

## Literature Cited

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## Dusting and Spraying Sugar Beets in Michigan for Control of *Cercospora* Leafspot

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During the years 1936, 1937, and 1938 the estimated loss to the sugar-beet crop in Michigan because of attacks of *Cercospora* leafspot averaged approximately 15 percent. This disease is one of long standing in the State, but only during recent years have there been succeeding serious losses to the sugar-beet industry.

In 1939, cooperative experiments and demonstrations were inaugurated with the various sugar companies, and dusting work was carried out on 26 blocks of beets in the Saginaw Valley. The dust material used was monohydrate copper, sulfate-lime 20-80, since previous work had shown this to be effective under moist conditions. The results of all these trials in 1939 showed conclusively that, in a year of moderate to heavy leafspot infection, the 20-80 copper-lime dust at 3 to 4 applications was an effective control, giving an average increase of approximately 2 tons of beets per acre, with an increase in sucrose of 1 percent, 1.2 percent increase in purity, and an increase in estimated recoverable sugar of 777 pounds per acre. These results

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also showed that dust applications at night, when the beets were wet with dew, were more effective than those made during the day with the beet leaves relatively dry.

### Results in 1940

The experiments in 1940 were set up to include several of the newer copper compounds so manufactured that for best results it was unnecessary to make applications at night. Various fillers also were used in combination with the copper materials. Briefly, the data from the trials of 1940 show that each of the materials tested, including basicop, cuprocide, bordow, tribasic copper sulfate, and monohydrate copper sulfate, in at least one combination with its filler and sticker, gave statistically significant increase in yield of recoverable sugar in the state-wide tests. These data, presented at the Detroit meeting last year, will not be given in this report.

### Results in 1941

For the trials in 1941, strip tests of 4 materials were made in 17 beet fields in the districts representing the Great Lakes, Lake Shore, Michigan and Monitor sugar companies. Each dusted strip in the field was adjacent to a strip of equal or greater width left undusted as a check. The results of these trials (table 1), using average yields for the entire State, show that each of the materials employed gave an increase in recoverable sugar statistically significant at the 5-percent level.

In addition to the strip tests using only 4 materials, 2 other experiments were carried out at the Merrill Farm of the Lake Shore Sugar Company and on a grower's farm in the Great Lakes Sugar Company district near Blissfield, Michigan. The plots in these experiments consisted of 4 replications of 11 and 12 materials, respectively, and an undusted check laid out in randomization. Leaf spot appeared rather late in the summer at the Merrill Farm and gained little headway throughout the season, even on the undusted check plots. The yield data from these plots showed no significant increase over check. In the absence of leafspot, it is indicated that there was no stimulation of sugar yield due to applications of copper compounds. However, in the Blissfield area, leafspot was abundant in many fields in mid-July and also was well distributed as a very light infection in all the randomized plots at this time. The first application of dust was made July 25 with a tractor-drawn 4-row duster. Subsequent applications were made August 6 and 22 and September 9, using 40 pounds of dust in all applications. The plots were harvested October 1 and 2.

Table 1.—Results of strip-dusting trials 1941.

Material		Beets tons per acre	Per- centage sucrose	Per- centage purity	Recoverable sugar; pounds per acre
Bordow (F132)	13.5 lb.				
PyraX	84.5 lb.	14.25	16.3	85.6	3990
Conditioner	2.0 lb.				
Check		13.1	15.7	84.9	3476
Gain		1.15	0.6	0.7	504
Difference required for significance		1.0	0.45	1.8	385
Caproclide	8 lb.				
PyraX	84 lb.	13.90	10.1	86.7	3884
Wheat flour	10 lb.				
Check		13.20	15.5	85.4	3133
Gain		0.70	0.6	1.3	451
Difference required for significance		1.06	0.47	1.8	411
Tribasic copper sulfate	14 lb.				
Eastern Magnesia Number 23 tale	71 lb.	14.10	16.5	88.6	4120
Bentonite	15 lb.				
Check		13.65	15.3	84.0	3490
Gain		0.45	1.2	4.6	621
Difference required for significance		1.15	0.40	1.5	500
Monohydrate copper sulfate	20 lb.				
Hydrated lime	60 lb.	14.17	10.1	85.0	3831
PyraX	20 lb.				
Check		13.62	15.8	84.4	3392
Gain		0.55	0.3	0.6	480
*Difference required for significance		1.31	0.37	2.4	893

\*Difference required for significance at 5-percent level.

Early application of the dust materials was prevented by frequent rains which made it impossible to get the dusting machine and tractor into the field. These conditions also prevailed at various times during the season, so that dust applications could not be made with the timeliness that disease conditions demanded. In spite of these severe conditions, however, 3 materials gave increases in yield of recoverable sugar, significant at the 5-percent level. These data from the Blissfield plots are shown in table 2.

Table 2.—Results of randomized replicated plot tests of copper materials in combination with various fillers, Blissfield district, Michigan, 1941.

Material		Beets— tons per acre	Per- centage sucrose	Per- centage purity	Recoverable sugar, lb. per acre
Tribasic copper sulfate	12 lb.				
Eastern magnesia tale No. 23	73 lb.	13.32	14.06	78.60	3514
Bentonite	15 lb.				
Tribasic copper sulfate	12 lb.				
Pyrax	73 lb.	13.55	13.59	78.48	2981
Bentonite	15 lb.				
Tribasic copper sulfate	12 lb.				
Loomkill tale	73 lb.	15.00	13.42	77.55	3146
Bentonite	15 lb.				
Mono. copper sulfate	20 lb.				
Hydrated lime	60 lb.	15.22	13.84	76.56	3233
Loomkill tale	20 lb.				
Mono. copper sulfate	20 lb.				
Hydrated lime	60 lb.	13.52	14.01	78.56	3484
Pyrax	20 lb.				
Mono. copper sulfate	20 lb.				
Hydrated lime	60 lb.	15.49	14.28	76.85	3401
Eastern magnesia tale No. 23	20 lb.				
Mono. copper sulfate	20 lb.				
Hydrated lime	60 lb.	15.14	14.05	78.28	3300
Copper oxychloride sulfate	12 lb.				
Eastern magnesia tale No. 23	73 lb.	14.03	14.17	79.45	3166
Bentonite	15 lb.				
Cuprocide (Red)	6 lb.				
Pyrax	84 lb.	15.31	13.82	77.34	3273
Wheat flour	16 lb.				
Bordow F48	13.5 lb.				
Pyrax	84.5 lb.	13.99	13.59	77.15	3000
Conditioner	2.0 lb.				
Bordow F48	13.5 lb.				
Loomkill tale	84.5 lb.	15.01	14.07	78.35	3312
Conditioner	2.0 lb.				
Bordow F48	13.5 lb.				
Eastern magnesia tale No. 23	84.5 lb.	14.59	13.58	77.55	3084
Conditioner	2.0 lb.				
Not dusted check		14.01	13.56	74.54	2839
*Difference for significance		1.92	1.00	2.46	588

\*Difference required for significance at 5-percent level.

Many of the sugar-beet growers are already equipped with power-spraying machinery used in growing potatoes or tomatoes. With good equipment on hand, these growers have asked whether or not sugar-beet leafspot could be controlled by spraying instead of dusting. Two trials were conducted, but in one field leafspot was practically absent because of severe drought conditions during July and August. In the second field, Arenac County, bordeaux mixture 8-4-100 and tribasic copper sulfate-lime 4-4-100 were used. The results show that both materials gave significant increases in yield of gross sugar. The difference in yield between the plots sprayed with bordeaux mixture and tribasic copper sulfate was not significant. These data are shown in table 3.

Table 3.—Summary of results of spraying commercial variety sugar beets with bordeaux mixture, 8-4-100, and tribasic copper sulfate—lime, 4-4-100.

Spray material	Beets— tons per acre	Percentage of sucrose	Gross yield sugar per acre	Gain over check
Bordeaux mixture 8-4-100	16.18	15.01	4858.8	828.5
Difference required for significance	0.96	0.85	296.0	
Tribasic copper sulfate— lime 4-4-100	15.57	15.73	4897.1	866.8
*Difference required for significance	0.17	0.64	60.1	
Check unsprayed	13.08	15.00	4030.3	

\*Difference required for significance at 5-percent level.

### Summary of 1941 Results

In state-wide field-strip trials, plots dusted with bordow F-132, euprocide 6-84-10, tribasic copper sulfate-talc-bentonite 14-71-15, and monohydrate copper sulfate-lime-pyrax 20-60-20 gave significant increases in yield of recoverable, sugar per acre, in comparison with the undusted plots. There were no significant differences between mean yields of plots treated with the first 3 dusts.

In randomized replicated plots in the Blissfield, Michigan, district, those receiving applications of monohydrate copper sulfate-lime-pyrax 20-60-20, monohydrate copper sulfate-lime-eastern magnesia talc 20-60-20, and tribasic-eastern magnesia talc-bentonite 12-73-15 gave yields of recoverable sugar significantly above those of the undusted plots.

Spraying sugar beets with bordeaux mixture 8-4-100 and tribasic copper sulfate-lime 4-4-100 gave sugar-per-acre yields significantly above those of the unsprayed plots. There was no significant difference between sugar yields of the spray treatments.