



College of Food and Agriculture Sciences

Department of Plant Protection

College: College of Food and Agriculture Sciences

Department: Department of Plant Protection

Major: Virology – Plant Pathology

Title of thesis: Distribution of *Tomato Brown Rugose Fruit Virus*

(ToBRFV) affecting tomato crop in Riyadh Region, Saudi Arabia

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Abstract

Tomato (*Solanum lycopersicum*L.) is the most economically important member of the family *Solanaceae*, cultivated worldwide and one of the most important crops in Saudi Arabia. Driven by symptoms observation, the aim of this study was screening symptomatic tomato plants in Riyadh region, Saudi Arabia for the presence of *Tomato brown rugose fruit virus* (ToBRFV). In January 2021, unusual fruit and leaf symptoms were observed in several greenhouses commercially cultivating tomatoes in Riyadh Region. Fruit symptoms included irregular brown spots, deformation, and yellow spots which render the fruits non-marketable, while the leaf symptoms included mottling, mosaic with dark green wrinkles, narrowing and deformation. A total of 145 symptomatic tomato leaves and fruits were collected during the growing seasons (2021-2022) and tested serologically against suspected important tomato viruses including: *Tomato chlorosis virus* (ToCV), *Tomato spotted wilt virus* (TSWV), *Tomato yellow leaf curl virus* (TYLCV), *Tomato chlorotic spot virus* (TCSV), *Tomato aspermy virus* (TAV), *Tomato bushy stunt virus* (TBSV), *Tomato black ring virus* (TBRV), *Tomato ringspot virus* (TRSV), *Tomato mosaic virus* (ToMV), *Pepino mosaic virus* (PeMV) and *Tomato brown rugose fruit virus* (ToBRFV) using Enzyme linked immunosorbent assay (ELISA). The results also showed that 77.24% (112/145) of symptomatic tomato samples were positive against at least one of the ELISA-tested viruses. The obtained results showed that 52.41% (76/145) of symptomatic tomato samples were positive to ToBRFV, 12 out of 76 samples (6.85%) were singly infected, however 64 out of 145 (44.13%) had mixed infection between ToBRFV and at least with one of the the tested viruses.

A sample with a single infection of ToBRFV was selected and mechanically inoculated to five replicates of the following plant species: *S. lycopersicum*, *Chenopodium amaranticolor*, *Nicotiana tabacum*, and *Datura stramonium*. Fourteen days post inoculation, the expressed symptoms were recorded, and the presence of ToBRFV was confirmed by reverse transcription-polymerase chain reaction (RT-PCR) and partial nucleotide sequencing. The host range experiments showed that 16 out of 19 tested plant species were positive to ToBRFV using ELISA and RT-PCR. Plants of *Citrullus lanatus*, *Cucumis melo*, *C. sativus* were asymptomatic and gave negative results to ELISA and RT-PCR. ToBRFV caused latent infection on *S. melongena* and *S. tuberosum* plants. A total RNA was extracted from 17 samples which were positive to ELISA and RT-PCR was carried out using specific primers F-3666 and R-4718 which amplified a fragment of 1052 bp. RT-PCR products were sequenced in both directions and partial nucleotide sequences were obtained from selected samples were submitted to GenBank under the following accession numbers: MZ130501, MZ130502, and MZ130503. BLAST analysis of Saudi Arabian isolates of ToBRFV showed that the sequence shared nucleotide identities ranged between 99 % to 99.50 % among them and 98.9-99.9 % identity with ToBRFV isolates.

Greenhouse experiment was carried out to evaluate the responses of thirteen commercially tomato cultivars to the mechanical inoculation with the Saudi isolate of ToBRFV (Accession no. MZ130503). The thirteen tomato cultivars showed a wide range of symptoms including: mosaic, mottling, leaf deformations, leaf narrowing, leaf rolling, blistering and shoestring. Disease severity index (DSI) of the tested cultivars ranged between 52% to 96%.

