

Diversity within *Cucurbita maxima* and *C. moschata* for resistance to RNA viruses

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Introduction: Pumpkin, *Cucurbita* L. spp., is a major vegetable crop grown in almost all regions, from cool temperate to tropical. In addition, some *Cucurbita* are used as rootstocks for other cucurbit crops. Zucchini yellow mosaic virus (ZYMV), Papaya ringspot virus-W (PRSV-W), Cucumber fruit mottle mosaic virus (CFMMV), Cucumber mosaic virus (CMV), Cucumber vein yellowing virus (CVYV), and Melon necrotic spot virus (MNSV) are serious and destructive viral RNA pathogens of cucurbit crops (1,2,3). As some of the viruses are soil-borne and some pumpkins are resistant to them, such pumpkin rootstocks can protect susceptible scions. Hence, pumpkin plant introductions were surveyed for virus resistance.

Materials and methods: In this study, new diagnostic tools, both molecular and immunological, have been developed for identifying the RNA viruses infecting cucurbits. Israeli isolates of PRSV-W, CMV, CVYV and MNSV were sequenced, cloned, and the sequences were compared to other described isolates. In addition, a Real-Time PCR (Q-RT PCR) assay was calibrated to detect ZYMV, PRSV-W and CFMMV. Nine *Cucurbita maxima* Duchesne and two *C. moschata* Duchesne accessions from different geographical regions were screened for resistance and tolerance to

mechanical infection with the viruses. Together with symptom screening, we measured the accumulated virus level in different accessions through RNA-hybridization and Q-RT PCR.

Results and Discussion: The severities of symptoms were evaluated on a scale from 0 to 5 (Table 1). Inoculation with the potyviruses ZYMV and PRSV-W caused leaf deformation, acute mosaic and significant damage in most of the accessions. The level of accumulated virus for most of the accessions was high, but not homogenous. Furthermore we found an S₃ inbred of *C. maxima* PI 458139 that was slightly tolerant to these two potyviruses. Plants that were inoculated with CFMMV displayed chlorotic mosaic, yellowing and developmental damage, except for two *C. maxima* accessions, 73115 and the PI 458139 S₃ inbred. In most of the accessions, plants infected with CMV showed initial chlorotic spots on the inoculated cotyledons, but no sign of systemic viral movement. No symptoms were detected in any of the accessions mechanically infected with CVYV and MNSV, which may indicate immunity.

Although most of the accessions tested were found to be susceptible to ZYMV, PRSV-W and CFMMV, all were resistant to CVYV and

MNSV. Interestingly, CMV infection was expressed as necrotic lesions on the cotyledons of plants of most accessions while systemic infection was observed in few accessions. Further efforts are expected to be focused on *C. maxima* PI 458139 because of its resistance to CFMMV and lower susceptibility to ZYMV and PRSV-W, for use in classical breeding as well as for investigating the mode of inheritance of its resistance to CFMMV.

Literature Cited

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Table 1. Severity of symptoms in eleven accessions infected with ZYMV, PRSV-W, CFMMV, CMV, CVYV, and MNSV.

<i>Cucurbita</i> sp.	IGB ^z Number	ZYMV	PRSV-W	CFMMV	CMV ^y	CVYV	MNSV
<i>C. maxima</i>	73079	4 ^x	4	4	co	0	0
<i>C. moschata</i>	59329	5	5	1	3-sy	0	0
<i>C. maxima</i>	73085	3	3	3	1	0	0
<i>C. maxima</i>	73088	3	3	3	co	0	0
<i>C. maxima</i>	59319	3	3	2	co	0	0
<i>C. maxima</i>	73112	3	3	3	1	0	0
<i>C. maxima</i>	73115	3	3	0	0	0	0
<i>C. maxima</i>	73081	4	4	5	1	0	0
<i>C. moschata</i>	73082	5	4	2	0	0	0
<i>C. maxima</i>	73113	4	3	4	co	0	0
<i>C. maxima</i>	PI ^w	2	2	0	co	0	0

^z IGB = Israel Gene Bank (www.agri.gov.il/Depts/GeneBank/Genebank.html)

^y co = symptoms on cotyledons only; sy = systemic infection

^x 0 = none to 5 = severe symptoms

^w PI = S₃ inbred of PI 458139