

RESPONSE OF BGMV AND BGYMV RESISTANT COMMON BEAN TO BEET CURLY TOP VIRUS

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INTRODUCTION

Beet curly top virus (BCTV, a leafhopper-vectored *Curtovirus*) and closely related species are endemic to the northwestern USA. Crop losses can be severe when susceptible large-seeded Andean dry and green bean cultivars are planted early in dry areas surrounded by abandoned or wastelands full of weeds or near semi-arid rangeland. Plant dwarfing, leaf puckering and chlorosis, and lack of pod production may result on plants infected at the seedling stage. Small and medium seeded Middle American cultivars, in general, are more tolerant.

There are five distinct *Curtovirus* species in the USA most of which can infect common bean. The ubiquitous presence of resistance in most great northern, pink, pinto, and red Mexican cultivars grown in the western USA may derive from the landraces California Pink and Common Red Mexican (see Miklas, 2000). ‘Burtner’ is also known to have contributed curly top resistance to green bean cultivars. A SCAR marker for the dominant gene, *Bct*, conferring resistance to BCTV, was generated and mapped to chromosome 4 (Larsen and Miklas, 2004). However, the marker is only useful for large-seeded Andean bean breeding.

Symptoms similar to BCTV may also be produced by *Bean dwarf mosaic virus* (BDMV, a whitefly transmitted geminivirus), *Bean golden mosaic virus* (BGMV, a whitefly transmitted geminivirus), and *Bean golden yellow mosaic virus* (BGYMV, a whitefly transmitted geminivirus). BDMV and BGMV occur in Argentina, Bolivia, and Brazil, whereas BGYMV is found in tropical and subtropical Central America, coastal Mexico, the Caribbean, and southeastern USA. Each of these viruses may also cause severe yield losses in susceptible cultivars in favorable conditions. Our objective was to determine the response to BCTV of selected common bean genotypes with resistance to BDMV, BGMV, and BGYMV.

MATERIALS AND METHODS

Sixty-five dry and green bean genotypes of diverse origin were planted in a farmer’s field near Kimberly, Idaho in 2007. A randomized complete block design with two replicates was used. Each plot consisted of 1 m long spaced 0.56 m apart. An average of 20 seeds was planted in each plot. Viruliferous leafhoppers (*Circulifer tenellus* Baker) reared on susceptible sugar beet plants were released in the nursery approximately three weeks after emergence. Data on plot basis were recorded five weeks after infestation and verified at fully developed pod stage (R8). A 1 to 5 disease rating scale was used, where 1= healthy plants with no visible disease symptoms, 2=moderately resistant, 3=moderately susceptible, 4=susceptible, and 5=highly susceptible.

RESULTS AND DISCUSSION

Of 65 dry and green bean genotypes cranberry Capri and UI 51 were highly susceptible and G 5686 and Dragone were susceptible (Table 1). Beluga, Lassen, USWA 64, Morales (with *bgm-1*), PR0247-49, Royal Red, Yakima, and Hooter were moderately susceptible. The moderately resistant group included A 195, Common Pinto, Common Red Mexican, GMR 2, G 122, Kimberly, PR 9771-3-2, Sawtooth, Tio Canela 75, UI 686, USWA 68, and Idelight. Dry bean genotypes A 429 (with *bgm-1*), DOR 390, DOR 500, and G 2402 (synonymous with

Garrapato which is the original source of *bgm-1*) did not exhibit any symptoms of BCTV. In general, breeding lines and cultivars with known resistance to BGMV and BGYMV (except Morales) were either resistant or moderately resistant to BCTV. In 2008, our intention is to repeat the experiment to verify the results obtained thus far. Nonetheless, based on our past experience and published literature it may be concluded that the race Durango cultivars and landraces are sources of genes that impart resistance to most viruses attacking common bean including BCMV and BCMNV (e.g., UI 31, UI 34, UI 35, UI 59), BCTV (e.g., California Pink, Common Red Mexican), BYMV (e.g., UI 31, UI 59), and BDMV, BGMV, and BGYMV (e.g., Garrapato). Further molecular and genetics research would be required to understand the evolutionary origin of the virulence and resistance genes for these viruses.

Table 1. Reaction of some dry and green bean genotypes to sugar beet curly top virus (BCTV) evaluated using viruliferous leafhoppers at Kimberly, Idaho in 2007.

Genotype	BCTV score†	Genotype	BCTV score
A 195	2	Morales§	3
A 429‡	1	PR0247-49	3
Beluga	3	PR9771-3-2	2
Capri	5	Royal Red	3
Common Pinto‡	2	Sawtooth‡	2
Common Red Mexican‡	2	Tio Canela 75§	2
DOR 390§	1	UI 51	5
DOR 500§	1	UI 686	2
GMR 2	2	Yakima	3
G 122	2	Idelight	2
G 2402‡	1	G 5686	4
Kimberly‡	2	Hooter	3
Lassen	3	Dragone	4
USWA 64	3	USWA 68	2

†BCTV= *Beet curly top virus*. Scored on a 1 to 5 rating scale, where 1= healthy plants with no visible disease symptoms, 2=moderately resistant, 3=moderately susceptible, 4=susceptible, and 5=highly susceptible.

‡Race Durango landrace or cultivar.

§Race Mesoamerica cultivar.

REFERENCES

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