Seed Treatment for Field Crops
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 chemicals to seeds in order to reduce, control or repel seedborne or soilborne organisms. Chemical treatment is accepted as a sound agronomic practice for seeds of many field and garden crops and is usually a routine part of seed conditioning.

Pests Controlled by Seed Treatment

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

Types of Chemical Action

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

1. **Seed surface disinfestation.** 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 soilborne diseases and insects; e. g. , Lorsban treatment of bean seed to protect it from seed corn 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 or Triadimenol (Baytan) treatments 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, sticking or suspending agents, emulsifiers and dyes. These materials do not have to be listed on the label on the seed container (bag) 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 chemical label. The label and Material Safety Data Sheet (MSDS) should be read and understood before the pesticide is used. 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 label. 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 label is a violation of state and federal pesticide regulations. Such regulations protect pesticide users and consumers and 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 and may be 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 the labeled recommendations precisely.

Table 1.

Recommended seed treatment for Michigan field crops.

Crop	*Recommended chemical*	*Pests controlled*
Oats, Barley, Wheat	Carboxin + Thiram (Vitavax 200 or RTU Vitavax-Thiram) or Triadimenol (Baytan 30) or Difenoconazole (Dividend)	Loose smut, seed rots, seedling blights and common bunt
Field beans	3-way slurry formulation of fungicide:	
	1) Captan, Thiram	Seed rots and seedling blights
	2) Insecticide: Lorsban, Diazinon, Lindane	Seed corn maggot
	3) Bactericide: Streptomycin	Bacterial blight (external)
Soybeans	Captan or Thiram	Seed rots and seedling blights
	Diazinon or Lindane	Seed corn maggot
	Apron	Phytophthora or pythium seed rots and seedling blights
Corn	Captan or Thiram	Seed rots and seedling blights
	Diazinon or Lindane	Seed corn maggot

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 liquids which do not settle out or stratify over time. 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.

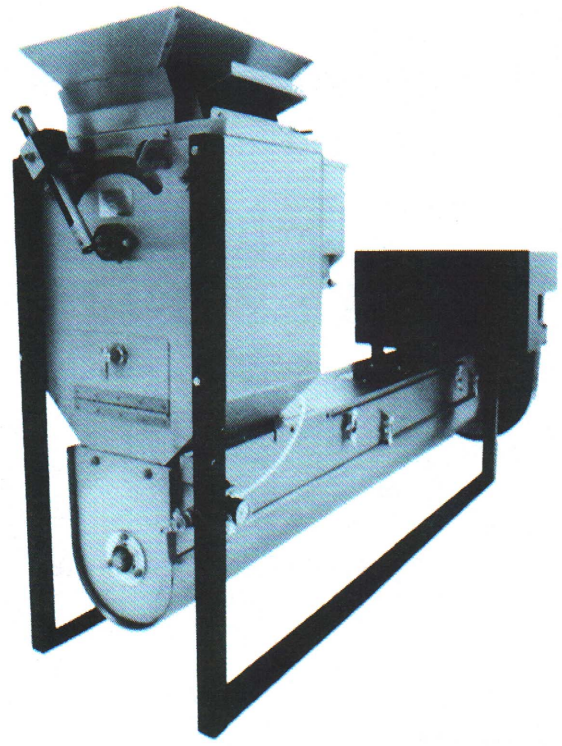


Fig. I. Slurry treating machine.

Slurry Treaters

Slurry treaters (see Fig. 1) are for formulations that are fluid 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 another carrier, 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 continuously agitated, their application is non-uniform and they tend to clog treating equipment. Slurry treatment machines also must be thoroughly cleaned periodically. Premix tanks are recommended to be used with diluted products.

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 good ventilation of the area where they are being used.

On-the-Farm Seed Treatment

Most seed treatment is applied by commercial seed conditioners or at the local elevator. However, smaller scale, less expensive equipment is also available for on-the-farm treatment (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 treatment equipment.

Drillbox Seed Treatment

Drillbox treatment of seed can be an effective method of treatment. In practice, however, it is often hurriedly done and applied less uniformly than other methods. It should be done only when other alternatives are not available and only with substances that are registered for drillbox use. It is

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

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 use personal protective equipment such as gloves, respirators, etc., follow good sanitary precautions and apply chemicals only at labeled concentrations. If applying chemicals with on-the-farm units or in the drillbox, use the same precautions required for commercial applicators.

EFFECTIVENESS OF SEED TREATMENT

The Michigan Seed Law, Act 329, Public Acts of 1965, defines treated seed as seed which has received an EFFECTIVE application of a substance designed to control seedborne or soilborne organisms. This not only requires that seed be treated within the limits of the label, but that the treatment has been effectively applied by appropriate application equipment or methods. The Michigan Department of Agriculture has the authority to determine the effectiveness of treated seed sold in Michigan.

COLORING AND LABELING

Coloration of Treated Seed

The Michigan Seed Law, Act 329, Public Acts of 1965 requires 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 dyes and colorants are most common. Dyes approved for this use present little hazard to the germinating seed or to the health of persons who process or use the seed, if done properly. Most importantly, they identify seed that cannot be used for feed or food.

Labeling Treated Seed

The Michigan Seed Law, Act 329, Public Acts of 1965, requires that seed that has been treated with an irritating or poisonous substance, harmful to humans or other vertebrate animals, be labeled with the following information. This information may appear on the seed analysis tag, on a separate tag, or conspicuously on the seed container:

1. A warning in 12-point or larger type that the seed has been treated.
2. The common, coined, chemical or abbreviated chemical name of the substance applied to the seed.
3. The following caution statement in 12-point type or larger: "Treated seed - do not use for food, feed or oil purposes. "

If the seed is treated, and the treatment is not irritating, poisonous, or harmful to humans or

other vertebrate animals, the seed must be labeled with a statement, in 12-point or larger type, describing the applied substance.

Seed conditioners and labelers should be aware that additional federal requirements exist with regard to highly toxic treatment materials if the treated seed enters interstate commerce. Clarification of these additional requirements can be obtained by contacting the USDA-AMS - Federal Seed Branch at (301) 504-9430 or the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division at (517) 373-1087.

PREVENTING CONTAMINATION

Government regulations are aimed at preventing treated seed from contaminating edible grain or livestock feed. They are also meant to protect the health of persons working in and around seed treatment facilities or using treated seed. The following information explains how elevators and seed processing plants can meet state and federal regulations.

Seed treatment chemicals 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 such contamination.

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

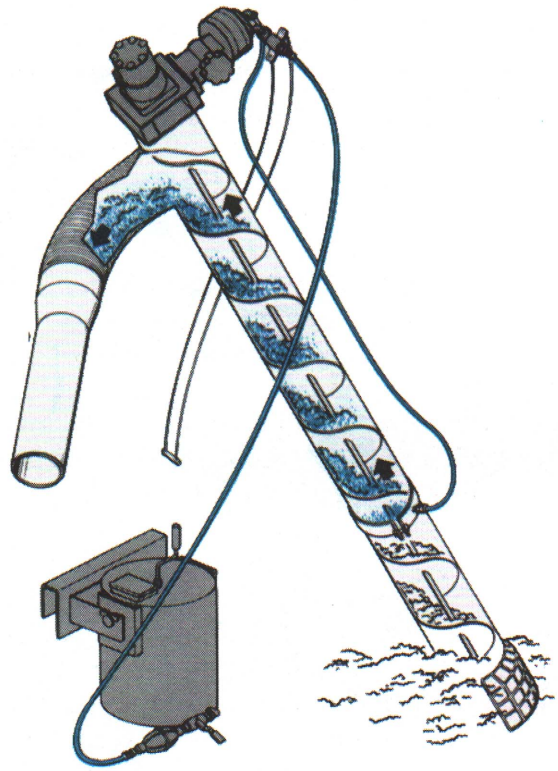


Fig. 3. Commercially available equipment for metering chemical into auger conveyor where it is mixed with seed before going into drillbox or holding container.

Commercial treating facilities storing pesticides in containers larger than 55 gallons are subject to the provisions of Regulation 640 - Commercial Pesticide Bulk Storage. Treaters and treatment operations should be located on an impervious surface and inside a permanent structure. Treater rinsing and pesticide mixing operations may be subject to the provisions of Regulation 637 - Pesticide Use. For information on these pesticide use and storage regulations, contact the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, P. O. Box 30017, Lansing, MI 48909 — phone: (517) 373-1087.

Facilities and Equipment Recommendations

1. The seed treatment 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 with a separate side entrance within a larger building may be suitable if other requirements are met (see Fig. 4). 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 contained.

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

3. The seed treater must not be located in the same room with edible grain or with any elevator carrying grain for food or feed purposes.

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

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

6. Holding bins, weight hoppers and bagging equipment for treated seed must 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 and must never be used for grain intended for feed or food.

2. Storage bins used for treated seed must be located in a separate facility (or room) from bins used for untreated seed. Bins holding treated seed must not connect with elevator legs or conveying equipment leading to facilities or bins used for untreated 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 must be removed immediately to prevent contamination of footwear or equipment.

5. Bags containing treated seed should be disposed of after use as regulated by EPA/DNR.

Storage of Chemicals

1. Storage of seed treatment chemicals should be in an isolated and locked building or cabinet area if in the treatment room. (Refer to label storage directions.)

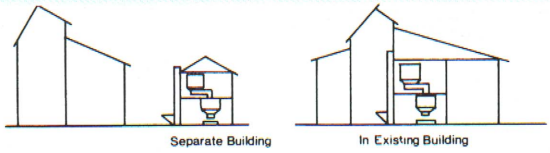
2. Chemicals must be retained in original containers with current labels intact.

Labeling and Identification of Treatment and Storage Area

All areas where seed is treated or in which treated seed is stored should be identified by clear signs legible at a distance necessary to protect against the hazard.

HEALTH AND ENVIRONMENT

Standards for the safety and health of employees of seed treatment facilities are created under the authority of 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), 33 (personal protective equipment) and 37 (accident prevention signs and tabs) of the safety standards of the health standards (Rule 4201 - Sanitation and Rule 3502 - General Respiratory Protection.



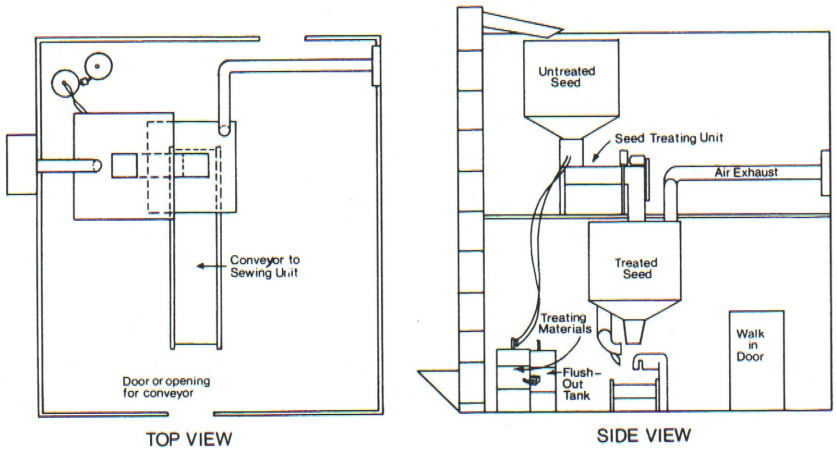
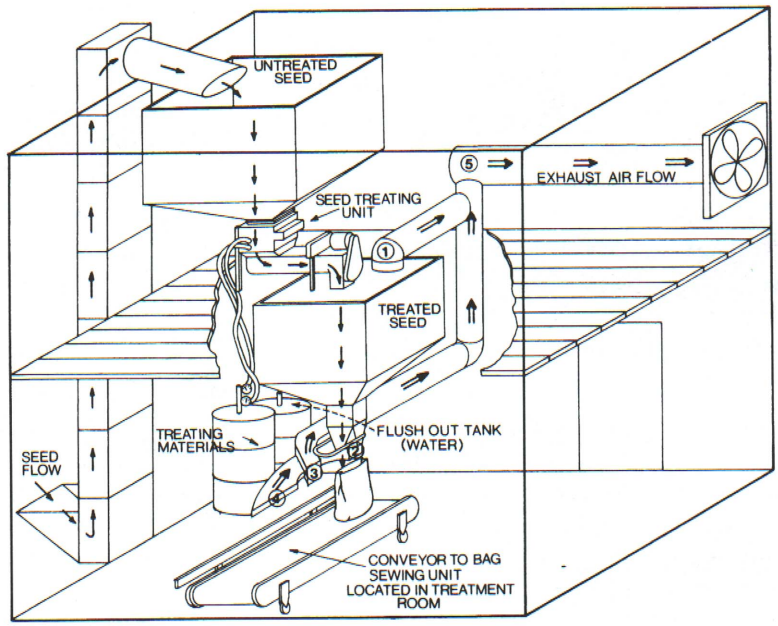


Fig. 4
Suggested design and arrangement of seed treatment facility. Dimensions are not provided since seed processors may want to modify this design to fit their own situations.



Here are some special guidelines for health and safety precautions for seed treatment facilities:

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

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

3. A 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.

5. Goggles with shielded vents or a face shield should be worn to protect eyes from splashing or spilled corrosive chemicals. Kits should be available for flushing chemicals from eyes (Rule 4401).

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. l lb of particulate/l,000 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 required 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 (Public Act 171) 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 enforcement under Act 171. This is an especially important consideration regarding treating seed because most of the seed treatments are formulated to control very specific organisms.

Licensing and Certification

The Michigan Pesticide Control Act 171 also requires licensing of all businesses that offer seed treatment services for the public. If seed is already treated and then sold, no pesticide applicator license is required. Licensing of firms is administered by the Michigan Department of Agriculture (MDA) which also certifies pesticide applicators. In order for a commercial seed treating facility to obtain a license, the firm must employ, or have on staff, at least one applicator certified in the category of seed treatment. Any person who applies seed treatment pesticides for a licensed firm must be either certified or registered. Seed treaters who do not apply treatments (pesticides) for hire do not need certification unless they use restricted use pesticides (pesticides designated as special hazards by the US-EPA and/or MDA).

Figures 1, 2 and 3 courtesy of Gustafson, Inc.

Major Revision 7:94 (destroy old), 3M-KMF-UP, 70¢ for sale only. File 22.74 (Field Crops-Seeds)