Wheat	Carboxin + Thiram (Vitavax 200—flowable or wettable powder)	Loose smut Stinking smut (bunt)
	or Maneb + HCB (Grannox NM or Grannox liquid)	Seed rots Seedling blights Stinking smut (bunt)
	PCNB (Pentachloronitrobenzene)	Stinking smut (bunt)
Field beans	3-way slurry formulation of Fungicide (Captan, Thiram)	Seed rots Seedling blights
	plus Insecticide (Diazinon, Lindane)	Seedcorn maggot
	plus Bacteriocide (Streptomycin) (Hopkins planter box seed protectant plus special Hopkins sticker)	Bacterial blight (external)
Soybeans	Chloronil, Thiram or Captan Diazinon or Lindane	Seed rots Seedling blights Seedcorn maggot
Corn	Captan or Thiram	Seed rots Seedling blights
	Diazinon or Lindane	Seedcorn maggot

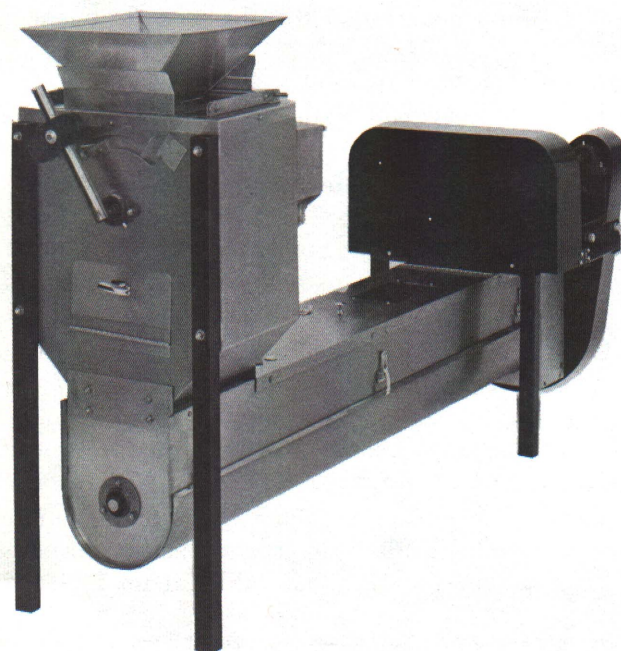


Fig. 1. Slurry treating machine.

Drillbox Seed Treatment

Drillbox treatment of seed (see Fig. 4) is usually the least effective and most nonuniform method of treatment. It should be done only when other treatment alternatives are not available and only with substances that are registered for drillbox use. It is absolutely essential to thoroughly mix the chemical (usually in a dust formulation) with the seed in the drillbox immediately before planting.

Regardless of the method or location of seed treatment, it is important to follow good health and sanitary precautions and to apply chemicals only at labeled concentrations. Persons applying chemicals with on-the-farm units or in the drillbox should use the same precautions required for commercial applicators. These are discussed on pages 4 and 5.

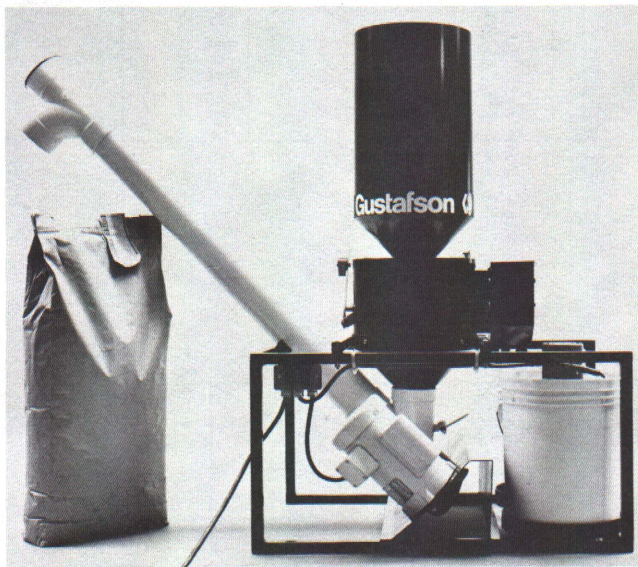


Fig. 2. Small equipment is available for on-the-farm treatment of seed.

COLORING AND LABELING

Coloration of Treated Seed

Michigan Department of Agriculture (MDA) regulations require all chemically treated seed to be prominently colored or dyed for easy identification. The dye must stain the seed a color that contrasts with the natural seed color. Red and green dyes are most common. Dyes approved for this use present little or no hazard to the germinating seed or to the health of persons who process or use the seed. Most importantly they identify seed that cannot be used for feed or food.

Labeling Treated Seed

Federal and state seed regulations require special labeling for treated seeds. The information listed below in type no smaller than 12 points must appear on containers of treated seed. This information may appear on a separate tag or on a seed analysis tag:

1. A statement indicating the seed has been treated and the name of the chemical(s) used (either the



Fig. 4. Drillbox treatment of seed.

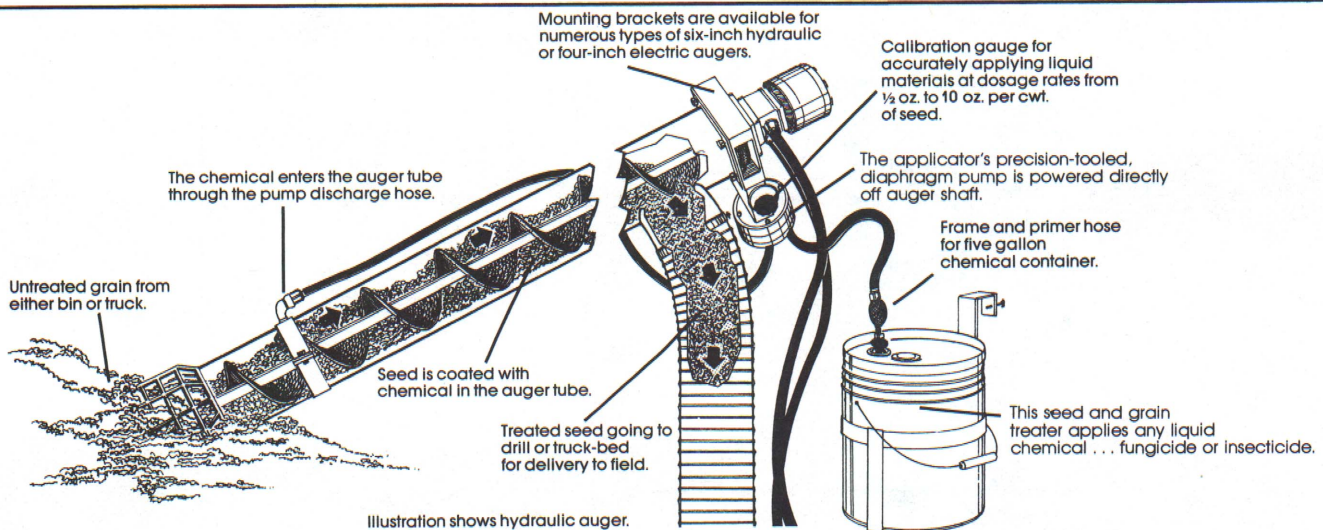


Fig. 3. Commercially available equipment for metering chemical into auger conveyor where it is mixed with seed before going into drillbox or holding container.

treated seed or edible grain.

3. Bags or other containers of treated seed should not be stored in the same building (or room) in which untreated seed or edible grain is stored.

4. Spilled seed should be removed immediately to prevent contamination of footwear or equipment.

5. Bags containing treated seed should be destroyed after use.

Storage of Chemicals

1. Storage of seed treatment chemicals should be in an isolated and locked building or cabinet area if in the treating room.

2. Chemicals should be retained in original containers with current labels intact.

Labeling and Identification

Clearly legible signs should identify all areas where seed is treated or in which treated seed is stored.

HEALTH AND ENVIRONMENT

Standards for the safety and health of employees of seed treatment facilities are included in the Michigan Occupational Safety and Health Act (MIOSHA), Public Act 154 of 1974. The act is administered jointly by the Michigan Departments of Health and Labor. Although there are no specific standards for seed treatment installations, standards for other operations apply to the treatment of seed. Particularly applicable are Parts 1 (general rules), 16 (machinery), 31 (personal protective equipment) and 35 (face and eye protection) of the safety code and Chapter 3 (ventilation and safety with air contaminants) of the health code.

Some special guidelines for health and safety precautions for seed treatment facilities are listed below:

1. Footwear of employees in the treatment facility should be thoroughly cleaned and sanitized before leaving.

2. Uniforms or special work clothes (including gloves) should be worn only in and around seed treatment and storage areas.

3. A special washroom and changing area should be accessible within the seed treatment and storage areas for personal sanitation and to prevent contamination of other areas.

4. Complete first-aid kits should be readily available to employees within the seed treatment facility.

Air Emission Restrictions

Pesticides, dusts and other pollutants in the air are hazardous to people and the environment. Emissions

of pesticides are controlled by the Air Pollution Control Commission of the Michigan Department of Natural Resources (DNR) under Public Act 348 of 1965 and the regulations of the Commission of 1967. The regulations provide standards for dusts (e.g., 0.1 lb of particulate/1000 lb of exhausted gases) and other toxic or nuisance (e.g., odors) emissions.

There are no specific emission standards for seed treatment equipment. Each installation is considered individually with regard to quantities and types of emissions. A DNR permit is required for the installation of new equipment that could release dust or other emissions into the air. Operators should obtain a permit before new equipment is installed to avoid costly changes that may be prescribed after installation.

Failure to obtain permit approval to install equipment is a misdemeanor and subject upon conviction to a fine of up to \$10,000 and, in the discretion of the court, an additional fine of \$2,000 per day if the violation continues. Information and permit application forms are available from the Chief, Permit Unit, Air Quality Division, P.O. Box 30028, Lansing, Michigan 48909.

PESTICIDE REGULATIONS

The Michigan Pesticide Control Act of 1976 obliges the user to avoid health hazards and contamination of the environment with pesticides. Any use of a pesticide, including seed treatments, other than as directed on the label is a misuse and subject to prosecution. This is especially important in treating seed because most of the seed treatments are formulated to control very specific organisms.

Licensing and Certification

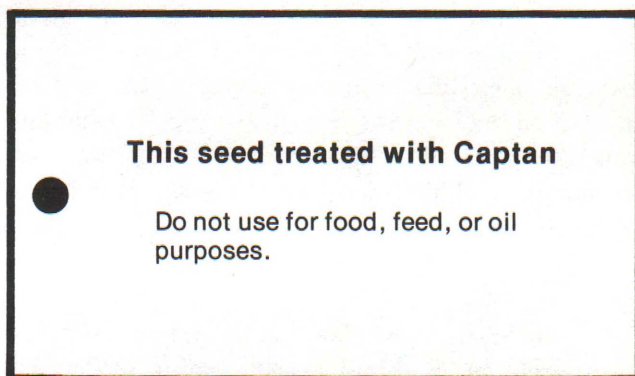
The Michigan Pesticide Control Act of 1976 requires licensing of all businesses that offer seed treatment services to the public. This especially includes facilities that custom treat seed for a fee. If seed is already treated and then sold, no pesticide applicator license is required. Licensing is administered by the Michigan Department of Agriculture (MDA) which also certifies pesticide personnel. An individual in each licensed facility must be **certified** in the category of seed treatment, and licenses are not issued until one person is so certified. Seed treaters who do not offer their services to the public will not need certification after October 1977 unless they use **restricted use pesticides** (pesticides designated as special hazards by the MDA).

common name, chemical (generic) name or abbreviated chemical name).

2. Seed treated with highly toxic pesticides requires a label bearing a skull and crossbones and a precautionary statement such as that shown below. The skull and crossbones must be at least twice the size as the type on the label, and the precautionary statement must be in red letters on a contrasting background.



3. Seed treated with most substances not listed as highly toxic requires a label with an appropriate precautionary statement such as that shown below. This information may appear on a separate tag or be printed conspicuously on the side or top of the seed container.



PREVENTING CONTAMINATION

Government regulations prevent treated seed from contaminating edible grain or livestock feed. They also protect the health of persons working in and around seed treatment facilities or using treated seed. The information below discusses some points of Michigan law and explains how elevators and seed processing plants can meet state and federal regulations.

Pesticides are not permitted on grains used for food or feed. According to Federal Standards for Grain, even one or two treated seeds may be cause for a "Distinctly Low Quality" designation for an entire lot of grain. Once contaminated, such lots may

not be used for food, feed or oil purposes. Great care must be taken to avoid mixtures.

The Michigan Department of Agriculture (MDA) is responsible for developing and administering regulations governing the sanitation and safety of seed treatment facilities. MDA Plant Industry personnel routinely visit elevators and seed processing plants to determine if adequate preventive measures are taken to prevent grain contamination and pesticide hazards to personnel. Where problems exist, MDA inspectors suggest corrective measures. In cases of severe violation of sanitation requirements or inadequate facilities, treating operations may be terminated.

Facilities and Equipment

1. The seed treating operation must be located in an area with permanent walls and a floor constructed so that spills are fully contained. A separate building is most desirable; however, separate rooms within a larger building may be suitable if other requirements are met (see Fig. 5). Existing rooms may be partitioned off to isolate the seed treater and treatment chemicals. A ground-level floor without an underlying basement is preferred to prevent seepage to lower floors. It is possible to have acceptable facilities over a basement if spills can be avoided.

2. The treating room should be located so that it can be entered only from an outside door.

3. The seed treater should not be located in the same room with edible grain or with any elevator carrying edible grain.

4. The treating room should be ventilated so that dust and fumes are removed from the treating area. Air must be adequately filtered prior to being exhausted to the outside.

5. Any conveyor that has handled treated seed should not be used for handling untreated seed or edible grain.

6. Holding bins, weight hoppers and bagging equipment for treated seed should not be used for untreated seed or edible grain.

7. Forklifts and other mobile equipment for handling seed containers should be cleaned immediately prior to leaving the seed treatment facility. Forks, tires, wheels, front mechanism and other parts of forklift or mobile handling equipment where seed might lodge should be carefully cleaned.

Storage of Treated Seed

1. Storage bins used for treated seed should never be used for untreated seed or edible grain.

2. Storage bins used for treated seed should be located in a separate facility (or room) from bins used for untreated seed. Bins holding treated seed should not connect with elevator legs or conveying equipment leading to facilities or bins used for un-

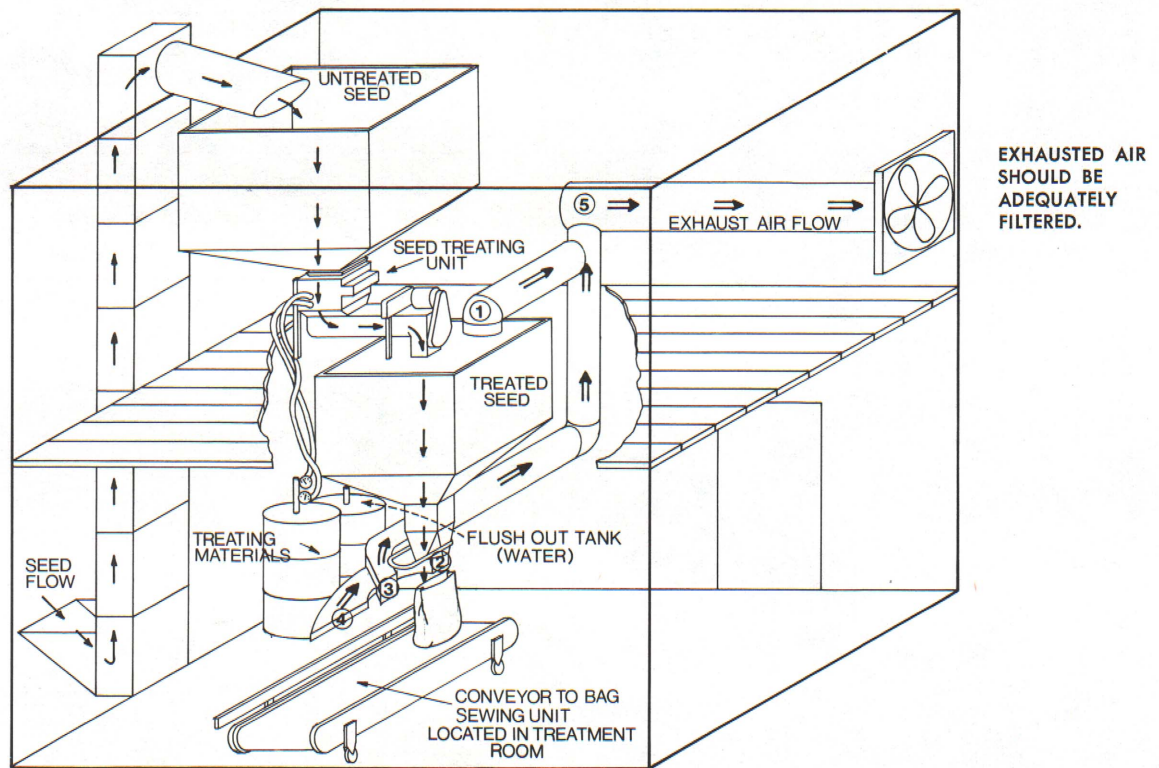
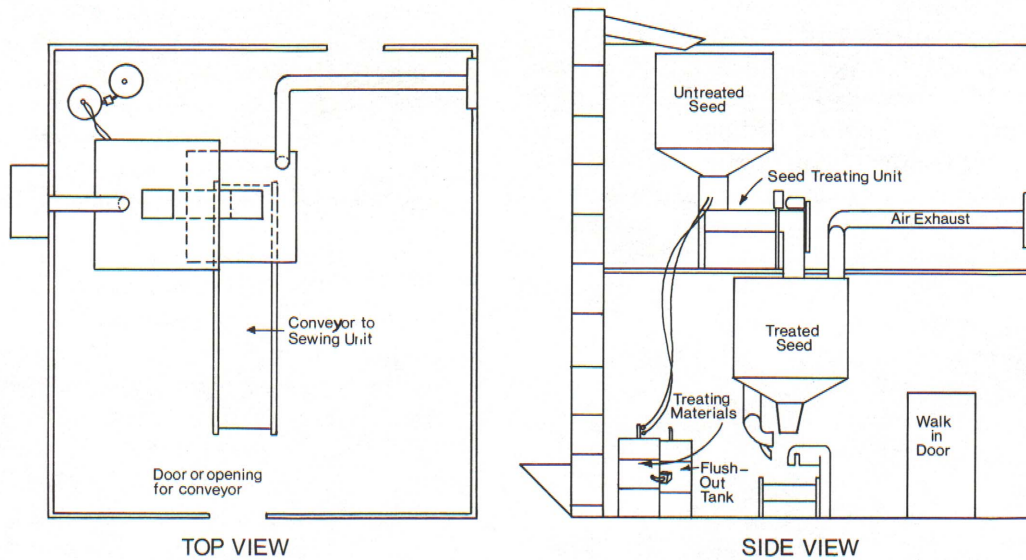
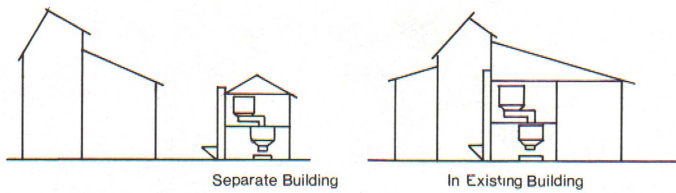


Fig. 5. Suggested design and arrangement of seed treatment facility. Dimensions are not provided since seed processors may want to modify this design to fit their own situations.