Some Properties of a Watermelon Mosaic Virus in Jordan

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ABSTRACT

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A strain of watermelon mosaic virus 2 (WMV-2) was isolated from squash and melon plants in Jordan. The virus was readily transmitted by *Myzus persicae, Aphis gossypii,* and *A. fabae.* Identification of the isolates as WMV-2 was based on host range, properties in sap, transmission, and serologic tests. This is the first report of WMV-2 in Jordan.

Cucurbits are among the main economic crops in Jordan, accounting for about 30% of the total area planted to vegetables (2). In the last 3 yr, many fields of cucurbits, especially squash, have been affected by a viruslike disease. Leaves showed raised green blisters and developed mosaic symptoms. Fruits, if set, were severely deformed and not marketable.

The only work done on cucurbit viruses in Jordan was part of an overall survey for viral diseases. Mink (5) isolated cucumber mosaic virus (CMV) and squash mosaic virus (SqMV) from squash plants. Martelli and Russo (4), on the basis of host range, identified watermelon mosaic virus 2 (WMV-2) in squash from Jordan; their isolate was later identified as watermelon mosaic virus 1 (WMV-1) (7). We present evidence of the occurrence of a strain of WMV-2 in squash and melon plants in Jordan.

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MATERIALS AND METHODS

Virus isolates from leaves of squash and melon were passed through two single-lesion transfers in *Chenopodium amaranticolor* and maintained in squash.

Plants for host range tests were planted in sterilized soil in 12-cm pots and grown in a greenhouse. Plants in the cotyledonary or first true leaf stage were dusted with Carborundum and inoculated mechanically with infectious sap from squash. Symptoms were recorded 20 days after inoculation. Inoculated and youngest leaves of all plants tested were back-indexed on *C. amaranticolor.*

For virus property tests, the youngest leaves of infected squash plants were triturated in 0.01 M neutral phosphate buffer. The sap was strained through two layers of cheesecloth and used to determine longevity in vitro and thermal inactivation and dilution end points. All treatments were assayed on *C. amaranticolor.*

Apterous nonviruliferous aphids (*Myzus persicae, Aphis gossypii,* and *A. fabae*) were starved for 1 hr, given an acquisition access period of 5 min on infected squash, and then transferred to 15 healthy squash seedlings at the rate of five aphids per seedling. After a 5-min inoculation access period, aphids were killed with insecticides.

Freeze-dried antisera to WMV-1 (852) and WMV-2 (868) and freeze-dried Jordan and Florida isolates of WMV-1 and a Florida isolate of WMV-2 were kindly supplied by D. E. Purcifull. Agar plates and antigen for sodium dodecyl sulfate (SDS) immunodiffusion tests were prepared as described elsewhere (3,6). Double-diffusion tests with CMV and SqMV antisera were done in 0.8% Noble agar prepared in 0.01 M neutral phosphate buffer containing 0.25% sodium azide. Antigens were prepared from infected squash leaves (1 g/ml) ground in 0.01 M neutral phosphate buffer containing 0.9% NaCl.

RESULTS

Both isolates (squash and melon) induced diffuse mosaic and mottling on the first two true leaves, followed by the appearance of raised green blisters and filiform leaves on cucumber, squash, snake cucumber, muskmelon, and watermelon. The isolates produced chlorosis on inoculated leaves of *Pisum sativum* 'Perfected Wales' and local lesions on *C. quinoa, C. amaranticolor, Phaseolus vulgaris* 'Gold Crop', and *Gomphrena globosa.* The two isolates had identical host ranges not restricted to the Cucurbitaceae. Plant species that did not produce symptoms and from which the virus was not recovered included *Amaranthus caudatus, A. tricolor; Beta vulgaris* 'Kleine'; *Capsella bursa-pastoris; Capsicum frutescens; Chenopodium murale; Convolvulus arvensis; Datura stramonium, D. tatula; Daucus carota; Glycine soja* 'Altonia' and 'Davis'; *Gossypium barbadense; Helianthus annuus; Lactuca sativa; Luffa acutangula; Lycopersicon esculentum; Nicandra physalodes; Nicotiana glutinosa, N. rustica, N. tabacum* 'Havana 423'; *Petunia hybrida; Phaseolus vulgaris* 'Bountiful', 'Black Turtle', 'Monroe', 'Pinto', and 'Topcrop'; *Physalis floridana; Raphanus sativus; Senecio vulgaris; Sesbania exaltata; Solanum melongena, S. nigrum; Spinacia oleracea; Trifolium pratense; Vicia faba;* and *Vigna unguiculata* 'California Blackeye'.

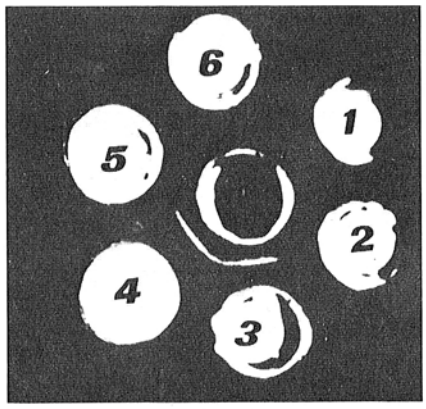

Fig. 1. Serologic reactions in an SDS immunodiffusion plate. The central well contained antiserum to the Florida strain of WMV-1; peripheral wells were charged with antigens (1) squash isolate (79-79), (2) melon isolate (79-8), (3) WMV-1 (Florida isolate), (4) WMV-1 (Jordan isolate of G. P. Martelli), (5) squash isolate (79-79), and (6) healthy squash.

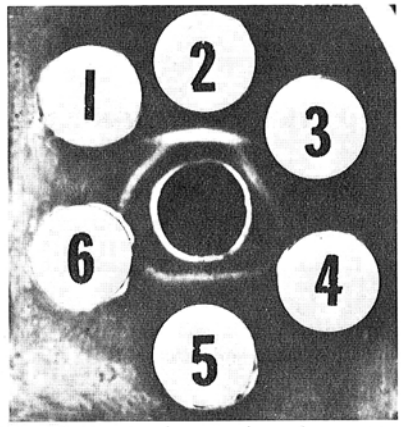

Fig. 2. Serologic reactions in an SDS immunodiffusion plate. The central well contained antiserum to the Florida strain of WMV-2; peripheral wells were charged with antigens (1) melon isolate (79-8), (2) WMV-2 (Florida isolate), (3) squash isolate (79-79), (4) healthy squash, (5) squash isolate (79-79), and (6) WMV-1 (Jordan isolate of G. P. Martelli).

The dilution end point for the two isolates was between 10^{-3} and 10^{-4}. The thermal inactivation point was between 55 and 60 C, and longevity in vitro was 2–3 wk. *M. persicae, A. gossypii,* and *A. fabae* transmitted the isolates.

Our isolates failed to react with antisera prepared against WMV-1 (Fig. 1), SqMV, or CMV. However, SDS immunodiffusion tests showed that our isolates were closely related to but distinct from the Florida isolate of WMV-2, as indicated by the spur formation (Fig. 2).

DISCUSSION

The two isolates produced similar symptoms on host plants. Unlike CMV, they did not infect *N. glutinosa* or *N. tabacum* 'Havana 423', and they failed to react with CMV antiserum. Aphid transmission, low thermal inactivation point, and failure to react with SqMV antiserum demonstrated the absence of SqMV. The isolates were not restricted in host range to the Cucurbitaceae, whereas WMV-1 seems to be restricted to this family (9). In addition, infection of *C. amaranticolor* (1) and failure to infect *Luffa acutangula* indicated the absence of WMV-1 (8). This was confirmed by failure of the two isolates to react with WMV-1 antiserum. However, both isolates cross-reacted with antisera produced against WMV-2. Although such cross-reactivity has been shown between soybean mosaic virus and WMV-2 antiserum (8), host range studies, properties in crude sap, and serologic tests suggested that our two isolates can be placed in the group designated as WMV-2.

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