Transmission of Bean Curly Dwarf Mosaic Virus and Bean Mild Mosaic Virus by Beetles in Costa Rica

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ABSTRACT

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Bean curly dwarf mosaic virus and bean mild mosaic virus were isolated from bean plants near Turrialba, Costa Rica. *Cerotoma ruficornis* subsp. *rogersi, Diabrotica balteata, D. adelpha, Paranapiacaba waterhousei,* and *Gynandrobrotica variabilis* were able to transmit bean curly dwarf mosaic virus, while only *C. ruficornis, D. balteata,* and *G. variabilis* transmitted bean mild mosaic virus.

Bean curly dwarf mosaic virus (BCDMV) and bean mild mosaic virus (BMMV) were originally isolated from bean plants brought to the United States from El Salvador for study (1,2). Meiners et al (1) and Waterworth et al (2) demonstrated that the beetle species *Diabrotica undecimpunctata howardi* Barber and *Epilachna varivestis* Mulsant transmitted the two viruses. This article reports the occurrence of BCDMV and BMMV near Turrialba, Costa Rica, and identifies some of their beetle vectors in that area.

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MATERIALS AND METHODS

BCDMV and BMMV were isolated from bean plants in the Centro *Agronó*mico Tropical de Investigación y Enseñanza (CATIE) experimental field, Turrialba, Costa Rica, in 1979. Plants from the field with viruslike symptoms were routinely assayed by mechanical inoculation to bean plants (*Phaseolus vulgaris* L. 'CATIE 1') as part of a study on the identity and occurrence of viruses in beans.

When virus transmission was recorded, plant sap was reacted in agar double-diffusion tests against antisera to BCDMV, BMMV, and bean pod mottle, bean rugose mosaic, bean yellow stipple, and southern bean mosaic viruses. (Antisera were kindly furnished by H. A. Scott, University of Arkansas.) One of the two isolates used in this study reacted only with BCDMV antiserum, and the

Table 1. Transmission of bean curly dwarf mosaic virus (BCDMV) and bean mild mosaic virus (BMMV) by beetle species native to Turrialba, Costa Rica

Beetle species	Virus	
	BCDMV	BMMV
Cerotoma ruficornis subsp. *rogersi*	24/31[a]	5/25
Diabrotica balteata	10/31	2/26
Diabrotica adelpha	6/26	0/27
Paranapiacaba waterhousei	7/29	0/27
Gynandrobrotica variabilis	9/32	8/31

[a] Number of beetles that transmitted virus/number of beetles tested.

other reacted only with BMMV antiserum.

Beetles of the species *Cerotoma ruficornis* (Oliv.) subsp. *rogersi* Jac., *Diabrotica balteata* Lec., *D. adelpha* Har., *Paranapiacaba waterhousei* Jac., and *Gynandrobrotica variabilis* Jac., were collected from various wild and cultivated plants. For virus acquisition, beetles were confined in 15-ml test tubes with foam rubber stoppers and allowed to feed for 1–2 days on infected trifoliolate leaves from CATIE 1 bean plants that had been inoculated 13–14 days earlier. Beetles were then caged for 1–2 days on screenhouse-grown CATIE 1 bean plants in the primary leaf stage. Wire mesh cylinders with half Petri plates taped to the tops were used as cages during transmission feeding.

Two weeks after transmission feedings, sap from each plant in the trial was reacted with appropriate antisera in agar double-diffusion tests.

RESULTS AND DISCUSSION

C. ruficornis subsp. *rogersi, D. balteata, D. adelpha, P. waterhousei,* and *G. variabilis* transmitted BCDMV, while *C. ruficornis, D. balteata,* and *G. variabilis* transmitted BMMV (Table 1).

BCDMV and BMMV may be assumed to be widely distributed in Central America, because both viruses have been found in two countries, El Salvador and Costa Rica. Apparently, beetle species capable of transmitting the viruses in the Turrialba area are not scarce—at least five can transmit BCDMV and at least three can transmit BMMV. This is the first report of *P. waterhousei* as a virus vector.

LITERATURE CITED

1. Meiners, J. P., Waterworth, H. E., Lawson, R. H., and Smith, F. F. 1977. Curly dwarf mosaic disease of beans from El Salvador. Phytopathology 67:163-168.
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