

# EPPO Datasheet: *Begomovirus coheni*

Last updated: 2024-05-15

## IDENTITY

**Preferred name:** *Begomovirus coheni*

**Taxonomic position:** Viruses and viroids: Monodnaviria:  
Shotokuvirae: Cressdnaviricota: Repensiviricetes: Geplafuvirales:  
Geminiviridae

**Other scientific names:** TYLCV, *Tomato leaf curl Oman virus*,  
*Tomato leaf curl begomovirus*, *Tomato leaf curl geminivirus*,  
*Tomato yellow leaf curl Gezira virus*, *Tomato yellow leaf curl*  
*begomovirus*, *Tomato yellow leaf curl bigeminivirus*, *Tomato yellow*  
*leaf curl geminivirus*, *Tomato yellow leaf curl virus*

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**EPPO Categorization:** A2 list

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**EU Categorization:** RNQP (Annex IV)

**EPPO Code:** TYLCV0



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## Notes on taxonomy and nomenclature

The acronym TYLCV is often used to design distinct species of the genus *Begomovirus*, which all together cause similar yellow leaf curl symptoms on tomato. The species *Tomato yellow leaf curl virus* (TYLCV) is the most widespread. The present EPPO datasheet concerns only this species.

## HOSTS

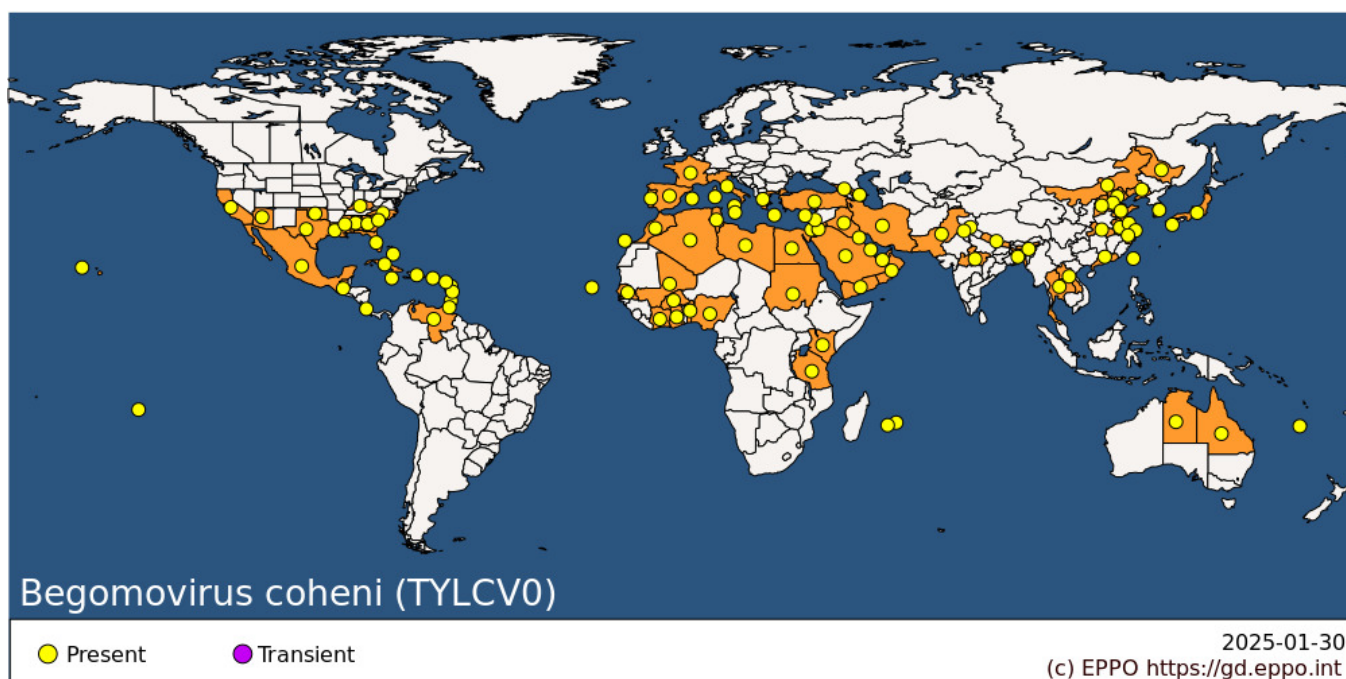
The main host of TYLCV is tomato (*Solanum lycopersicum*). Common bean (*Phaseolus vulgaris*), pepper (*Capsicum annuum*) and tobacco (*Nicotiana tabacum*) are the most frequently cultivated hosts that are naturally infected. At least 79 species in more than 20 different families have been reported to be hosts of TYLCV, in natural conditions or from experimental tests (Cohen *et al.*, 1966, Papayiannis *et al.*, 2011; Ying *et al.*, 2000).

**Host list:** *Acalypha australis*, *Acalypha virginica*, *Agastache rugosa*, *Amaranthus graecizans*, *Amaranthus retroflexus*, *Amaranthus viridis*, *Asteriscus aquaticus*, *Baliospermum solanifolium*, *Begonia sp.*, *Calendula arvensis*, *Capsicum annuum*, *Capsicum frutescens*, *Carica papaya*, *Chenopodium murale*, *Chrozophora tinctoria*, *Citrullus lanatus*, *Convolvulus arvensis*, *Convolvulus humilis*, *Convolvulus sp.*, *Cucumis sativus*, *Cucurbita pepo*, *Cuscuta sp.*, *Cyamopsis tetragonoloba*, *Cynanchum acutum*, *Datura innoxia*, *Datura stramonium*, *Dittrichia viscosa*, *Erigeron bonariensis*, *Erigeron sumatrensis*, *Erodium ciconium*, *Erodium cicutarium*, *Euphorbia heterophylla* var. *cyathophora*, *Euphorbia pulcherrima*, *Eustoma russellianum*, *Glebionis coronaria*, *Glebionis segetum*, *Hirschfeldia incana*, *Lamium amplexicaule*, *Macroptilium lathyroides*, *Malva multiflora*, *Malva neglecta*, *Malva nicaeensis*, *Malva parviflora*, *Malva sylvestris*, *Malvastrum coromandelianum*, *Mercurialis annua* subsp. *ambigua*, *Mikania micrantha*, *Nicotiana tabacum*, *Passiflora edulis*, *Phaseolus vulgaris*, *Physalis ixocarpa*, *Plantago lagopus*, *Plantago major*, *Raphanus raphanistrum*, *Raphanus sativus*, *Scandix pecten-veneris*, *Scorpiurus muricatus*, *Sinapis alba*, *Sinapis arvensis*, *Solanum elaeagnifolium*, *Solanum lycopersicum*, *Solanum melongena*, *Solanum nigrum*, *Solanum villosum*, *Sonchus asper*, *Sonchus oleraceus*, *Sonchus tenerrimus*, *Urospermum picroides*, *Vicia faba*, *Vigna unguiculata*, *Viola prionantha*

## GEOGRAPHICAL DISTRIBUTION

TYLCV is an Old World begomovirus, first described in the Middle East in the 1960s. It remained of limited geographical distribution, until the B biotype of its vector *B. tabaci* (now Middle East-Asia Minor 1 (MEAM1)) started to spread dramatically through the EPPO region in the 1980s (Czosnek *et al.*, 1990) and then to other regions

of the world. The spread of *B. tabaci*, particularly MEAM1 and MED (Mediterranean) species, was accompanied in the New World by the emergence of numerous begomoviruses of Solanaceae (e.g. tomato mottle bigeminivirus; EPPO/CABI, 1996b) and the spread of TYLCV to North America and the Caribbean region from 1994.



**EPPO Region:** Algeria, Azerbaijan, Cyprus, France (mainland), Georgia, Greece (mainland, Kriti), Israel, Italy (mainland, Sardegna, Sicilia), Jordan, Malta, Morocco, Portugal (mainland), Spain (mainland, Islas Baleares, Islas Canarias), Tunisia, Türkiye

**Africa:** Algeria, Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Egypt, Ghana, Kenya, Libya, Mali, Mauritius, Morocco, Nigeria, Reunion, Senegal, Sudan, Tanzania, Tunisia

**Asia:** Bahrain, Bangladesh, China (Anhui, Beijing, Guangdong, Hebei, Heilongjiang, Hubei, Jiangsu, Liaoning, Neimenggu, Shandong, Shanghai, Shanxi, Zhejiang), India (Assam, Himachal Pradesh, Madhya Pradesh, Punjab), Iran, Iraq, Israel, Japan (Honshu, Kyushu), Jordan, Korea, Republic, Kuwait, Laos, Lebanon, Nepal, Oman, Pakistan, Saudi Arabia, Taiwan, Thailand, United Arab Emirates, Yemen

**North America:** Mexico, United States of America (Alabama, Arizona, California, Florida, Georgia, Hawaii, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Texas)

**Central America and Caribbean:** Bahamas, Costa Rica, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Guatemala, Jamaica, Martinique, Puerto Rico, St Kitts-Nevis, Trinidad and Tobago

**South America:** Venezuela

**Oceania:** Australia (Northern Territory, Queensland), French Polynesia, New Caledonia

## BIOLOGY

Tomato yellow leaf curl begomovirus is transmitted by different species belonging to the *Bemisia tabaci* complex (EPPO/CABI, 1996a) in a circulative and persistent manner (McGrath & Harrison, 1995). The two invasive vector species of this complex, MEAM1 and MED, previously known as the B and Q biotypes, are efficient vectors of TYLCV (Sánchez-Campos, 1999).

Minimum acquisition and inoculation feeding periods range from 15 to 30 min, depending on the viral isolates (Cohen & Nitzany, 1966; Czosnek *et al.*, 2002, Ioannou, 1985; Mansour & Al-Musa, 1992). The latent period inside the insect is 8-24h following acquisition (Cohen *et al.*, 1966, Czosnek *et al.*, 2002). TYLCV can persist in the vector for all its life following acquisition. Transovarial transmission of the virus has been demonstrated for MEAM1 and MED whiteflies (Wei *et al.*, 2017). The replication of TYLCV in the whitefly vector was also demonstrated (He *et al.*, 2020).

In the plant, the virus is restricted to the phloem tissue and induces cytological changes. For details on these changes,

see Channarayappa *et al.*, 1992. Symptoms appear from 12 to 15 days after inoculation (Ber *et al.*, 1990).

There are strain variations in TYLCV. *Tomato yellow leaf curl virus* regroups 6 different strains (TYLCV-IL, TYLCV-Mld, TYLCV-Ge, TYLCV-Bou, TYLCV-Ker and TYLCV-Iran). TYLCV-IL and TYLCV-Mld are the most widespread strains. Given the propensity for recombination among begomovirus genomes, recombinant genomes have emerged, particularly in the Mediterranean region where TYLCV and Tomato yellow leaf curl Sardinia virus (TYLCSV) co-infect tomatoes. Thus, Tomato yellow leaf curl Axarquia virus (TYLCAxV), TYLCV isolates TYLCV-IS176 and TYLCV-IS141 are recombinants between TYLCV-IL and TYLCSV (Belabess *et al.*, 2015; García-Andrés *et al.*, 2006; Panno *et al.*, 2018). Tomato yellow leaf curl Malaga virus (TYLCMalV) is a recombinant between TYLCV-Mld and TYLCSV (Monci *et al.*, 2002).

## DETECTION AND IDENTIFICATION

### Symptoms

Tomato plants infected at an early stage are severely stunted; their terminal and axillary shoots are erect, and their leaflets are reduced in size and abnormally shaped. Leaves that develop soon after infection are cupped downward, whereas leaves developing later are prominently chlorotic and deformed, with leaf margins rolled upwards and curling between the veins. The effect on fruits depends on the age of the plant when infected. If infected early, plants lose vigour and stop producing marketable fruits. When infections occur at a later stage of development, additional fruits fail to set, but fruits already present ripen in a nearly normal manner. No flower symptoms are observed but flower drop is common.

Symptoms of thickening, epinasty, crumpling, and reduction of leaf size have been described on bean (Navas-Castillo *et al.*, 1999). However, some cultivars were found to be resistant (Lapidot *et al.*, 2002). Symptoms also vary between peppers from mild to yellowing, leaf curling, cupping, twisting, and mottling. Many other host species are asymptomatic.

### Morphology

TYLCV has geminate particles that are isometric and approximately 20 nm in diameter (Channarayappa *et al.*, 1992). The genome is composed of a single-stranded circular DNA (Czosnek *et al.*, 1988). The length of the DNA is in all cases about 2800 nucleotides. The DNA of several strains has been sequenced (Antignus & Cohen, 1994; Noris *et al.*, 1994).

### Detection and inspection methods

The disease may be difficult to identify due to the great variation in symptoms, particularly on species other than tomatoes. *Ty-1*-resistant tomato cultivars replicate the virus at low level and remain asymptomatic, but constitute a reservoir for other susceptible crops. The emergence of TYLCV recombinants can also make it difficult to detect the virus using certain molecular tests. Polymerase chain reaction with specific or degenerated primer pairs, followed by partial DNA sequence analysis is the most common method used for the detection and identification of TYLCV (EPPO, 2022). Certain serological tests, such as ELISA can be used for the detection of a number of begomoviruses but they are not specific at the species level. Other tests that can be used for the detection and/or identification of begomoviruses are described in PM 7/152 (EPPO, 2022).

## PATHWAYS FOR MOVEMENT

In nature, TYLCV is transmitted only by the vector *Bemisia tabaci*, which can spread it between fields and glasshouses in infested areas. Transport of young plant seedlings between national or international production areas for transplanting constitute a pathway, if they were infected very early. Grafting also allows contamination of plants. Tomato fruits were shown to carry TYLCV which may then be transmitted by whiteflies (Just *et al.*, 2014; Delatte *et al.*, 2003). Based on two molecular studies, TYLCV is not considered to be seed-transmitted (Rosa Dias *et al.*, 2017; Perez Padilla *et al.*, 2020), although seed transmission was reported in previous studies (Kil *et al.*, 2016, Kil *et al.*, 2017 and Kil *et al.*, 2018). There is a certain risk of movement via *B. tabaci* to other host plants (e.g. ornamentals), given the fact that the vector moves readily from one host to another and that begomoviruses are known to persist in

the vector for all its life after acquisition. Moreover, thanks to the ability of whiteflies to transmit TYLCV transovarially, TYLCV can be spread by *B. tabaci* emerging from viruliferous eggs to healthy plants in the field, even if the eggs were laid on non-host plants for the virus (Wei *et al.*, 2017).

## PEST SIGNIFICANCE

### Economic impact

The vector *Bemisia tabaci*, and especially the MED and MEAM1 species (previously called biotypes Q and B), is now very widely distributed throughout the world (EPPO/CABI, 1996a). TYLCV causes major damage affecting tomato production in many tropical and subtropical countries. Field cropping of tomato in the coastal plains of Lebanon stopped because of TYLCV (Abou-Jawdah & Shebaro, 1993). Yield losses reached 80% according to Mazyad *et al.* (1979). Whenever TYLCV is introduced into a new country where the vector is already present, it rapidly spreads throughout commercial tomato crops.

### Control

Chemical control of the vector *B. tabaci* is difficult because of the resistance of whiteflies to most of the relevant pesticides, and the problem of residues on vegetable crops. Biological control agent against whiteflies were tested but their slow action and limited shelf life make them less effective than chemicals (Faria & Wraight, 2001). Different formulations of predatory insects and entomopathogenic fungi have been developed to control *Bemisia tabaci* but they must be present in relatively high numbers in the crop to be effective against this vector (Down *et al.*, 2009). Cultural control measures include the choice of planting dates in order to avoid periods of high whitefly populations, the use of screens to exclude the vector, the elimination of virus sources, and the use of healthy transplants. Six resistance genes (Ty-1 to 6) have been identified (Yan *et al.*, 2018) but *Ty-1* is virtually the only gene introduced in the commercial cultivars deployed in the Mediterranean Basin. This gene reduces the virus accumulation and tomato plants are asymptomatic. However, the strong selection pressure exerted by *Ty-1*-cultivars has led to the emergence of recombinant viruses in the Mediterranean Basin (Belabess *et al.*, 2016, García-Andrés *et al.*, 2009, Urbino *et al.*, 2020, 2022). Transgenic tomato plants with the capsid protein of TYLCV are resistant to the virus (Kunik *et al.*, 1994). In addition to preventative measures and the use of resistant varieties, the concept of Integrated Pest Management (IPM), consisting of the use of different practices to control whiteflies and reduce virus sources, is the most successful strategy to control TYLCV (Horowitz & Antignus, 2011).

### Phytosanitary risk

Establishment outdoors and spread of TYLCV are limited to regions with ecoclimatic conditions suitable for the establishment of *B. tabaci* populations. Because of the very high potential impact of TYLCD, tomato production in regions where the virus and the vector are present requires intensive crop management efforts to reduce impact. The use of *Ty-1* resistant tomato cultivars and the preventative measures adopted by growers counterbalance the negative effects of TYLCV in tomato crops, in most production areas, although constituting a selective environment for the emergence of resistance-breaking variants.

If the virus is introduced into a country where *B. tabaci* is established, the likelihood of serious crop damage and economic losses is high. For areas/countries where *B. tabaci* cannot establish outside due to the climate, the significance of TYLCV is low in outdoor crops but outbreaks can nevertheless occur under protected cultivation conditions.

## PHYTOSANITARY MEASURES

Phytosanitary measures to prevent introduction from one country to another within the EPPO region may be difficult to apply because TYLCV and *B. tabaci* are already widely distributed. If TYLCV is introduced into a country, or if outbreaks occur because of particular climatic conditions the only possibilities for avoiding serious damage would be to encourage careful monitoring of the situation within the country and the use of preventative measures by the growers. Plants for planting were considered a significant pathway for tomato plants grown under protected conditions in northern countries and management measures to ensure the freedom of tomato plants for planting were

proposed (see EPPO, 2018).

## REFERENCES

- Abou-Jawdah Y & Shebaro WA (1993) Situation of TYLCV in Lebanon. *Tomato Leaf Curl Newsletter* **4**, 2-3.
- Antignus Y & Cohen S (1994) Complete nucleotide sequence of an infectious clone of a mild isolate of tomato yellow leaf curl virus (TYLCV). *Phytopathology* **84**, 707-712.
- Belabess Z, Dallot S, El-Montaser S, Granier M, Majde M, Tahiri A, Blenzar A, Urbino C & Peterschmitt M (2015) Monitoring the dynamics of emergence of a non-canonical recombinant of Tomato yellow leaf curl virus and displacement of its parental viruses in tomato. *Virology* **486**, 291-306.
- Belabess Z, Peterschmitt M, Granier M, Tahiri A, Blenzar A, & Urbino C (2016) The non-canonical tomato yellow leaf curl virus recombinant that displaced its parental viruses in southern Morocco exhibits a high selective advantage in experimental conditions. *J Gen Virol.* 97(12):3433-3445.
- Ber R, Navot N, Zamir D, Antignus Y, Cohen S & Czosnek H (1990) Infection of tomato by the tomato yellow leaf curl virus: susceptibility to infection, symptom development and accumulation of viral DNA. *Archives of Virology* **112**, 169-180.
- Channarayappa, Muniyappa V, Schwegler-Berry D & Shivashankar G (1992) Ultrastructural changes in tomato infected with tomato leaf curl virus, a whitefly-transmitted geminivirus. *Canadian Journal of Botany* **70**, 1747-1753.
- Cohen S & Nitzany FE (1966) Transmission and host range of tomato yellow leaf curl virus. *Phytopathology* **56**, 1127-1131.
- Czosnek H, Ber R, Antignus Y, Cohen S, Navot N & Zamir D (1988) Isolation of tomato yellow leaf curl virus, a geminivirus. *Phytopathology* **78**, 508-512.
- Czosnek H, Navot N & Laterrot H (1990) Geographical distribution of tomato yellow leaf curl virus. A first survey using a specific DNA probe. *Phytopathologia Mediterranea* **24**, 1-6.
- Czosnek, H., Ghanim, M and Ghanim, M (2002) The circulative pathway of begomoviruses in the whitefly vector *Bemisia tabaci*— insights from studies with *Tomato yellow leaf curl virus*. *Annals of Applied Biology*, 140: 215-231.
- Delatte H, Dalmon A, Rist D, Soustrade I, Wuster G, Lett JM, Goldbach RW, Peterschmitt M, Reynaud B (2003) *Tomato yellow leaf curl virus* can be acquired and transmitted by *Bemisia tabaci* (Gennadius) from tomato fruit. *Plant Disease* **87**, 1297–300.
- Down R, Cuthbertson A, Mathers J & Walters K (2009) Dissemination of the entomopathogenic fungi, *Lecanicillium longisporum* and *L. muscarium*, by the predatory bug, *Orius laevigatus*, to provide concurrent control of *Myzus persicae*, *Frankliniella occidentalis* and *Bemisia tabaci*. *Biological Control* **50**, 172-178.
- Faria M & Wraight S (2001) Biological control of *Bemisia tabaci* with fungi. *Crop Protection* **20**, 767-778.
- EPPO/CABI (1996a) *Bemisia tabaci*. In: *Quarantine pests for Europe*. 2nd edition (Ed. by Smith IM, McNamara DG, Scott PR, Holderness M). CABI, Wallingford, UK.
- EPPO/CABI (1996b) Tomato mottle bigeminivirus. In: *Quarantine pests for Europe*. 2nd edition (Ed. by Smith IM, McNamara DG, Scott PR, Holderness M). CABI, Wallingford, UK.
- EPPO (2018) Evaluation of the Regulated non-quarantine pest (RNQP) status for Tomato yellow leaf curl virus. [available at [https://rnqp.eppo.int/recommendations/summarysheet\\_pest?pest=TYLCV0](https://rnqp.eppo.int/recommendations/summarysheet_pest?pest=TYLCV0)] [accessed on 9 April 2006]
- EPPO (2022) PM 7/152 (1) Begomoviruses. *EPPO Bulletin* **52**, 643–664.

- García-Andrés S, Monci F, Navas-Castillo J, Moriones E (2006). Begomovirus genetic diversity in the native plant reservoir *Solanum nigrum*: Evidence for the presence of a new virus species of recombinant nature. *Virology*. 350(2):433-442.
- García-Andrés S, Tomás DM, Navas-Castillo J, Moriones E (2009) Resistance-driven selection of begomoviruses associated with the tomato yellow leaf curl disease. *Virus Res.* Dec;146 (1-2):66-72.
- He YZ, Wang YM, Yin TY, Fiallo-Olivé E, Liu YQ, Hanley-Bowdoin L & Wang XW (2020) A plant DNA virus replicates in the salivary glands of its insect vector via recruitment of host DNA synthesis machinery. *Proceedings of the National Academy of Sciences*. **117**, 16928-16937.
- Horowitz A, Y Antignus & D Gerling (2011) Management of *Bemisia tabaci* Whiteflies. In: Thompson, W. (eds) The Whitefly, *Bemisia tabaci* (Homoptera: Aleyrodidae) *Interaction with Geminivirus-Infected Host Plants*. Springer, Dordrecht.
- Ioannou N (1985) Yellow leaf curl and other virus disease of tomato in Cyprus. *Plant Pathology* **34**, 428-434.
- Just K, Leke WN, Sattar MN, Luik A & Kvarnheden A (2014) Detection of *Tomato yellow leaf curl virus* in imported tomato fruit in northern Europe. *Plant Pathology* **63**, 1454-1460.
- Kil EJ, Park J, Choi EY, Byun HS, Lee KY, An CG, Lee JH, Lee GS, Choi HS, Kim CS, Kim JK & Lee S (2018) Seed transmission of Tomato yellow leaf curl virus in sweet pepper (*Capsicum annuum*). *European Journal of Plant Pathology* **150**, 759-764.
- Kil EJ, Kim S, Lee YJ, Byun HS, Park J, Seo H, Kim CS, Shim JK, Lee JH, Kim JK, Lee KY, Choi HS, Lee S (2016). Tomato yellow leaf curl virus (TYLCV-IL): a seed-transmissible geminivirus in tomatoes. *Sci Rep.*; 6:19013. doi: 10.1038/srep19013.
- Kil EJ, Park J, Choi HS, Kim CS, Lee S (2017). Seed Transmission of *Tomato yellow leaf curl virus* in White Soybean (*Glycine max*). *Plant Pathol J.* 33(4):424-428.
- Kunik T, Salomon R, Zamir D, Navot N, Zeidan M, Michelson I, Gafni Y & Czosnek H (1994) Transgenic tomato plants expressing the tomato yellow leaf curl virus capsid protein are resistant to the virus. *Bio/Technology* **12**, 500-504.
- Lapidot M (2002) Screening Common Bean (*Phaseolus vulgaris*) for Resistance to Tomato yellow leaf curl virus. *Plant Disease* **86**, 4,429-432.
- Laterrot H (1993) Present state of the genetic control of tomato yellow leaf curl virus and of the EEC-supported breeding programme. In: *Proceedings of the XIIth Eucarpia meeting on tomato genetics and breeding*, pp. 19-24. Maritsa Vegetable Crops Research Institute, Plovdiv, Bulgaria.
- Mansour A & Al-Musa A (1992) Tomato yellow leaf curl virus: host range and virus-vector relationships. *Plant Pathology* **41**, 122-125.
- Mazyad HM, Omar F, Al-Taher K & Salha M (1979) Observations on the epidemiology of tomato yellow leaf curl disease on tomato plants. *Plant Disease Reporter* **63**, 695-698.
- McGrath PF & Harrison BD (1995) Transmission of tomato leaf curl geminiviruses by *Bemisia tabaci*: effect of virus isolate and vector biotype. *Annals of Applied Biology* **126**, 307-316.
- Monci F, Sánchez-Campos S, Navas-Castillo J & Moriones E (2002) A natural recombinant between the geminiviruses Tomato yellow leaf curl Sardinia virus and Tomato yellow leaf curl virus exhibits a novel pathogenic phenotype and is becoming prevalent in Spanish populations. *Virology* **303**, 317-26.
- Navas-Castillo J, Sánchez-Campos S, Díaz JA, Sáez-Alonso E & Moriones E (1999) Tomato yellow leaf curl



virus-Is causes a novel disease of common bean and severe epidemics in tomato in Spain. *Plant Disease* **83**, 29-32.

Noris E, Hidalgo E, Accotto GP & Moriones E (1994) High similarity among the tomato yellow leaf curl virus isolates from the West Mediterranean Basin: the nucleotide sequence of an infectious clone from Spain. *Archives of Virology* **135**, 165-170.

Panno S, Caruso AG & Davino S (2018) The nucleotide sequence of a recombinant tomato yellow leaf curl virus strain frequently detected in Sicily isolated from tomato plants carrying the *Ty-1* resistance gene. *Archives of Virology* **163**, 795-797.

Papayiannis LC, Katis NI, Idris AM & Brown JK (2011) Identification of weed hosts of Tomato yellow leaf curl virus in Cyprus. *Plant Disease* **95**, 120-125.

Pérez-Padilla V, Fortes IM, Romero-Rodríguez B, Arroyo-Mateos M, Castillo AG, Moyano C,

De León L & Moriones E (2020) Revisiting Seed Transmission of the Type Strain of *Tomato yellow leaf curl virus* in Tomato Plants. *Phytopathology* **110**, 121-129.

Rosas-Díaz T, Zhang D & Lozano-Durán R (2017) No evidence of seed transmissibility of *Tomato yellow leaf curl virus* in *Nicotiana benthamiana*. *Journal of Zhejiang University Science B* **18**, 437-440.

Sánchez-Campos S, Navas-Castillo J, Camero R, Soria C, Díaz JA, Moriones E (1999) Displacement of Tomato Yellow Leaf Curl Virus (TYLCV)-Sr by TYLCV-Is in Tomato Epidemics in Spain. *Phytopathology*. 89 (11):1038-43.

Urbino C, Regragui ZF, Granier M & Peterschmitt M (2020) Fitness advantage of inter-species TYLCV recombinants induced by beneficial intra-genomic interactions rather than by specific mutations. *Virology* **542**, 20-27.

Urbino C, Jammes M, Belabess Z, Troadec E, Autechaud A, Peterschmitt M (2022) Chapter 31 - invasive tomato yellow leaf curl virus recombinants challenge virus diagnosis and disease management. In: Gaur, R.K., Sharma, P., Czosnek, H. (Eds.), *Geminivirus: Detection, Diagnosis and Management*. Academic Press, 497-511.

Wei J, He YZ, Guo Q, Guo T, Liu YQ, Zhou XP, Liu SS & Wang XW (2017) Vector development and vitellogenin determine the transovarial transmission of begomoviruses. *Proceedings of the National Academy of Sciences* **114**, 6746-6751

Yan Z, Pérez-de-Castro A, Díez MJ, Hutton SF, Visser RGF, Wolters A-MA, Bai Y and Li J (2018) Resistance to Tomato Yellow Leaf Curl Virus in Tomato Germplasm. *Front. Plant Sci.* 9:1198.

Ying Z & Davis MJ (2000) Partial characterization and host range of tomato yellow leaf curl virus in South Florida. *Proceedings of the Florida State Horticultural Society*. **113**.

## ACKNOWLEDGEMENTS

This datasheet was extensively revised in 2024 by Cica Urbino, CIRAD (FR). Her valuable contribution is gratefully acknowledged.

## How to cite this datasheet?

EPPO (2025) *Begomovirus coheni*. EPPO datasheets on pests recommended for regulation. Available online. <https://gd.eppo.int>

## Datasheet history

This datasheet was first published in 1997 in the second edition of 'Quarantine Pests for Europe', and revised in 2024. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', 'Hosts', and

'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

CABI/EPPO (1997) *Quarantine Pests for Europe (2<sup>nd</sup> edition)*. CABI, Wallingford (GB).



Co-funded by the  
European Union