Control of Cercospora Leaf Spot of Sugar Beet With Ultra-Low-Volume Oil-Based Fungicidal Mists

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Introduction

The following are among the advantages of oil sprays over other conventional spray materials for the control of plant pathogenes: they are effective spreaders and stickers; relatively cheap; well adapted to aerial application; and nonphytotoxic (1)[2]. Fisher (2) reports satisfactory control of greasy spot disease of citrus (*Cercospora citrigrisea* sp. nov.) with oil emulsion spray. Calpouzos (1) cites several instances of control of Sigatoka leaf spot disease of banana (*Mycosphaerella musicola* Leach = *Cercospora musae* Zimm.) with ultra-low-volume oil-mist sprays, applied either as fungicide carriers or applied alone. Evidence accumulated by Calpouzos indicates that oil acts as a fungistatic therapeutic agent in controlling this disease. According to Wilson et al. (3), addition of emulsifiable oil to fixed copper sprays for control of sugar beet leafspot (*Cercospora beticola* Sacc.) is beneficial because it appears to reduce the eroding action of wind and rain on the copper deposit.

The successful control of the aforementioned cercosporoses of citrus and banana with oil sprays prompted our own tests of the efficiency of ultra-low-volume mist applications of petroleum oil—alone and as a fungicide carrier—in the control of sugar beet leaf spot induced by *C. beticola*.

Materials and Methods

We compared the following treatments in a field test under severe and sustained exposure to *C. beticola*:[3]

1. Petroleum spray oil (Esso)[4]; a naphthenic spray oil of 92 USR (unsulfonatable residue) and 70 second viscosity (Saybolt Universal Seconds).
2. Copper oxychloride (0.5 lb/gal of emulsion comprising one part petroleum oil + 3 parts water).
3. Maneb (1.25 lb/gal petroleum oil).
4. Tri-basic copper sulfate (1 lb/gal petroleum oil).
5. Control.

[1] Plant Pathologist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Logan, Utah.

[2] Numbers in parentheses refer to literature cited.

[3] All materials were prepared and furnished by Esso Research and Engineering Company, Linden, New Jersey.

[4] Mention of material and company name is for identification only and does not emply endorsement by U. S. Department of Agriculture.

The plots, arranged in a 5 × 5 latin square, were situated in a field of approximately 3 acres of sugar beets at the Plant Industry Station, Beltsville, Maryland, in 1961. Each plot comprised four 20-ft. rows of commercial sugar beet variety, SL 122 MS × SP 5481-0, spaced 2 ft apart.

On June 23, inoculum consisting of dried and ground sugar beet leaves infected with *C. beticola* was applied to all sugar beet plants in the test plots and in the surrounding field.[5] By July 10, leaf spot symptoms began to appear. A severe leaf spot epiphytotic prevailed throughout the field during August and September.

The treatments were applied with a "Solo Port" knapsack type mist blower on July 10, 20, 31, August 14, 25, 28 (following heavy rains on August 26, 27), September 7 and 22. All treatments, except copper oxychloride + oil were applied at the rate of approximately one gal/acre. Copper oxychloride and oil was applied at 4 gal/acre on July 10 but subsequent applications were at one gal/acre because foliage injury was associated with the higher rate. No injury was associated with any of the other treatments.

Leaf spot severity readings were made on July 30, August 14 and September 25. On October 4 the two center rows of each plot were harvested and weighed. We obtained sucrose percentage and refractometer readings from a sample comprising all plants in the two center rows of each plot.

Results and Conclusions

Each of the 3 fungicide-oil treatments reduced leaf spot severity and caused a proportionate increase in gross sugar, root

Table 1.—Results of ultra-low-volume fungicide-oil spray test for control of Cercospora beticola on sugar beet variety SL 122 MS × SP 5481-0 at Beltsville Maryland, 1961.

Treatment	Leaf spot[a/b] severity rating	Acre yield[a]		Sucrose[a]	Apparent[a] purity coefficient
		Gross sugar	Roots		
		Pounds	Tons	Percentage	
Copper oxychloride + oil	2.5	3986 a	13.86 a	14.38 ab	80.52 a
Maneb + oil	3.2	3832 ab	13.21 a	14.51 a	79.52 a
Tri-basic copper sulfate + oil	3.6	3373 bc	12.30 ab	13.72 bc	79.98 a
Oil alone	5.0	2887 c	11.06 b	13.07 c	78.63 a
Control	6.2	2255 d	9.29 c	12.14 c	77.44 a

[a] Results given as 5-plot averages. Superscripts indicate levels of significance for ranked means. Treatments not including the same letter are significantly different at the 5% level (Duncan's multiple range test).

[b] Leaf spot readings based on a scale from 0 (no disease) to 10 (all leaves dead). Ratings shown are maxima for readings on 3 different dates.

[5] Inoculum was prepared and applied by Dr. G. E. Coe, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.

weight and sucrose percentage in comparison with the untreated control (Table 1). Application of oil alone resulted in a significant reduction in leaf spot damage but not so effectively as copper oxychloride + oil or maneb + oil.

The results of this study indicate the efficacy of oil-based ultra-low-volume fungicide mists in controlling cercosporosis of sugar beet. The results also indicate the advisability of further studies with different oils and dosages to determine the extent to which the antifungal property of oil can be utilized in controlling this disease.

Literature Cited

(1) CALPOUZOS, L. 1962. Some contributions from the tropics to plant disease control methods. Phytopath. 52: 942-945.

(2) FISHER, FRAN E. 1961. Greasy spot and tar spot of citrus in Florida. Phytopath. 51: 297-303.

(3) WILSON, J. D., FRANK IRONS and JAMES HENRY. 1963. Experiments in the control of Cercospora leaf spot of sugar beets—1962. Botany and Plant Pathology Series 42, Ohio Agr. Expt. Sta. 23 pp.