



ORIGINAL ARTICLE

GENETIC VARIATION AMONG SOME ISOLATES OF *TOMATO YELLOW LEAF CURL VIRUS* AND ITS CONTROL USING SOME BIOLOGICAL CONTROL FUNGI AND NANOPARTICLES

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Abstract: Tomato is an important vegetable crop due to increased production and consumption all over the world. Numerous viruses attack tomato plants but *Tomato yellow leaf curl virus* (TYLCV) is one of the serious concerns under the open and protected cultivations. In the present study, we collected leaf samples from TYLCV infected plants grown in some farms located in the desert regions of Najaf and Karbala provinces in Iraq. We diagnosed 16 disease-inducing viral isolates using the polymerase chain reaction and the degenerate coat protein (CP) primer pair was used to determine the nucleotide sequence of the amplified PCR product. BLAST results revealed that all identified isolates belong to TYLCV. Among the identified TYLCV isolates, it was evident that the highest differences in the CP nucleotide sequences were found in the TYLCV isolates 7 and 13 ranging between 97%-99%. Whiteflies-mediated inoculation of tomato plants (Super Marmande and Moneymaker) with the isolates 7 and 13 separately induced different symptoms in severity and the time of symptoms appearance. Biological control agents *i.e.* *Trichoderma asperellum*, *Trichoderma longibrachiatum*, and *Trichoderma asperlloides* were mixed with soil. Plants grown in soil infested with the fungi *T. asperlloides* and *T. asperellum* did not show typical symptoms of TYLCV infection and the absence of the virus was confirmed by PCR. Whereas, all plants grown in soil infested with the fungus *T. longibrachiatum* exhibited TYLCV infection but with fewer symptoms compared with the more severe symptoms noticed in the control treatment. Moreover, application of the nanoparticles notably silver nitrate (AgNO₃), magnesium oxide (MgO), and iron oxide (Fe₂O₃) in 1200, 1400, 1600, 1800, 2000, and 2200 ppm concentrations did not prevent infection of TYLCV, but it was noted that there was a significant reduction in the displayed symptoms and silver nitrate (AgNO₃) nanoparticles were the most effective in preventing the symptoms compared with the other nanoparticles.

Key words: Tomato yellow leaf curl virus, CP, Tomato, Nanoparticles, *Trichoderma* spp.

Cite this article

Aqeel N. AL-Abedy, Kareem A. Al-Shujairi, Intissar Al-Salami, Muhammad Ashfaq and Balqees H. AL-Musawi (2021). Genetic Variation among some Isolates of *Tomato Yellow Leaf Curl Virus* and its Control using some Biological Control Fungi and Nanoparticles. *International Journal of Agricultural and Statistical Sciences*. DocID: <https://connectjournals.com/03899.2021.17.229>