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Occurrence of Strain NL-8 of Bean Common Mosaic Virus in Western New York

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Until a few decades ago, bean common mosaic virus (BCMV) was one of the most prevalent and often destructive agents affecting the bean crop of New York State. The widespread use of certified seed and resistant cultivars have almost eliminated this threat from commercial fields. Occasionally, however, some certified seed lots may bring unusual strains or pathotypes of the virus, causing unexpected losses.

In 1982, several fields of the cultivar Sanilac were severely affected by a viral disease which significantly reduced the yield and quality of their seed crop. These fields were located in two separate areas of Western New York, but they had been planted with seed from the same commercial lot produced in Michigan. The causal agent of the disease was identified as BCMV by electron microscopy and host range. Using the international standard set of bean differentials (2) and enzyme-linked immunosorbent assay (ELISA) with antisera to specific strains of BCMV (4), the new isolate of BCMV (NY82-20) was further characterized as the NL-8 strain. This strain was first found in The Netherlands a few years ago (1) and appears to be the only member of Group III of BCMV (3). To our knowledge, this is the first known occurrence of NL-8 in the United States.

Attempts to detect NL-8 in more than a thousand plants of Sanilac deriving from the same seed lot used for field plantings were unsuccessful. Thus, either the rate of seed transmission was exceedingly low, or some other bean cultivar growing in the same areas was the source of the virus. The search of NL-8 strain in seed of other commercial cultivars is continuing. However, seed transmission of NL-8 in Sanilac and Black Turtle 2 (a selection of Black Turtle Soup) was easily demonstrated by testing the progeny of plants that had been experimentally inoculated under greenhouse conditions. Virus transmission ranged from 55% in seed of Sanilac to 41% in those of Black Turtle 2. Plants of these lines reacted with a prominent foliar mosaic. An unusual reddish-brown streak also developed on most pods of Sanilac, whereas those of Black Turtle 2 exhibited only a green mottle.

NL-8 can be classified as one of the 'temperature-independent necrosis-inducing' strains of BCMV (3), and incites a lethal hypersensitive necrotic reaction in some lines possessing the I1 gene. In order to determine the reaction of other bean cultivars, plants of 71 lines were tested with isolate NY82-20. Sixteen to 20 plants of each line were mechanically inoculated at the primary leaf stage and maintained in an insect-free greenhouse at 25 C.

Resistant cultivar: Amanda, Astro, Avalanche, Barbuni, Bush Blue Lake 47, Bush Blue Lake 109, Cacahuate, California Light Red Kidney, Canario 107, Checkmate, Cherokee Wax, Corbett Refuges, Early Gallatin, Earliwax, Eastern Butterwax, Gaelic, Gold Rush Wax, Gold Crop Wax, Great Northern 31, Great Northern 123, Great Northern 1140, Idagreen, Imuna, Jubila, Lake Shasta, Moon Gold Wax, Monroe, Pencil Pod Wax, Pencil Pod Black Wax, Pinto 114, Provider, Puregold Wax, Red Mexican 35, Redkote, Redcloud, Redlands Greenleaf B, Redlands Greenleaf C, Roma, Seneca BL6, Slimgreen, Spartan Arrow, Sprite, Sunrise Wax, Tenderette, Topcrop, Topnotch Golden Wax, VC-1009, VC-1575, VC-1913, and White Kidney. In plants of these lines, viral infection was confined to the inoculated leaves, which responded with chlorotic or necrotic spots, or some veinal chlorosis. However, the virus failed to invade the rest of the plant systemically.

Susceptible cultivars: Antigua, Arriaga, Black Turtle 2, Jamapa, Dubbele Witte, Michelite 62, Pinto 111, Pioneer, Red Mexican 34, Sanilac, Stringless Green Refugee, and Sutter Pink. Plants of this group developed systemic symptoms characteristically associated with BCMV infection.

Hypersensitive cultivars: Aurora, Black Turtle 1, Bush Blue Lake 94, Kentucky Wonder Wax, Midnight, Pico, Widusa, Sataya, and VC-1820. Plants of these cultivars developed necrotic local lesions and veinal necrosis on inoculated leaves followed by apical and stem necrosis and death.

It is encouraging that 72% of the cultivars tested were resistant to NL-8 strain, but still a significant number (28%) were severely infected. The finding of 'alien' strains of BCMV in New York and in Michigan signify that they are filtering into this country faster than anticipated. Consequently, it seems advisable to reassess our approach to breeding for BCMV resistance.

References

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