

Effect of Seed Treatments on Seedling Diseases of Beets Planted in the Greenhouse in Highly Infested Soil¹

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VARIOUS CHEMICAL compounds, in different combinations and concentrations were used for treating sheared sugar beet seed for controlling seedling diseases of beets. The following chemicals were used: New Improved Ceresan, Ceresan, Yellow cuproicide, Phygon, Arasan, Copper trichlor phenate and Chloranil. These were used either in the form of dust or the chemical materials were stuck on the seed by the use of Methocel. In addition to these chemicals, 10 percent of treble-superphosphate was added to some of this seed. Some seed was also pelleted and the treating chemicals were incorporated in the pelleting material. Two separate experiments were conducted.

The seed used in these experiments was U. S. 215x216 beet variety and was furnished by the Beet Sugar Foundation of Fort Collins, Colorado. The treatments were designed by the Committee on Seed Treatments of the American Society of Sugar Beet Technologists. The Farmer's and Manufacturer's Beet Sugar Association of Saginaw, Michigan, arranged to treat this seed. All fungicides, treble-phosphate, etc., are given in percentage of weight of seed. The treated seed for the first experiment was distributed directly by the Farmer's and Manufacturer's Beet Sugar Association, and the seed for the second experiment was distributed by Dr. A. R. Downie, Chairman of the Committee on Seed Treatments.

The seed of the first experiment was treated as indicated in table 1. Untreated seed of beet variety Arizona 59 was planted as an additional check in soil fertilized with nitrogen, phosphorus and manure. The experiment was repeated using the same soil.

The seed of the second experiment was treated as indicated in table 2. An additional check was used where untreated seed of U. S. 215x216 was planted in soil fertilized with nitrogen, phosphorus and manure.

An 8 percent solution of Methocel was used as a binding material for making pellets. Six quarts of this solution were used per 15 pounds of seed. The inert material in the pellets consisted of 2/3 feldspar and 1/3 fly-ash. The fly-ash was produced by burning powdered coal. The pellets were built up in a rotating drum. For pasting the different fungicides and treble-superphosphate on the seeds the same solution of Methocel was used as above, except that only 2.5 quarts of this solution were used per each 15 pounds of seed.

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These tests were conducted in the greenhouse. Soil from the third year of the alfalfa plot in rotation 62B at the Huntley Branch Station, Huntley, Montana, was used in the greenhouse-flats which held 24 pounds of soil. A high percentage of seedling disease always occurred in this soil in previous studies. For each treatment, three rows of sheared sugar beet seed, each containing 40 seeds, were planted in each flat. The following fertilizers were added to one of the check flats in both experiments: 15.7 grams of sodium nitrate, 1.8 grams of treble-superphosphate and 1/5 of manure on the basis of soil volume.

Regular readings of healthy and diseased plants were taken approximately for 1 month after emergence. At the end of this period the plants in all flats were harvested and final readings pertaining to the amount of disease and weight of seedlings were taken.

Results and Discussion

Two consecutive plantings of the seed of the first experiment were made in the same soil. The percentage of healthy seedlings for the treated seed in the first planting (table 1) varied between 7.7 (1.0 percent of Arasan with Methocel) and 42.6 (1.0 percent of Phygon with Methocel) and in the second planting between 0.0 and 1.0 (1.0 percent of Phygon dust). Check seed planted in non-fertilized soil had 20.8 percent of healthy seedlings in the first planting and none in the second planting. Untreated seed planted in fertilized soil had 98.4 percent healthy seedlings in the first planting and 92.2 percent in the second planting. These results show that there was a considerable decrease in the percentage of healthy beet seedlings in the second planting as compared to the first one. Apparently an accumulative effect of the inoculum had something to do with this situation.

The results of the second experiment show (table 2) that the percentage of healthy seedlings grown from all treated seed was very low and varied between none and 1.3 percent (5 percent of Arasan, 2.5 percent of Phygon, 0.25 percent of Ceresan and 10 percent of treble-superphosphate) for individual treatments. Untreated seed planted in unfertilized soil had no healthy seedlings and similar seed planted in fertilized soil had 97.1 percent of healthy seedlings.

These results show that the effect of all seed treatments used in controlling seedling diseases of sugar beets was very small. Untreated beet seed planted at the same time in fertilized soil produced a large number of healthy seedlings. It is evident that any fertilization which produces vigorous, fast-growing beets was more important in controlling seedling diseases of beets than the different seed treatments in these experiments. The weights of beets grown in fertilized soil were in most cases much higher than those grown from treated or untreated seed planted in unfertilized soil. These results confirm those obtained in previous investigations. Seedling diseases of sugar beets are complex in nature, but under Montana conditions *Aphanomyces cochlioides* is perhaps the most important organism responsible for seedling diseases of sugar beets.

Table 1.—Effect of seed treatments on seedling diseases of sugar beets under greenhouse conditions, Bozeman, Montana, 1947.

Seed treated with	First Planting						Second planting					
	At harvest						At harvest					
	Sugar beet seedlings			Weight per plant			Sugar beet seedlings			Weight per plant		
	Number	Percent		Grams		Number	Percent		Grams			
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased		
0.375 ¹ percent N.I. Ceresan Methocel	10	102	8.9	91.1	0.62	0.47	0	88	0.0	100.0	0.00	0.11
1.0 percent Y. Cuproicide Methocel	17	86	16.5	83.5	0.88	0.46	0	99	0.0	100.0	0.00	0.08
1.0 percent Phygon dust	17	103	14.2	85.8	0.74	0.61	1	99	1.0	99.0	0.10	0.09
1.0 percent Phygon Methocel	43	58	42.6	57.4	1.83	1.20	0	95	0.0	100.0	0.00	0.25
1.0 percent Arasan dust	21	91	18.7	81.3	1.31	1.47	0	98	0.0	100.0	0.00	0.14
1.0 percent Arasan Methocel	8	96	7.7	92.3	0.50	0.71	0	92	0.0	100.0	0.00	0.11
Check	15	57	20.8	79.2	1.60	2.21	0	83	0.0	100.0	0.00	0.14
Check — NPM	124	2	98.4	1.6	0.79	0.20	107	9	92.2	7.8	1.08	0.13

¹All fungicides, treble-superphosphate, etc., are given in percentage of weight of seeds.

Table 2.—Effect of seed treatments on seedling diseases of sugar beets under greenhouse conditions, Bozeman, Montana, 1947.

Code No.	Seed treated with	Sugar beet seedlings				At harvest weight per plant	
		Number		Percent		Grams	
		Healthy	Diseased	Healthy	Diseased	Healthy	Diseased
	Untreated sheared seed 7/64" — 9/64"	0	147	0.0	100.0	0.0	0.10
4701X	3/8 ¹ percent New Improved Ceresan	0	145	0.0	100.0	0.0	0.13
4702X	1 percent Phygon, 10 percent T.S.P. ²	1	156	0.6	99.4	0.1	0.14
4703X	2½ percent Phygon, 10 percent T.S.P.	0	150	0.0	100.0	0.0	0.21
4704X	5 percent Phygon, 10 percent T.S.P.	0	153	0.0	100.0	0.0	0.18
4705X	1 percent Arasan, 10 percent T.S.P.	0	167	0.0	100.0	0.0	0.15
4706X	5 percent Arasan, 10 percent T.S.P.	0	164	0.0	100.0	0.0	0.18
4707X	10 per cent Arasan, 10 percent T.S.P.	0	138	0.0	100.0	0.0	0.17
4708X	¼ percent Cu Trichlor phenate, 10 percent T.S.P.	0	127	0.0	100.0	0.0	0.34
4709X	1 percent Cu Trichlor phenate, 10 percent T.S.P.	0	122	0.0	100.0	0.0	0.34
Pellet 808	5 percent Arasan, 5 percent Cuproicide, 5 percent Chloranil, 10 percent T.S.P.	0	127	0.0	100.0	0.0	0.27
4710X	5 percent Arasan, 5 percent Cuproicide, 5 percent Chloranil, 10 percent T.S.P.	2	157	1.3	98.7	0.05	0.15
Pellet 907	5 percent Arasan, 2½ percent Phygon, ¼ percent Ceresan, 10 percent T.S.P.	0	127	0.0	100.0	0.0	0.26
4711X	5 percent Arasan, 2½ percent Phygon, ¼ percent Ceresan, 10 percent T.S.P.	0	153	0.0	100.0	0.0	0.15
Pellet	10 percent Arasan, 10 percent T.S.P.	0	128	0.0	100.0	0.0	0.15
	Untreated sheared seed + NPM	135	4	97.1	2.9	4.7	1.00

¹All fungicides, treble-superphosphate, etc., are given in percentage of weight of seeds.

²T.S.P. = treble-superphosphate.