SURFACTANT INHIBITS PLANT VIRUSES

A compound normally used as a sticking, spreading, or wetting agent may stop insects from introducing diseases

■ A surfactant that has clear-cut antiviral activity in plants has been found in USDA greenhouse tests.

Tests are underway to find if the compound is useful as a preventive of virus introduction into plants by insects, a major factor in the spread of viruses.

The surfactant, dioctyl sodium sulfosuccinate (DOSS), markedly reduced development of five virus diseases in bean plants. Surfactants, compounds which reduce the surface tension of liquids, are commonly added to agricultural chemicals to improve their contact with plant surfaces or to facilitate penetration.

DOSS is not a cure for plants with established virus diseases, because it is not absorbed or translocated in effective amounts. It does provide a valuable basis for further research on chemical control of viruses.

Effectiveness of DOSS in arresting virus development was found by ARS plant pathologist I. R. Schneider and plant physiologist J. W. Mitchell in their search for surfactants to combine with antibiotics in the experimental control of virus diseases. They found, however, that application of the surfactant alone to plant leaves 15 minutes, and in some cases up to 30 hours, after inoculation with viruses effectively inhibited disease development. The experiments were made at the Agricultural Research Center, Beltsville, Md.

Paired leaves of pinto bean plants were inoculated by brushing leaf surfaces with extracts of virus-infected plant juice and an abrasive. An aqueous solution of DOSS, 2,000 p.p.m., was applied 15 minutes later to one leaf of each pair by mechanical spray or cotton swab. Treated leaves in each experiment developed fewer local lesions (visible disease sites) than did untreated leaves. Test viruses were southern bean mosaic, tobacco mosaic, and alfalfa mosaic.

The compound was also highly effective in preventing development of systemic symptoms (reduction in plant growth) in Black Valentine beans and pinto beans caused, respectively, by tobacco ringspot and yellow bean mosaic viruses.

The inoculum of virus-infected juice and abrasive was brushed on leaves of test plants. Surfactant was sprayed on 15 minutes later.

DOSS prevented reduction in growth by tobacco ringspot. Left to right: control; inoculated plant; inoculated, treated plant.

Although DOSS assists penetration of other chemicals into plants, the compound was not found to move into plants or to be translocated in effective amounts through leaves or roots. It apparently moved into plant cells, as did the viruses, through openings made by the inoculation procedure. Thus, it may be useful as a protection against insect-transmitted viruses, which gain entry into plants through openings made by insects.

The scientists believe activity of DOSS may be two-fold—it destroys infectiousness of virus particles and interferes with initial virus multiplication.

In some experiments with southern bean mosaic virus, treatments were made 16 hours and 30 hours after inoculation. Lesions were smaller in treated leaves than in untreated leaves, even when no reduction in number of lesions occurred. This indicates that the amount of virus formed per infection site was reduced, although infection was not prevented.

Moreover, even when no visible lesions occurred, Schneider and Mitchell were able to recover some virus from treated, inoculated leaves 5 days later. Recovery of virus indicates that infection did take place but that virus multiplication did not proceed effectively enough to produce visible symptoms.

How DOSS is able to inhibit virus isn't known, but its action is directly correlated with its ability to reduce surface tension of water. Four other compounds related to DOSS were also tested, and it was found that increasing ability to reduce surface tension of water paralleled effectiveness in antiviral activity.☆

Your Editor,

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