

Technical manual no.1

Tomato Curly Stunt Begomovirus



A new Pathogen of tomatoes

IN

South Africa



DEPARTMENT: AGRICULTURE
REPUBLIC OF SOUTH AFRICA

2003

Published by Department of Agriculture
Directorate Agricultural Information
Services
Private Bag X144, Pretoria, 0001
South Africa

Introduction

1

The tomato is an important vegetable crop. Commonly grown by subsistence and resource poor farmers in South Africa, it is widely used as a fresh vegetable and in the form of an onion-tomato-amaranth stew to supplement the local staple diet of maize meal. As a result, it is one of the main vegetables used for hawking by small-scale entrepreneurs in the informal sector. The crop is also grown commercially and provides a large number of jobs in this country. Some 5 465 ha were planted to tomatoes in 1998 in South Africa (Anonymous 1999), creating a direct employment opportunity for 16 395 people.

A new virus disease of tomato is cause for concern. Currently, it is confined to the areas of Onderberg in Mpumalanga, and Pongola and Nkwalini in KwaZulu-Natal, and Trichardtsdal, Limpopo. but it is of importance to tomato production in South Africa, in general. Although its symptoms look like those of tomato yellow leaf curl disease, this disease is caused by a new, so-called Begomovirus, namely tomato curly stunt virus (ToCSV) (Pietersen 1999, unpublished), which differs significantly from any previously detected virus of this genus, worldwide. It is related to tomato yellow leaf curl virus-Israel (TYLCV-Is), East African cassava mosaic virus (EACMV) from Malawi, and South African cassava mosaic virus, but is distinct from them all.

Distribution and damage

During 1997, Dr P. Grobblaar of Hygrotech reported the disease in the Onderberg region of Mpumalanga an important tomato-producing area south of the Kruger National Park as suspected tomato yellow leaf curl virus. In 1998 the Plant Protection Research Institute of the Agricultural Research Council (ARC-PPRI) investigated the occurrence of this disease in the Onderberg. Some 141 ha under tomatoes spread throughout the area were assessed. In the Strydomblok area, the incidence of infected plants was between 1 and 50 %.

Yield losses on individual plants ranged from negligible to 100 %, and appeared to relate to the age of the plant at the time of infection. The disease was found as far as Tonetti and Malelane. In March 2000, the virus was identified in tomato plants from Pongola, in Northern KwaZulu-Natal. The disease occurred at an incidence of 100 % in a 1,5 ha block of six-week old tomato plants, and an estimated 30 % incidence in a second, slightly older block of tomatoes. By June 2001, the disease was also present at high incidences at Nkwalini, KwaZulu-Natal. In June 2002, the disease was noted at Trichardtsdal, Limpopo. All tomato-production areas in South Africa are now considered potentially at risk of infection by this disease.

Symptoms

2

Infected plants show the symptoms of typical TYLCV-like (tomato yellow leaf curly virus) disease. The upper leaves of the plants become yellow and reduced in size with curling margins and progressively stunted internodes. No fruit is borne in affected tissue.



FIGURE1: Artificially inoculated tomato plant, showing the start of typical symptoms of ToCSV infection. Note the yellowing, cupping of margins, and reduction of size of young leaves and the general stunting of the plant.



FIGURE 2: Stunted, ToCSV-infected tomato plants, Nkwalini, KwaZulu-Natal, 2001.



FIGURE 3: Tomato field 100 % infected with ToCSV. Nkwalini, KwaZulu-Natal, 2001.

Transmission of the disease

The Virology Unit of the ARC-PPRI, has shown that the disease could be transmitted to healthy tomato plants by both field-collected and laboratory-reared whiteflies identified as *Bemisia tabaci* Biotype B.

It is extremely important that tomato producers and seedling nurserymen be aware of the disease, especially in affected areas, as they could inadvertently spread it to unaffected areas by means of infected seedlings or whiteflies carrying the virus. It is unlikely, but not impossible, that whiteflies will be spread by the fruit itself.

Host range

A large number of crops are known hosts of the whitefly vector, but only thorn apple (*Datura stramonium*), tobacco, tomato, and dry-bean cultivars are known to be hosts to the virus.

Disease management

In view of the close relationship between the South African ToCSV and the tomato Yellow Leaf Curly virus (TYLCV), it is likely that they share a number of biological properties, and that control strategies useful for TYLCV may also work for the ToCSV. This, however, cannot just be assumed, and must be tested prior to implementation. Very little research has been done on controlling the disease and currently there are no pesticides registered for chemical control of the disease. However, a number of disease- control strategies for this virus are currently being assessed. These include avoidance of peak activities of the vector, changes in cultural practices such as the control of between-season, alternate hosts, in addition to identification of resistance sources and the production of transgenic plants containing resistant genes from wild species.

Field and glasshouse trials have been performed in order to assess whether cultivars developed in Israel, Spain and The Netherlands, tolerant to TYLCV, are also tolerant to ToCSV. A fairly good correlation exists, with most TYLCV tolerant cultivars showing tolerance to ToCSV.

Further information and advice about this pathogen can be obtained from:

Directorate Plant Health

Division Plant Health Promotion

Private Bag X258

PRETORIA

South Africa

0001

Tel.: South Africa (012) 319 6293/6091

Fax: South Africa (012) 319 6055

or

ARC - PPRI

Plant Pathology & Microbiology Division

Private Bag X134

PRETORIA

South Africa

0001

Tel.: South Africa (012) 808 8000

Fax: South Africa (012) 808 8299

Sources of information:

- Anonymous 1999. *Tomato Producers Organization Industry Report*, 1999.
- Cohen, S. & Antignus, Y. 1994. *Tomato yellow leaf curl virus, a whitefly-borne geminivirus of tomatoes..* Advances in Disease Vector Research 10:259–288.
- Czosnek, H. Navot, N. & Laterrot, H. 1990. *Geographical distribution of tomato yellow leaf curl virus. A first survey using a specific DNA probe.* Phytopathol. Medit. 29:1–6.
- Gonzalez, G. & S. Valdes. 1995. *Virus del encrespamiento Amarillo de las hojas del tomate (TYLCV) en Cuba.* CEIBA (Honduras) 36:103.
- McGlashan, D. J.E. Polston, J.E. & Bois. D. 1994. *Tomato yellow leaf curl geminivirus in Jamaica.* Plant Disease, 78:1219.
- Louro, D. Noris, E. F. Veratti, F. & Accotto, G.P. 1996. *First report of tomato yellow leaf curl virus in Portugal.* Plant Disease, 80:1079.

- Nakhla, M.K., Maxwell, D.P., Maritnez, R.T., Carvalho, M.G. and Gilbertson, R.L. 1994. *Occurrence of the eastern Mediterranean strain of tomato yellow leaf curl geminivirus in the Dominican Republic*. *Phytopathology*, 84:1072.
- Nakhla, M.K. & Maxwell, D.P. 1998. *Epidemiology and management of tomato yellow leaf curl disease*. In *Plant Virus Disease Control*, edited by Hadidi, A. R., Khetarpal, K. & Koganezawa, H. APS Press, St. Paul, Minnesota, 565–583.