



## Seed Treatment

### Bulletin 638

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#### Definition Of Treated Seed

The term "treated" means given an application of a pesticide or subjected to a process designed to reduce, control or repel disease organisms, insects, or other pests that attack seed or seedlings grown from treated seed.

#### Seed Normally Treated

The kinds of seed that are normally treated with one or more pesticides are corn, peanuts, cotton, sorghum, wheat, oats, rye, barley, millet, soybeans (under some conditions), pine tree and most vegetable seed.

#### Pests Commonly Associated With Seed

**Diseases:** (a) Seed rot--rotting of seed before germination. (b) Damping-off and seedling blight--soft rot of stem tissues near ground level and water soaking of seedling tissues. (c) Seedling wilt--gray coloration starting at the leaf tips and extending rapidly to the whole leaf, causing complete collapse of seedlings in 24 to 28 hours. (d) Root rot--water soaking, browning and sloughing of rootless. (e) Loose and covered smut of small grains.

**Disease Organisms:** (a) Pythium species, (b) Fusarium, (c) Diplodia, (d) Penicillium, (e) Helminthosporium, (f) Ustilago (smut), and (g) Rhizoctonia.

**Cereal Grain Insects:** Rice Weevil--Found in all grains, it is the most common and most destructive of the stored grain insects. A small snout beetle, it flies and sometimes infests grain in the field before harvest. The larva burrows into the heart of the kernel where it feeds and passes through the pupa stage. It emerges as an adult, cutting a small hole through the kernel (weevil exit hole).

- Granary Weevil--This insect is very similar to the rice weevil and can only be distinguished from it by microscopic examination. It cannot fly.
- Angoumois Grain Moth--The adult is a dull gray. The larvae bore into the kernel, pass through the pupa stage and emerge through a small round hole cut in the outer layer of the kernel. The moth breeds on the surface of the grain.
- Lesser Grain Borer--This is a small beetle, dark brown to black with its head turned down under the front part of the body. It is a strong flier and can live under much drier conditions than most of the other stored grain insects.
- Cadelle Beetle--This is one of the largest stored grain insects and is black in color. The larvae burrow into the woodwork of bins and can stay there to infest new grain. These larvae are white with black heads and two horny, black points at the end of their bodies.

- Saw-Toothed Grain Beetle--This is a reddish-brown to black insect that has six saw-toothed projections on each side of the front part of the body, visible under microscope.
- Confused Flour Beetle--The confused flour beetle, saw-toothed grain beetle and flat grain beetle are commonly referred to as "bran bugs." The confused flour beetle is reddish-brown and is one of the most common storage insects both in elevators and mills.
- Flat Grain Beetle--This is one of the smallest stored grain beetles. It is a flattened, oblong, reddish-brown beetle with an antennae about 2/3 as long as the body.
- Indian-Meal Moth--This moth has wings that are reddish-brown, coppery luster on the outer two-thirds, with the rest light gray. The larvae may completely web over the surface of the infested grain. This moth is particularly common in corn storage and in packaged feed and meal.

## Pesticide Labels

Before using any pesticide, read and analyze the information about the product. The label contains detailed information about the product such as active ingredient, inert ingredients, warning statement (including "Danger-Keep Out of Reach of Children" or "Poison" and "Handle with Care), antidotes, type seed and rate per bushel, kind of pests controlled, care in handling and use of treated seed, and disclaimer or warranty clause.

## Seed Treatment Pesticides

**Fungicides:** Fungicidal seed treatment may be divided into three categories, depending on the nature and purpose of the treatment. These categories are seed disinfection, seed disinfestation, and seed protection. **Note**, a given fungicide may serve in one or more of these categories.

- Seed disinfection--Disinfection is the elimination of a pathogen that has penetrated into living cells of the seed, infected it and become established.
- Seed disinfestation--Disinfestation is the control of spores and other forms of pathogenic organisms found on the surface of the seed.
- Seed protection--Seed protection is chemical treatment to protect the seed and young seedling from pathogenic organisms in the soil.

Seed treatment materials are usually applied to seed in one of three forms-dust, slurries (a mixture of wettable powder in water) and liquids.

Based on composition, seed treatment fungicides may be organic or inorganic, metallic or non-metallic and until recently, mercurial or non-mercurial. Before the cancellation of the volatile mercurials, fungicides for treating seed were generally classified as volatile and non-volatile. With the elimination of the volatile mercurials, most fungicides now approved for use on seed are classified as nonvolatile. When using this type material, complete coverage of the seed is necessary to obtain effective control.

Some of the systemics, a fairly new class of pesticides, may now be used as seed treatment materials. The desirability of having materials that would move inside the seed or plant and control the pest has long been recognized. Such a material is called a systemic. When used according to the manufacturer's recommendations (see label), a systemic moves through the host plant and controls or retards the growth of certain fungi and insects without affecting the host's metabolic system.

**Insecticides:** Insecticides are often applied to seed to control or reduce insect damage to seed during storage and to a lesser degree to prevent damage from such insects as wire worms and seed corn maggots in the soil.

Since some of the pesticides are selective in the control of pests, many times two or more compounds are combined in the treater tank, or an extra tank may be used, to give the spectrum of activity needed.

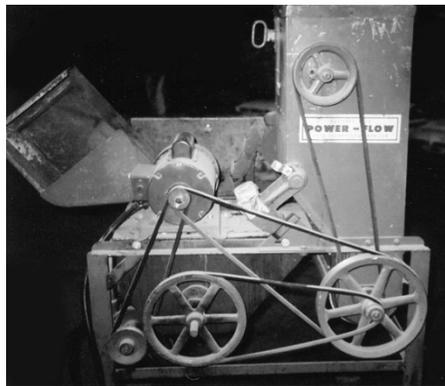
The manufacturers of pesticides are now making combinations available to seed processors but should a processor blend two or more pesticides, the compatibility of the materials must be determined, as some combinations of materials may seriously reduce seed germination. When applying two or more pesticides at different times, the sequence of application is also important.

Whether a single pesticide or a combination is to be applied to the seed, read the label and follow the manufacturer's directions carefully.

## Seed Treatment Equipment

Commercial seed treaters are designed to apply accurately measured quantities of pesticides to a given weight of seed. Basically, there are three types of commercial seed treaters on the market-dust treaters, slurry treater and direct treater. The Panogen and Mist-O-Matic treaters are examples of the direct treaters.

**Dust Treater:** (Using Gustafson LX Dry Powder Seed Treater as an example): **Operation**--Controlling the flow of Seed: The amount of seed that flows into the weigh pan, which is just beneath the feed hopper on top of the treater, is controlled by opening or closing the gates of the seed hopper by means of the hand wheel on the side of the hopper. The scale on the hopper shows how far gates are open in inches. Gates should be open to whatever number of inches it takes to keep the weigh pan filled to the required number of pounds per dump as it tilts in either direction. The number of pounds per dump is adjusted by correctly setting the counterweight up or down on the counterweight arm.



Seed Treater

**Powder Application**--To ascertain that the correct amount of power is being applied to the seed flow, a preliminary test must be made in which a given number of pounds of seed (example, 100 pounds) is run through the feeder. During this run, the measuring cup provided with the feeder should be used to catch the powder as it comes off the vibrator. After the given amount of seed has run through, the powder should be weighed so as to determine how much is being applied to that amount of seed. The vibrator speed can then be adjusted accordingly. Then another or more tests should be run until proper setting of the vibrator speed is determined for correct coverage.

Approximate Setting			
No. Dumps	Powder Scale Opening	Syntron Setting	Oz. Produced/100 lbs.
25	1/2	60	2
25	3/4	60	5
25	3/4	70	6
25	3/4	80	7
25	1	60	10

Number 4 on counterweight arm gives five pounds per dump.

**Slurry Seed Treater:** The slurry treatment principle involves suspension of wettable powder treatment material in water. The treatment material applied as a slurry is accurately metered through a sample mechanism composed of a slurry cup and seed dump pan. The cup introduces a given amount of slurry with each dump of seed into a mixing chamber where seed are blended.

While operation of slurry treater is relatively simple, the various operation procedures must be thoroughly understood.

The metering principle is the same in direct, ready-mix or fully automatic treaters, i.e., the introduction of a fixed amount of slurry to a given weight of seed.

To obtain a given dump weight, slurry treaters are equipped with a seed gate that controls seed flow to the dump pan. With the proper seed gate setting, a constant dump weight for a given seed can be obtained.

The amount of treatment material applied is adjusted by the slurry concentration and the size of the slurry cup or bucket. As the dump pan fills, a point is reached where it over balances the counterweight and dumps into the mixing chamber. This brings the alternate weighing pan in position to receive the inflow of seed and activates a mechanism to add a cup of slurry to the mixing chamber. Thus, one cup of slurry is added with each dump of seed.

The mixing chamber is fitted with an auger type agitator that mixes and moves seed to the bagging end of the chamber. The speed of the auger is important because at slow speeds more uniform distribution is obtained.

Slurry tanks have 15 to 35 gallon capacities, depending on the size of the treater. They are equipped with agitators that mix the slurry in the tank and keep it suspended during operation. It is important that the powder be thoroughly suspended in water before treating. If the treater has been idle for any period of time, sediment in the bottom of the slurry cups must be cleaned out.

The proper size slurry cup must be used. Most machines now have cups with ports and rubber plugs for 15 cc, 23 cc, and 46 cc quantities. Some users prefer to mix the slurry in an auxiliary tank and then transfer to the slurry chamber as needed.

**Direct Treaters:** Direct treaters are the most recent development and include the Panogen and Mist-O-Matic treaters. These two were initially designed to apply undiluted liquid treatment. Instead of applying 23 cc of material per 10 pounds of wheat, as in slurry treaters, they apply 14 to 21 cc (1/2 to 3/4 ounces) per bushel of wheat. This small quantity of material is suitable only with liquid materials that are somewhat volatile and do not require complete, uniform coverage for effective action.

Later modifications for treaters include dual tanks that permit simultaneous addition of a fungicide and an insecticide, and adaptations for the application of slurries. The metering device in both treaters is similar to that of the slurry treater, since it is attained through synchronization of a treatment cup and seed dump. Otherwise, they differ decidedly from the slurry treater and from each other. Both of these direct treaters have an adjustable dump pan counterweight to adjust the weight of the seed dump. This is not practical with slurry treaters.

**Panogen Seed Treater:** The operation of the Panogen treater is relatively simple. A small treatment cup, operating from a rocker arm directly off the seed dump pan and out of a small reservoir, meters one cup of treatment with each dump of the seed pan. Fungicide flows through a tube to the head of the revolving drum seed mixing chamber. It flows in with seed from the dumping pan and is distributed over the seed by the rubbing action of the seed passing through the revolving drum.

The desired treating rate is obtained by the size of the treatment cup and adjusting the seed dump weight. Treatment cup sizes are designated by treating rate in ounces and not by actual size, e.g., the 3/4 ounce cup applies 3/4 ounce (22.5 cc) of treatment per bushel with six dumps per bushel. Actual size of this cup is approximately 3.75 cc.

**Mist-O-Matic Seed Treater:** The Mist-O-Matic treater applies treatment as a mist directly to the seed. The metering operation of the treatment cups and seed dump is similar to that of the Panogen Treater. Cup sizes are designated by the number of cc's they actually deliver, e.g., 2 1/2, 5, 10, 20 and 40. The treater is equipped with a large treatment tank, a pump and a return that maintains the level in the small reservoir from which the treatment cups are fed. After metering, the treatment material flows to a rapidly revolving fluted disc mounted under a seed spreading cone. The disc breaks the droplets of the treatment into a fine mist and sprays it outward to coat seed falling over the cone through the treating chamber. Just below the seed dump are two adjustable retarders designed to give a continuous flow of seed over the cone between seed dumps. This is important since there is a continuous misting of material from the revolving disc. The desired treating rate is obtained through selection of treatment cup size and proper adjustment of the seed dump weight.

## **Calibrating a Slurry or Liquid Seed Treater for The Correct Dosage**

Determine how much liquid your treater's metering cup or bucket will dump into the seed each time the weighted seed pan trips. Record for future use.

Run seed slowly into the treater until the weighted seed pan dumps seed into the treater. Shut off the feed to the treater immediately. Weigh the amount of seed dumped into the treater. Record the setting of the weight on the weight balance arm and the weight of the grain dumped for future use.

Determine the number of dumps per bushel by dividing the weight per dump into the bushel weight of your seed. For example, a treater dumps 6 pounds of wheat each time the seed pan trips. Dividing 60 pounds per bushel by 6 gives 10 dumps per bushel.

Determine how much of the liquid or slurry you are applying per bushel of seed. To do this, multiply (1 above) the amount of chemical your metering cup dumps into the seed by (3 above) the number of dumps per bushel. Since most metering cup capacities are measured in cc while the chemical recommendations are in ounces per bushel, divide the result by 29.57 to give the liquid ounces per bushel applied.

Metering cup capacity in cc/29.57 \* Number of dumps per bushel = ounces of liquid applied per bushel.

For example: 46 cc \* 10 dumps/29.57 = 460/29.57 = 15.6 oz. liquid per bushel

To determine the correct amount of powdered chemical to add to one gallon of water for a slurry mixture, divide 128 by the number of ounces of liquid applied per bushel and multiply the result by the ounces of the chemical you want to apply to one bushel.

128 ounces per gallon/ (oz.liquid applied/bu.) \* Oz. powdered chemical desired per bushel = Ounces of slurry to add to one gallon of water.

For example:  $128/15.6 * 1.5 = 12.3$  ounces powdered chemical to add to one gallon of water. Note, for additional information, see the Calibration instruction manual furnished with each machine by the manufacturer.

## **Requirements Under The Federal And State Seed Laws For Labeling Of Treated Seed**

Information required to be shown on the label: A word or statement in type no smaller than 8 point indicating that the seed have been treated.

The commonly accepted, coined, chemical or abbreviated chemical (generic) name of the applied substance and the rate of application.

A caution statement if the substance used in such treatment in the amount remaining with the seed is harmful to humans or other vertebrate animals.

Seed treatment with a mercurial or similarly toxic substance, shall be labeled to show a statement such as Poison Treated in red. In addition, the label shall show a representation of a skull and crossbones.

Seed treated with less toxic substances, if the amount remaining with the seed is harmful to humans or other vertebrate animals shall be labeled to show a caution statement in type no smaller than 8 point such as Do Not Use for Food, Feed or Oil.

Figures shown are minimum labeling requirements and the label may contain additional information such as Purpose of Treatment, Antidotes, Safety Precautions and Procedure to Follow in Case of an Accident.

## **Coloring Grain Seed Treated With Poisonous Substances**

All interstate shipments of the food seed such as wheat, corn, oats, rye, barley and sorghum bearing a poisonous treatment in excess of a recognized tolerance or treatment for which no tolerance or exemption from tolerance is recognized must be denatured by a suitable color to prevent use of such seed as food, feed or oil.

Many of the pesticides now come from the manufacturer with the dye or color added as a convenience to the operator; however, some seed processors prefer to mix the dye with the pesticide at the plant so that the desired color may be obtained. Most all treated seed are now colored, with the dye causing no apparent injury to seed germination or danger to personnel processing or using the seed.

## **Pesticide Carriers, Binders And Stickers**

These materials are listed on the label as inert ingredients. There is no requirement that the name of these materials be given. They are selected by the manufacturer and are usually neutral in pH, non-toxic to humans and cause no apparent damage to the germination of the seed.

## **Safety Precautions**

### **A. Hazards associated with handling, sorting, mixing and storage of treated seed.**

Read the label and follow instructions carefully, as over treatment may injure the seed and under treatment will not control the pest.

When handling mercurials or similarly toxic substances, the operating personnel must be provided with protective clothing such as (a) coveralls, (b) cap, (c) protective glasses, (d) rubber apron, (e) rubber boots, (f) rubber gloves, and (g) respirator designed for use with the material. Personnel should not inhale the dust or vapor nor permit the material to contact the skin or eyes. Operator should wash thoroughly with soap and water before eating and smoking. Bathe immediately after work and change all clothing. Wash clothing thoroughly with soap and hot water before reuse. In case of contact, immediately remove contaminated clothing and wash skin thoroughly with soap and water.

A safety shower should be installed in the immediate vicinity of the treater.

An exhaust system should be installed to remove vapors and dust from the operating area. The exhaust air should discharge into a cyclone or bag-type dust collector. The treater should also be vented and tied into the exhaust system.

Seed treaters should be isolated and not operated in the vicinity of other personnel or farm commodities that are to be used for food, feed or oil.

Special multiwall (3 or 4 ply) or tightly woven bags are recommended for seed that has been treated with mercurials or similarly toxic substances. Seed should be thoroughly dry before going into the bag, as excessive moisture can cause rapid deterioration of the seed.

Store treated seed in a dry cool place away from food or feed products.

Seed treaters should be thoroughly cleaned after use as some of the pesticides are corrosive and others settle out and cause clogging of the equipment. Do not run contaminated water into stream or public sewer, but discharge into a shallow ground pit.

### **B. Hazards associated with the use of treated seed and the disposal of unused treated seed and empty pesticide and treated seed containers.**

The user of treated seed should read and follow the label carefully.

Planter hoppers should be filled outdoors.

Do not breathe dust or fumes from treated seed or get in eyes or on skin. Wash thoroughly with soap and warm water after handling treated seed.

Use treated seed as seed and do not introduce them into the food and feed channels. To do so may cause serious injury to poultry, livestock and humans.

Do not reuse pesticide containers. Destroy them by mutilation and burying at least 18 inches deep in an isolated area away from water supplies. Note, on 55 gallon drums, follow manufacturer's recommendations for decontamination and container disposal.

Empty treated seed containers and low germinating seed should be destroyed by burying at least 18 inches deep in an isolated area away from the water supplies. Note, treated seed exposed on soil surfaces will be hazardous to birds and wildlife.