

## BIOASSAYS TO DIAGNOSE SELECTED BEAN POTYVIRUSES

J. W. Shail Jr., A. G. Taylor and R. Provvidenti

Department of Horticultural Sciences and Plant Pathology, New York State Agricultural Experiment Station, Cornell University, Geneva, New York, USA 14456

A hot and dry growing season revealed many virus symptoms in commercial snap bean fields in upstate New York in 2005. Dr. Rosario Provvidenti suspected three potyviruses, Bean Yellow Mosaic Virus (BYMV), Clover Yellow Vein Virus (CYVV) and Watermelon Mosaic Virus (WMV) in field samples of 'Hystyle' snap bean in Geneva, New York. Unfortunately, common immunosorbent assays (ELISA) are not able to resolve specific potyviruses, and bioassays have not been reported to make distinctions between these three potyviruses. This report highlights the development of practical bioassays using specific indicator plants for diagnosing the potyviruses: BYMV, CYVV and WMV in the bean virus complex.

Pure cultures of each virus were obtained from the following sources:

BYMV – Richard Larsen USDA-ARS, Prosser WA

CYVV – Rosario Provvidenti collection, Geneva, NY

WMV- Rosario Provvidenti collection, Geneva, NY

The purity of these isolates was confirmed by RT-PCR at the New York State Agricultural Experiment Station (P. Griffiths, unpublished).

The bean genotypes used in this study as indicator plants consistently show distinct responses to virus infection under greenhouse conditions. A list of genotypes is provided below:

**BT-1 and BT-2:** Selections from a dry bean cultivar, Black Turtle were developed as diagnostic genotypes for WMV (Provvidenti, 1983). The original Black Turtle stock is referred to as BT-1 and the selection is BT-2. BT-1 carries a single dominant gene, *Hsw*, that confers resistance to WMV, while BT-2 is susceptible showing systemic yellow mottling and stunted growth.

**B-21:** Dry bean genotype developed by Provvidenti et al. (1989) that carries the *By-2* gene that confers resistance to BYMV. It is highly susceptible to CYVV infection showing apical necrosis and later death.

**Black Knight:** A dry bean variety developed from the Cornell breeding line CU M90 (Scully et al., 1991). It is highly resistant to CYVV and susceptible to BYMV with systemic yellow mosaic and stunting.

**SP 17B:** White seeded bean carrying resistance to BYMV and CYVV (Scully et al., 1995). Plants show a compact habit of growth and less vigor compared to other genotypes.

**GN-1140 and USWK-6:** White-seeded genotypes (GN-1140: seeds supplied by B. Scully and USWK-6: developed by P. Miklas et al, 2002) with slightly taller plant habits than other genotypes in this study. Both genotypes are resistant to CYVV and susceptible to BYMV infection with systemic yellow mosaic. They have the same responses as Black Knight with respect to BYMV and CYVV. USWK-6 carries the *bc-3* gene.

**Clipper:** A Navy bean developed in Ottawa, Ontario, Canada, supplied by Provvidenti. Highly resistant to CYVV and highly susceptible to BYMV with strong leaf mosaic and stunting. Clipper and Black Knight have similar responses to CYVV and BYMV.

Bioassay protocols for diagnosis of BYMV, CYVV and WMV. All protocols include inoculating plant extracts onto the first true leaves of the indicator bean plants.

**BYMV** - If BYMV is present, Black Knight is susceptible with stunted growth and yellow leaves, while B-21 is resistant.

**CYVV** - If CYVV is present B-21 is susceptible with the virus killing the growing point and later the whole plant dies. In contrast Black Knight is resistant. In the event that both CYVV and BYMV are present, then SP-17B is resistant to both viruses.

**WMV** - If WMV is present BT-2 is susceptible with stunted plants and chlorotic leaves, in contrast BT-1 is highly resistant.

Index of Genotype Responses to Viral Infections

Diagnostic Plant	BYMV	CYVV	WMV
BT-1	S <sub>M</sub>	S <sub>N</sub>	R
BT-2	S <sub>M</sub>	S <sub>N</sub>	S <sub>N</sub>
B-21	R	S <sub>N</sub>	R
Black Knight	S <sub>M</sub>	R	NT
SP 17B	R	R	R

R= Resistant with no symptoms; SM = susceptible with systemic mosaic or mottling; SN = Susceptible with leaf distortion and apical necrosis; NT = not tested

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