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Authors

Costa, Claudio L.

Muller, G. W.

Sobrinho, J. T.

et al.

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Reducing Tristeza Infection of Citrus Seedlings by Repelling *Toxoptera citricidus* with Rice Husk Mulch

C. L. Costa, G. W. Müller, A. S. Costa, and J. Teófilo Sobrinho

After Kring (6) found that aluminum surfaces repelled flying aphids, many attempts were made to control or reduce spread of insect-transmitted viruses by placing reflective materials around plants (3, 4, 5, 7, 8, 9).

Studies carried out by the writers to test the possible repellent action of materials readily available showed that mulching of the soil with rice husks greatly reduced landing of different aphid species on yellow water traps placed on this background. Mulching soil around plants with this material

also reduced virus infection spread by migrants of the vector *Myzus persicae* (Sulz.) landing on tomato plants (1), and reduced incidence of a mosaic virus transmitted by *Aphis gossypii* (Glov.) to bush squash plants (2).

C. L. Costa (unpublished) found that *Toxoptera citricidus* (Kirk.) was strongly repelled by rice husk mulch. Tests were undertaken to determine if this background would protect citrus plants in seedbeds and nurseries from infection by tristeza virus. Results of three experiments are reported.

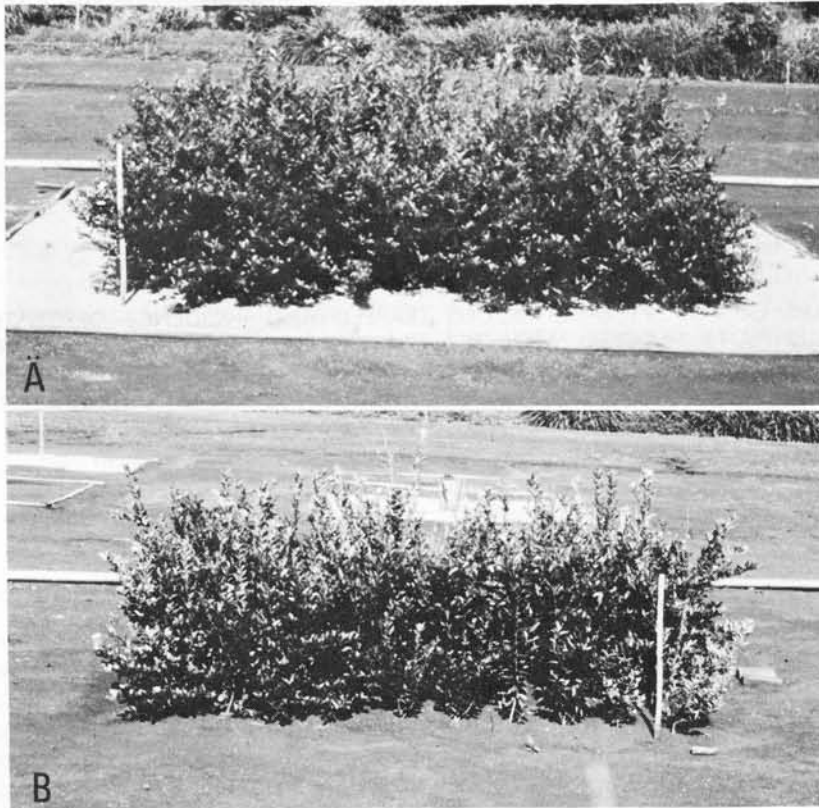


Fig. 1. Galego lime field plots. *A*, mulched with rice husk between plants and 1.5 m around the plot; *B*, unmulched control plot.

MATERIALS AND METHODS

Two tests were undertaken in Campinas, Brazil, and one in Limeira, Brazil. Test 1 was located in an area of bare, red soil, Test 2 in a field 100 m removed from citrus, and Test 3 in an area surrounded by different types of citrus plants.

Greenhouse-grown Galego lime seedlings, about 10 cm tall, were used as test plants. In each test, two groups of 100 seedlings each were set in the field on two 3 × 3-m plots, 10 m apart. In one group the soil between plants and in a 1.5-m band around the plot was mulched with rice husks, which were renewed periodically. The other group

of plants was kept free of weeds and mulch (fig. 1).

Evaluations were made by comparing percentages of plants infected by tristeza and by comparing catches of the vector in a modified Moericke yellow water trap placed in each plot, 20 cm above ground level. Plants infected with tristeza were recorded at intervals, but only final determinations are reported here. Alates of the vector caught in the traps were counted three times a week for the period of the tests.

To prevent aphid colonization and to minimize spread of virus within the plots, plants were sprayed at frequent intervals.

RESULTS

Results of the experiments are shown in table 1. In Test 1, water traps placed on unmulched soil caught 25.4 times more alates of *Toxoptera citricidus* than did traps on rice husks and in Test 2, 94.3 times more. At Limeira 9.2 times more alates were in the trap on unmulched soil than on rice husks. As an average of the three tests, traps on un-

mulched plots caught 16.5 times more aphids than did traps on rice husks.

The incidence of tristeza was also much higher in unmulched than in mulched plots. In Test 1, twice the number of plants in the unmulched soil were infected as in the rice husk plot, and in Test 2, 3.7 times as many plants were infected. At Limeira there

TABLE 1
NUMBERS OF TOXOPTERA CITRICIDUS TRAPPED AND INCIDENCE OF TRISTEZA IN CITRUS PLOTS MULCHED WITH RICE HUSKS AND IN UNMULCHED CONTROLS

Test, time, and place	Av. number aphids trapped		Percentage of infected plants	
	Unmulched plot	Rice husk plot	Unmulched plot	Rice husk plot
Campinas				
Test 1:				
11/14/69-10/5/70	432.0	17.0	12.0	6.0
Test 2:				
5/8/70-2/14/71	283.0	3.0	30.0	8.0
Limeira				
Test 3:				
12/31/71-7/4/72	477.0	52.0	44.0	6.0
Mean	397.3	24.0	28.7	6.7

were 7.3 times more infected plants on unmulched soil than in the rice husk plot. The average figure for all tests

combined was 4.3 times more infected plants on unmulched than in rice husk plots.

DISCUSSION AND CONCLUSIONS

The ratio of reduction in aphids on traps placed on rice husks to the ratio of reduction in tristeza virus infection of plants grown on this background was much greater at Campinas. At Limeira, the ratio of reduction in aphids was almost the same as the ratio of disease reduction. Data from the Limeira trial agree with data reported elsewhere that showed a proportional reduction of the incidence of vectors and virus (1).

As the experiments progressed, there were increasingly fewer healthy plants in the unmulched than in the mulched

plots. Since virus-carrying aphids might have landed on plants already infected, the evaluation of the rice husk mulch effect in reducing tristeza infection was probably underestimated.

That *Toxoptera citricidus* is responsive to the reflectance of the rice husk mulch is confirmed. Under conditions where rootstock infection by tristeza virus prior to budding might be a problem, the rice husk mulching of the soil between plants in seedbeds and nurseries may be a valuable method for reducing tristeza infection of citrus plants.

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