

The Systemic Fungicidal Activity of Triphenyl Tin Acetate Against *Cercospora beticola* on Sugarbeet

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ABSTRACT

Triphenyl tin acetate, as well as benomyl, applied to the lower surface of sugarbeet leaves, decreased infection by *Cercospora beticola* inoculated on the untreated leaf side. Both fungicides, applied either to some of the foliage or to roots, reduced infection on untreated leaves. The systemic fungicidal activity of triphenyl tin acetate was inferior to that of benomyl. *Phytopathology* 61:738-739.

Additional key words: *Beta vulgaris*.

Triphenyl compounds are efficient protective fungicides for controlling *Cercospora* leaf spot of sugarbeet, *Beta vulgaris* L. (1, 2, 5, 7). The factors contributing to the superiority of triphenyl tins over other protective fungicides were investigated by Stallknecht & Calpouzos (8). No systemic fungicidal activity has been demonstrated for the triphenyl tins (3, 4), although Baumann (1) suggested that translocation should not be excluded. In previous work (6), triphenyl tin acetate (TPTA) applied 3 days before inoculation with *C. beticola* spores did not have any systemic fungicidal activity. In the present study, inoculations were made at intervals for 28 days following treatment. The systemic effect of TPTA, which became apparent, was compared with that of benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate], a typical systemic fungicide (6).

Two thirds of the leaves of sugarbeet plants, grown singly in pots in a greenhouse, were sprayed on their lower surface, to the point of runoff, with suspensions of 120 and 1,200 ppm of TPTA (Brestan 60 WP, 60% TPTA, and 20% maneb, Farbwerke Hoechst AG, Frankfurt-Hoechst, Germany), and benomyl (Benlate, 50% WP, E.I. Du Pont de Nemours, Wilmington, Del., USA). Inert fluorescent particles (Saturn Yellow) were added to the suspensions to detect any possible contamination on either the untreated leaf surface or the remaining untreated leaves. At intervals of 1, 3, 17, and 28 days after fungicide application, areas in marked circles (28 mm diam) on the upper surface of the leaves were uniformly inoculated by atomizing a measured amount of *C. beticola* spore suspension. The plants were then transferred to a mist chamber for 4 days, and the severity of the infection obtained was recorded 2 weeks later.

The treatment with both fungicides reduced infection in untreated as well as in treated areas of the plants (Fig. 1), but the fungicides differed as to the response to time and dosage. The fungicidal action was mani-

fested first with leaves treated on one side only and inoculated on the untreated side. With this experimental scheme, TPTA gradually decreased infection severity with time, up to 63 and 80% at 120 and 1,200 ppm, respectively, after 28 days, whereas benomyl completely controlled the disease 1 day after application. In partially treated plants, TPTA reduced infection severity on untreated leaves inoculated 28 days after treatment by 45-62%, depending on dosage. This is a moderate rate of control as compared with the 90-99% reduction of infection obtained with benomyl treatments. The results seem to indicate that both fungicides were translocated. The decrease in infection severity either on leaves inoculated on the untreated side or in untreated leaves in partially treated plants suggested laminar penetration (depth action) and translocation, respectively. However, TPTA, even when applied at a dosage as high as 5,000 ppm to one side of the leaves, did not reduce infection when the opposite side of the leaf was inoculated 1 day later.

For comparison with the systemic fungicides, and to exclude any systemic effect of maneb, which is present in Brestan, a maneb preparation was applied at 1,200 ppm at the same time intervals; no reduction of the infection severity was observed. Since maneb did not

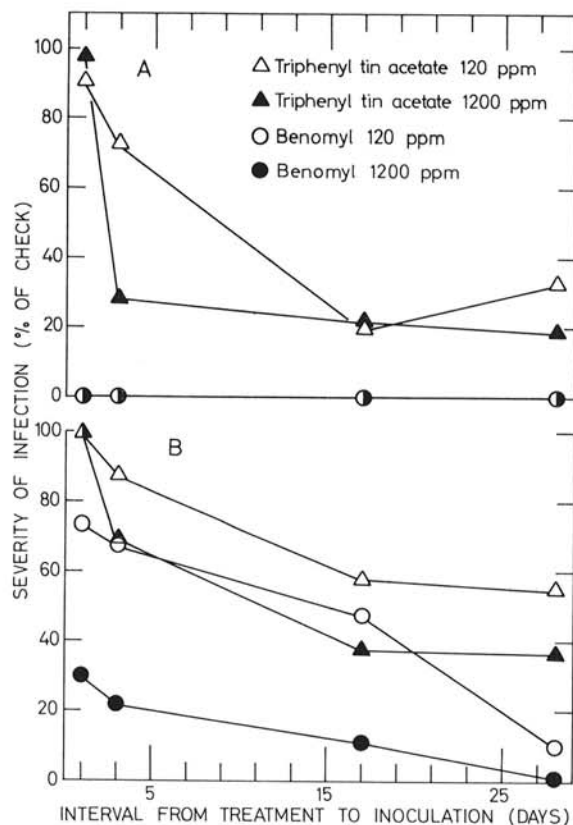


Fig. 1. Severity of infection of *Cercospora beticola* on the upper surface of sugarbeet leaves, inoculated at intervals after application of fungicides to the lower leaf surface of two-thirds of the leaves in the plant. Data are averages from two trials. A) Treated leaves. B) Untreated leaves.

manifest systemic effect, its presence (20%) in the Brestan formulation can be disregarded.

Root uptake was studied with 1-month-old sugarbeet seedlings. Root systems of seedlings were immersed in 10-ppm fungicide suspensions for 3 days. The leaves were then inoculated with *C. beticola* spore suspension, and incubated for 3 days in a mist chamber; spore germination on two leaves of each of eight plants was then determined. In two experiments, germination percentage with TPTA, benomyl, maneb, and in the control averaged 48.3, 0.0, 88.2, and 91.6%, respectively. These results indicate again a moderate systemic movement of TPTA.

The efficient fungicidal performance of TPTA in controlling *Cercospora* leaf spot in the field may be due, in addition to its protective activity, also to its moderate systemic property. The superiority of benomyl in field experiments (7) can be ascribed to its excellent systemic properties.

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