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Sorghum Seed Treatment

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Sorghum SEED TREATMENT

SOUTH DAKOTA
AGRICULTURAL
EXPERIMENT
STATION

SOUTH DAKOTA
STATE COLLEGE
BROOKINGS

Seed Treatment

- CONTROLS SMUT
- PREVENTS SEED DECAY BY SOIL-BORNE MOLDS
- DISINFECTS MOLDY SEED

Effective Materials Are

COPPER CARBONATE, 18%

ETHYL MERCURIC PHOSPHATE, 5%
(Trade name, New Improved Ceresan)

ETHYL MERCURIC PHOSPHATE, 1%
(Trade name, New Improved Semesan Jr.)

Local farm cooperatives, elevators, seed dealers, and druggists have sorghum seed treatment materials

Follow the manufacturer's directions
(See also page 5 of this circular)

Sorghum Seed Treatment

By W. F. Buchholtz, Plant Pathologist

Sorghum has since 1930 become a major South Dakota crop. One of the highly beneficial farm practices involved in successful sorghum production in this state is seed treatment. Covering the seed with a mold-killing dust before planting has a threefold effect:

1. It completely controls smut. Smutted heads develop only on plants grown from seed infected during germination by smut carried on the seed. By killing the seed-borne smut, seed treatment prevents infection and insures a stand of smut-free plants.

2. It prevents seed decay by molds in cold, wet soil. Sorghum stands often fail in South Dakota when the seed lies in cold wet soil during unseasonably cold weather.

3. It kills molds on the seed. These molds usually develop during storage. Moldy seed is less likely than clean seed to produce a satisfactory stand.

This circular tells what seed treatment materials to use for these purposes and gives the results of their use in experiments at the South Dakota Station.

SMUT CONTROL

Sorghum smut is the black, sooty mass which replaces all the kernels of the sorghum head. In grain sorghum, smutted heads are lost during threshing. In forage they make the fodder less palatable and less nutritious. It is estimated that 5 to 10 percent of the sorghum grown in South Dakota each year is destroyed by smut.

South Dakota farmers in 1942 planted about 1,000,000 acres of sorghum and harvested nearly 200,000 acres for grain.[1] The annual grain sorghum loss from smut probably falls between 100,000 and 200,000 bushels. The total loss equals some 500,000 bushels of feed. There is very little smut in sorghum grown from treated seed.

Sorghum Smut Development

The "smut kernels" in the smutted sorghum head are masses of

[1] *South Dakota Agricultural Statistics, 1942,* South Dakota Crop and Livestock Reporting Service, Sioux Falls, South Dakota. 1943.

dark spores covered by a white or gray membrane. They occur in the places normally occupied by sorghum kernels and are somewhat longer and narrower (Fig. 1). The membranes may break after standing for a long time in the field or shock, and most of them are forcibly broken when grain or seed is threshed or combined (Fig. 2). Some of the freed black spores adhere to normal seed and remain dormant with them.

Germination of the seed and the smut spores occurs at the same time. Then the smut quickly infects the seedlings. The smut fungus lives throughout the season inconspicuously within the entire sorghum plant until the development of the head where each kernel is replaced by a smut-spore mass.

After the seed has germinated there is no further smut infection. There is no spreading of smut from plant to plant. There is no effec-

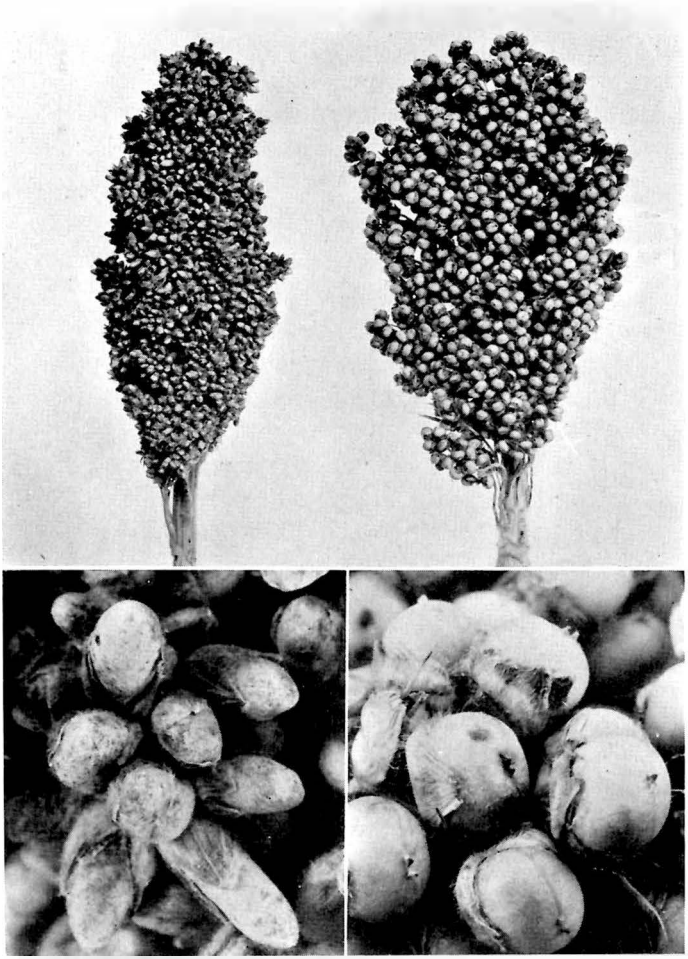

Fig. 1—*Above*. Smutted *(left)* and nonsmutted heads of South Dakota grain sorghum. *Below (enlarged)*. Gray "smut kernels" *(left)*, longer and narrower than normal grain *(right)*.

Fig. 2—Each "smut kernel" is a mass of spores. This mass is covered by a gray membrane, which is crushed when the grain is combined or harvested.

tive overwintering of smut in the soil or on plant refuse. Smutted heads develop only on plants grown from seed infected during germination.

Control by Seed Treatment

The only smut control necessary is the killing of the smut spores adhering to the seed. Treating the seed with one of the following dusts will kill these spores:

1. Copper carbonate, 18 percent (3 ounces of dust per bushel). This is the old seed treatment for bunt or stinking smut of wheat. Thorough mixing of the seed and dust is desirable to insure seed coverage. Sorghum seed treated with copper carbonate can be stored indefinitely without danger of injury. A slight excess of dust is not harmful.

2. Ethyl mercuric phosphate, 5 percent (½ ounce of dust per bushel). This is the most common seed treatment for small grains and is sold under the trade name, *New Improved Ceresan*. It is good practice to mix seed and the exact amount of dust together thoroughly and allow the mixture to stand about 24 hours before seeding. However, it may injure seed treated with it and stored more than 4 weeks. It is likewise injurious if applied at a rate much above ½ ounce per bushel. At a much lower rate it is not so effective.

3. Ethyl mercuric phosphate, 1 percent (2 ounces of dust per bushel). This is a common corn seed treatment which is sold under the trade name, *New Improved Semesan Jr.*

TABLE 1. SORGHUM SMUT CONTROL BY SEED TREATMENT WITH COPPER CARBONATE AND ETHYL MERCURIC PHOSPHATE, BROOKINGS, 1942
(Sooner Milo was the grain variety; 3930-S, the forage variety.)

Seed treatment	Percent of smutted heads in—		Percent of control in—	
	grain sorghum	forage sorghum	grain sorghum	forage sorghum
None	23.7	20.2	—	—
Copper carbonate, 18% (3 ounces per bushel)	0.0	1.3	100	94
Ethyl mercuric phosphate, 5%* (½ ounce per bushel)	0.8	0.1	96	96
Ethyl mercuric phosphate, 1%† (2 ounces per bushel)	4.0	0.8	83	96

* Sold under the trade name, *New Improved Ceresan.*
† Sold under the trade name, *New Improved Semesan Jr.*

The same general directions apply as for Treatment 2—use exactly 2 ounces of dust per bushel of seed, mix well with the seed and let stand for 24 hours before seeding, and do not store treated seed for more than 4 weeks.

The effectiveness of these three preparations for smut control was evident in a test at Brookings in 1942. There was a much smaller percentage of smutted heads in the sorghum from treated than from untreated seed (Table 1).

SEED PROTECTION

Another result of seed treatment is protection of seed from decay by soil-borne molds. Sorghum seed will rot in cold wet soil. In South Dakota, periods of cold wet weather frequently occur after sorghum seed is planted. To delay planting until germination in warm soil is assured invites damage to the crop by early fall frost.

The seed treatments that control smut also prevent seed decay. In a seed treatment experiment at Brookings in 1943 it happened that a planting on June 3 was made in cold wet soil. For a week after planting the weather was cold and there was rain on all but 2 days.

All stands from this planting were rather poor, but there was a satisfactory stand from seed treated with copper carbonate (54 seedlings per 100 seeds planted) (Table 2). Stands from both treated lots were better than from untreated seed. Abundant tillering and satisfactory maturity resulted in a reasonable yield from the June 3 planting, even though stands were somewhat thin. In a June 17 planting, stands from untreated seed were satisfactory, but somewhat better from treated seed. However, despite indicated yields of 18 to 21 bushels per acre, the crop was only fair because of immaturity.

TABLE 2. STANDS AND YIELDS OF SOONER MILO FROM TREATED AND UNTREATED SEED PLANTED JUNE 3 AND JUNE 17, 1943, AT BROOKINGS

Date of planting	Seed treatment	Seedlings per 100 seeds planted	Yields per acre	Maturity
			bu.	
June 3	None	19	21.6	
	Copper carbonate, 18% (3 ounces per bushel)	54	40.3	Satisfactory
	Ethyl mercuric phosphate, 1%* (2 ounces per bushel)	31	30.5	
June 17	None	66	18.2	
	Copper carbonate, 18%	80	20.2	Immature
	Ethyl mercuric phosphate, 1%*	81	21.3	

* Sold under the trade name, *New Improved Semesan Jr.*

While results like these are unusual and may not always occur, in this experiment they were equally striking in each of five repetitions. The seed lot used was sound, relatively free from molds, and obviously had a high percentage of live seeds. Cracked or otherwise injured seed are even more likely to rot in the soil than sound seed. Both copper carbonate and ethyl mercuric phosphate improved seedling stands and yields in this test (Table 2). These are the materials listed for smut control (page 5).

It may be well to point out that sorghum seed planted in cold soil early in the spring will probably germinate at about the same time as certain annual grass weeds (foxtail, for instance). Early planting of sorghum in a soil that has many seeds of such weeds may result in crop failure in spite of satisfactory stands.

SEED DISINFECTION

A third result of sorghum seed treatment is the destruction of molds which occur on the seed. These molds usually develop on somewhat damp seed in storage. Sorghum seed that is moldy in a germination test is less likely than clean seed to produce a satisfactory stand without seed treatment and may benefit from seed treatment even in warm soil.

HOW TO APPLY DUSTS

The means of applying seed-treatment materials to sorghum seed depends upon the materials available to the individual farmer. With the usual sorghum acreage per farm and with planting at a reasonable rate, the amount of seed to treat is not large and offers no particular

problem. *Manufacturer's directions and suggestions for application are on or in each container*. The following additional suggestions may be useful.

Any equipment for thoroughly mixing the seed and the treatment dust is satisfactory—an old rotary churn, cream can or covered bucket, a barrel that can be easily covered and rotated, a rotary-type cement mixer.

Special equipment can be built or in some instances purchased and is available for treating sorghum seed and other seed for several years. The county agent can help farmers to obtain plans for wooden or metal mixers which can be built from materials already on most farms.

Copper carbonate. This dust should be well mixed with the seed. It is most effective when it *completely covers* the seed. Complete coverage is sometimes difficult because copper carbonate may not always be light and dusty.

Experiments have shown that an application slightly less than 3 ounces per bushel is nearly as effective as the full amount. On the other hand, a slight excess does not injure the germinating seed. Seed treated with copper carbonate can be stored indefinitely.

Ethyl mercuric phosphate. The preparations containing this material adhere to the seed and cover it very well. The active portion partially evaporates and tends to spread uniformly through the mass of seed even after mixing. Therefore after treating a seed lot, it is good practice to store it for 24 hours in a bin, pile, wagon box, or in sacks.

However, storage of seed treated with ethyl mercuric phosphate for more than about 4 weeks may result in chemical injury to the seed.

There is some danger of injuring the seed if more than standard dosages are applied. Amounts less than the standard dosages may not be fully effective. These standard dosages are ½ ounce of the 5-percent preparation per bushel and 2 ounces of the 1-percent preparation.

WARNING

Both copper carbonate and ethyl mercuric phosphate dusts in large quantities are poisonous to human beings and livestock. Seed treated with either material should not be fed to livestock. If a large quantity of seed is to be treated, the person doing the treating should wear a mask or tie a dry cloth over the nose and mouth to prevent inhaling the dust. The treating operation can be so arranged as to allow the wind or a well placed fan to move the dust-laden air away from the operator. There probably is no danger of personal injury while treating less than 10 bushels of seed.

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