Note

SCREENING OF *Lycopersicon* sp. ACCESSIONS FOR RESISTANCE TO *Pepper yellow mosaic virus*

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ABSTRACT: The tomato is a crop of great economical importance, however it is susceptible to a large number of pests and diseases, including viral disease for which the best control strategy is genetic resistance. The disease, caused by *Pepper yellow mosaic virus* (PepYMV) has become a recent problem. Consequently, the idea of this work was to screen 376 accessions of *Lycopersicon* sp. to find possible sources of resistance to PepYMV. Out of 355 accessions of *L. esculentum* inoculated with PepYMV, 52 did not express symptoms. However, the virus reached high concentration in the tissues as measured by indirect ELISA, and therefore they were not considered as safe sources of resistance. Among 21 accessions of wild *Lycopersicon* species, one of *L. hirsutum* was shown to be resistant, with no observed symptoms. A low concentration of the virus was detected as measured by indirect ELISA. This accession seems to be suitable for breeding programs aiming at incorporating resistance for this disease into commercial tomato cultivars.
Key words: *Lycopersicon hirsutum,* genetic resources, viruses, potyvirus

IDENTIFICAÇÃO DE FONTES DE RESISTÊNCIA DE ACESSOS DE *Lycopersicon* sp. AO *Pepper yellow mosaic virus*

RESUMO: O tomateiro é uma olerícola de grande importância econômica, porém suscetível a um grande número de patógenos, dentre os quais os vírus, cuja forma de controle mais eficiente é a resistência genética. A doença causada pelo *Pepper yellow mosaic virus* (PepYMV) tem se tornado um problema recente. Por isso, o presente estudo teve por objetivo avaliar 376 acessos de *Lycopersicon* sp. visando identificar fontes de resistência ao PepYMV. Dos 355 acessos de *L. esculentum* inoculados com o PepYMV, 52 não apresentaram sintomas. No entanto, não foram considerados fonte segura de resistência por conterem alta concentração viral quando avaliados pelo teste de ELISA indireto. Dentre os 21 acessos de espécies silvestres do gênero, foi detectado um acesso de *L. hirsutum* resistente por ser assintomático. Baixa concentração do vírus foi detectada pelo teste de ELISA indireto. Este acesso pode ser indicado para programas de melhoramento visando incorporar resistência a este vírus em cultivares comerciais de tomate.
Palavras-chave: *Lycopersicon hirsutum*, recursos genéticos, virose, potyvirus

INTRODUCTION

The tomato (*Lycopersicon esculentum*) is a crop susceptible to the incidence of several diseases, including those of viral etiology, which depending on the resistance level of the cultivar, may become a yield limiting factor (Jones et al., 1991). In Brazil, the main viral diseases currently affecting tomato are caused by species from the *Tospovirus* and *Begomovirus* genera (Pozzer et al., 1996; Ribeiro et al., 2003). *Pepper yellow mosaic virus* (PepYMV, family *Potyviridae*, genus *Potyvirus*), originally described infecting pepper plants (Inoue-Nagata et al., 2002), can also infect tomato. The incidence of PepYMV in tomato crops has increased in Brazil, with recent reports of economic losses of up to 100% in the Espírito Santo State (Maciel-Zambolim et al., 2004; Ávila et al., 2004).

The *Potyvirus* genus constitutes the largest genus of plant viruses, containing approximately 20% of the described species (Fauquet et al., 2005). Viral

particles are long flexuous rods, measuring 680 to 900 nm in length and 11 to 13 nm in diameter, with a genome composed of a single positive-sense ssRNA molecule with approximately 10,000 nucleotides (Fauquet et al., 2005). Potyviruses are transmitted by several species of aphids in a noncirculative manner, in which the virus is confined to the insect's mouth apparatus and both virus acquisition and transmission by the vector occur in a matter of seconds. Moreover, there is very little specificity between virus and vector species. As a result, chemical control of the insect vector is ineffective for disease control.

The disease caused on tomato by PepYMV can be quite severe, inducing yellow mosaic, leaf distortion, stunting and yield reduction (Maciel-Zambolim et al., 2004). The identification of sources of resistance to this emerging viral disease could avoid heavy losses in the future. Therefore, the objective of this study was to screen for sources of resistance to PepYMV in accessions of *Lycopersicon* sp. from the Vegetable Crops Germplasma Bank of the Federal University of Viçosa (BGH-UFV).

MATERIAL AND METHODS

For the identification of sources of resistance to PepYMV, 376 accessions of *Lycopersicon* sp. from the BGH-UFV were screened: 355 of *L. esculentum* and 21 accessions of wild species of this genus.

The experiments were performed under greenhouse conditions in Viçosa, MG, (latitude 20°45'14" S, longitude 42º52'53"W and an altitude of 650 m) during 2004, in a randomized block experimental design with five replications. Plants were grown individually in one-liter plastic pots. A total of 1880 plants were evaluated, and each plant of each accession was considered as an experimental unit.

Plants of *Nicotiana debneyi*, infected with PepYMV isolate 3, were used as inoculum source. The viral isolate was obtained from pepper plants collected in a production field located at Igarapé, Minas Gerais (Truta et al., 2004). Inoculum was prepared by grinding *N. debneyi* leaves in 0.05 M potassium phosphate buffer pH 7.2, containing 0.01% Na_2SO_3. The inoculation consisted of rubbing this extract on leaves of 15 days-old tomato plants that had been previously dusted with 600 mesh carborundum. Plants were inoculated three times at 24 hour intervals to ensure infection and avoid escapes. As a control, one carborundum-dusted plant of each accession was mock-inoculated with buffer.

Plants were scored visually for symptoms of PepYMV infection until 30 days after the first inoculation (dafi). Plants without obvious symptoms were evaluated by indirect ELISA (I-ELISA; Clark et al., 1986) using a polyclonal antiserum raised against PepYMV isolate 3 (Truta et al., 2004). Two or three newly emerged (non- inoculated) leaves of the tested plants were collected for I-ELISA. Samples of mock-inoculated tomato and of PepYMV-infected *N. debneyi* plants were used as negative and positive controls, respectively. After the enzymatic reaction, color intensity (405 nm) was measured on a Titertek Multiskan Plus MK II reader. Absorbance values greater than twice the average of the negative control were considered as positive readings, indicating the presence of replicating virus.

In a second experiment, plants from accessions that displayed resistance to virus infection in this first experiment were inoculated and evaluated for a longer period of time (60 dafi) and with 15 replications per accession, using the same procedures described previously for inoculation and assessment of virus infection.

RESULTS AND DISCUSSION

Out of the 355 accessions of *L. eculentum* inoculated with PepYMV, 52 did not display any symptoms at 30 dafi. However, the detection via I-ELISA indicated the presence of virus in latent infection in all of the 52 accessions. Consequently, these should not be considered as good sources of resistance. These accessions (52) were: BGH 24, 55, 83, 121, 184, 224, 225, 227, 406, 468, 813, 1497, 1499, 1532, 1538, 1990, 2032, 2049, 2074, 2086, 2087, 2110, 2144, 2206, 2247, 2251, 2280, 2345, 2420, 2447, 3318, 3405, 3477, 3484-3486, 3488, 3493, 3494, 3505, 3507, 3508, 6843, 6844, 6860, 6861, 6868, 6870, 6874, 6877, 6878, 6889.

The wild accessions evaluated belonged to the *L. hirsutum, L. peruvianum, L. cheesmani* and *L pimpinelifolium* species. Out of the 21 tested accessions, 12 did not display visual symptoms and presented negative results in I-ELISA (Table 1). In the second experiment, an accession of *L. hirsutum* (BGH 6902) was selected as a good source of resistance, since the absorbance value measured by I-ELISA was equivalent to that of the mock-inoculated plant used as a negative control.

CONCLUSION

Out of 355 accessions of *Lycopersicon esculentum* from UFV's Vegetable Crops Germplasm Bank evaluated, any one was considered to be resistant to PepYMV. From the 12 wild resistant accessions, only the *L. hirsutum* (BGH 6902) was consid-

Table 1- The wild accessions evaluated by I-ELISA as resistant (R) or susceptible (S), 30 days after the first inoculation with PepYMV.

Accession	Species	I-ELISA	Evaluation
BGH 6837	*Lycopersicon* sp.	-	R
BGH 6845	*Lycopersicon* sp.	-	R
BGH 6876	*Lycopersicon* sp.	-	R
BGH 6881	*Lycopersicon* sp.	-	R
BGH 6882	*Lycopersicon* sp.	-	R
BGH 6883	*Lycopersicon* sp.	+	S
BGH 6884	*Lycopersicon* sp.	+	S
BGH 6895	*Lycopersicon* sp.	-	R
BGH 6896	*Lycopersicon* sp.	-	R
BGH 6899	*L.esculentum* v. *cerasiforme*	+	S
BGH 6900	*L.esculentum* v. *cerasiforme*	+	S
BGH 6901	*L. hirsutum*	-	R
BGH 6902	*L. hirsutum*	-	R
BGH 6903	*L. peruvianum*	+	S
BGH 6904	*L. peruvianum*	-	R
BGH 6905	*L. peruvianum*	+	S
BGH 6906	*L. peruvianum*	+	S
BGH 6908	*L. cheesmani*	-	R
BGH 6909	*L. pimpinelifolium*	+	S
BGH 6910	*L. pimpinelifolium*	-	R
BGH 6937	*L.esculentum* v. *cerasiforme*	+	S

ered a good source of resistance to PepYMV. From this result it is necessary to check out the heritage of resistance of the BGH 6902 to PepYMV, in order to determine the best improvement method for the incorporation of resistance in elite cultivars of tomato.

REFERENCES

ÁVILA, A.C.; IONUE-NAGATA, A.K.; COSTA. H.; BOITEUX, L.S.; NEVES, L.O.Q.; PRATES, R.S.; BERTINI, L.A. Ocorrência de viroses em tomate e pimentão na região serrana do estado do Espírito Santo. **Horticultura Brasileira**, v.22, p.655-658, 2004.

CLARK, M.F.; LISTER, R.M.; BAR-JOSEPH, M. ELISA techniques. **Methods in Enzymology**, v.118, p.742-766, 1986.

FAUQUET, C.M.; MAYO, M.A.; MANILOFF, J.; DESSELBERGER, U.; BALL, L.A. (Ed.) **Virus taxonomy**. San Diego: Elsevier Academic Press, 2005. 1259p. (Report of the International Committee on Taxonomy of Viruses, 8).

INOUE-NAGATA, A.K.; FONSECA, M.E.N.; RESENDE, R.O.; BOITEUX, L.S.; MONTE, D.C.; DUSI, A.N.; ÁVILA, A.C.; VAN DER VLUGT, R.A.A. Pepper yellow mosaic virus, a new potyvirus in sweetpepper, Capsicum annuum. **Archives of Virology**, v.147, p.849-855, 2002.

JONES, J.B.; JONES, J.P.; STALL, R.E.; ZITTER, T.A. (Ed.) Compendium of Tomato Diseases. St. Paul: The American Phytopathological Society, 1991. 73p.

MACIEL-ZAMBOLIM, E.; CAPUCHO, H.C.A.S.; ÁVILA, A.C.; IONUE-NAGATA, A.K.; KITAJIMA, E.W. Surto epidemiológico do vírus do mosaico amarelo do pimentão em tomateiro na região serrana do Espírito Santo. **Fitopatologia Brasileira,** v.29, p.325-327, 2004.

POZZER, L.; RESENDE, R.O.; LIMA, M.I.; KITAJIMA, E.W.; GIORDANO, L.B.; AVILA, A.C. Tospovirus, uma visão atualizada. **Revisão Anual de Patologia de Plantas**, v.4, p.95-148, 1996.

RIBEIRO, S.G.; AMBROZEVICIUS, L.P.; ÁVILA, A.C.; BEZERRA, I.C.; CALEGARIO, R.F.; FERNANDES, J.J.; LIMA, M.F.; MELLO, R.N.; ROCHA, H.; ZERBINI, F.M. Distribution and genetic diversity of tomato-infecting begomoviruses in Brazil. **Archives of Virology**, v.148, p.281-295, 2003.

TRUTA, A.A.C.; SOUZA, A.R.R.; NASCIMENTO, A.V.S.; PEREIRA, R.C.; PINTO, C.M.F.; BROMMONSCHENKEL, S.H.; CARVALHO, M.G.; ZERBINI, F.M. Identidade e propriedades de isolados de potyvírus provenientes de *Capsicum* spp. **Fitopatologia Brasileira**, v.29, p.160-168, 2004.

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