

GENETIC IMPROVEMENT OF BEANS (*PHASEOLUS VULGARIS* L.) FOR GEMINIVIRUS DISEASE RESISTANCE

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INTRODUCTION

In Arizona, biolistic inoculation of hypocotyls from germinated seed was tested as an alternative to seeding and inoculating first trifoliolates for resistance screening of begomoviruses, and the former approach was found to be more efficient. This approach, together with scarification, resolved some of the problems associated with uneven seedling height (gene gun chamber space is limited) due to asynchronous germination in some lines. Additional seed was requested from various collaborators to replace lots that did not germinate well or at all.

METHODS

Candidate cultivars of selected *Phaseolus vulgaris* L. in a core collection (Americas) were screened for geminivirus cross-resistance by inoculating seedlings with candidate viruses from phylogenetically divergent *Begomovirus* and *Curtovirus* genera: *Bean golden yellow mosaic virus* (Puerto Rico) *Bean calico mosaic virus*, *Squash leaf curl virus*, *Cotton leaf crumple virus* (CLCrV), and *Beet curly top virus* (BCTV)-Worland. All assays included 'Topcrop' and 'Red Kidney' as susceptible or tolerant/resistant controls from different centers of bean diversification. Field trials under natural BCTV pressure indicated Hystyle, Cardinal, G122, Othello, Zacatecano, Porrillo Sintetico, Moncayo, and Royal Red were highly resistant.

RESULTS AND CONCLUSIONS

The results of inoculations to date are shown below in Table 1. Nine of 15 lines experimentally inoculated with BGYMV, BCaMV, CLCrV, and SLCV exhibited a resistance response. Of those, Cardinal, Moncayo, Othello, Royal Red, DOR, T39 and UI-114 also were resistant to BCTV, indicating some extent of cross-resistance between virus genera and species in certain lines. In addition 'Red Kidney' is tolerant to *Squash leaf curl virus* (SLCV) (S) infection (perhaps also for Mesoamerican lines). Topcrop (Andean) is very susceptible to SLCV and *Squash mild leaf curl virus* (SMLCV), and this result also has been confirmed by PCR. SLCV and SMLCV are viruses from the Sonoran Desert; they and closest relatives are distributed throughout Mesoamerica and are not known to occur in South America.

Table 1. Results of geminivirus screening using biolistic inoculation for selected lines and varieties.

Line	Source	Type	Origin	Gene(s)	Geminivirus					
					BGYMV	BGMV	BCaM V	CTV	BDM V	TYLC V
A429	Beaver/Miklas	Dry	MA	bgm-1	R (PR) ¹					
Amarillo 154	AZ (Brown) ²	Dry			S (GT)		S			
BAT1215 Baja tropico	CIAT	Dry	MA	Bgp-1?	R (PR)					
Benton	Syngenta	Snap	A				S	S		S
Bolon Rojo	AZ (Brown)	Dry			S (GT)		S			
Burros Argentinos	AZ (Brown)	Dry			S (GT)		S			
Caballero	AZ (Brown)	Dry			S (GT)		S			
Cardinal	Miklas	Dry	A	Bet?			R			
Carioeca	AZ (Brown)	Dry			S (GT)		S			
Contender	?	Snap	A	?						R
Coscorron Corriente	AZ (Brown)	Dry			S (GT)		S			
DOR-364	Beaver/Miklas	Dry	MA	W12-QTL, Bgp-1?	R (PR)					
DOR-482	AZ (Brown)	Dry			R (GT)		R			
DOR-482 or 476	Beaver/Miklas/ CIAT	Dry	MA	bgm-1, W12, Bgp-	R (RP)					
Espada	Harris Moran	Snap	A				S	S		
Frijola	AZ (Brown)	Dry			S (GT)		S			
G122 (Jatu Rong)	Miklas	Dry	A	?	R (PR)			R		
G19833	CIAT/Miklas	Dry	A		S (PR)					
Genuine	Shamrock/Talo	Snap	A/MA	bgm-1	R (PR)					
Hilca	?	Snap	A							S
Hystyle	Harris Moran	Snap	A				S	S		
IAPAR 72(MD 820)	?	Dry	MA	?		R (BR)				
Monca 40	AZ (Brown)	Dry			S (GT)		S			
Moncayo	Syngenta	Snap	A	Bet parent			R	R	R	
Montcalm	Miklas	Dry	A					S (Mild) R ³		
NY6020-4	Miklas	Snap	A	?						
OjoCabraSantaRita	AZ (Brown)	Dry			S (GT)		S			
Othello	Miklas	Dry	MA	Bdm				R	R	
Porrillo Sintetico	Beaver/Miklas	Dry	MA	W12-QTL	R (PR)					
Porrillo Sintetico	AZ (Brown)	Dry			T (GT)		T			
PR9443-4	Beaver/Miklas	Dry	A	bgm-2	R (PR)					
PR9771-3-2	Beaver	Dry	MA	bgm-3, Bgp-2	R (PR)					
Primo	AZ (Brown)	Dry		Bet parent	S (GT)				S	
Primo	Syngenta	Snap					S	S		
Radical San Gil	AZ (Brown)	Dry			S (GT)					
Royal Red	Miklas	Dry	A	?	R			R	R	
SEL1309	CIAT/Miklas	Dry	MA		S (PR)					
T39	Miklas	Dry	MA	Bdm?					R	
Taylor Horticulture	Miklas	Dry	A					S		
Top Crop	?	Snap	A		S (PR)	S (BR)		S	S	
UI-114	Miklas	Dry	MA	?		S (BR)				
UI-44	Miklas	Dry	MA	Bdm?				R	R	
Venture	?	Snap	A	?						R
VR romano	AZ (Brown)	Dry			S (GT)		S			
XAN 176	Miklas	Dry	MA		S (PR)					
Zacatecano	?	Dry	MA	bgm-1?	R (PR)					