

Product Information: DAS-ELISA

Tomato brown rugose fruit virus (ToBRFV)

Synonym: Tobamovirus fructirugosum

Tomato brown rugose fruit virus (ToBRFV), also known as „Jordan virus“, has been present in Israel since 2014 and was first discovered in 2015 in Jordan (1) and 2017 in Israel (2). In Europe, ToBRFV was first reported in Germany in 2018 (3). Since then, reports of infections have been accumulating across Europe but also on other continents (amongst others: Mexico, USA, China). ToBRFV belongs to the genus of *Tobamovirus* and was shown to have resistance-breaking properties against other *Tobamoviruses*, such as tobacco mosaic virus (TMV) or tomato mosaic virus (ToMV) (2). Host plants for ToBRFV mainly include tomatoes (*Solanum lycopersicum*) and peppers (*Capsicum* spp.). ToBRFV causes different symptoms in different varieties. Observed symptoms include yellow or brown, wrinkled spots on fruits, narrowing and mosaic discolorations of leaves as well as deformed or irregularly ripened fruits.

Sampling instruction

The DAS-ELISA is based on antibodies by the Leibniz Institute DSMZ GmbH, Braunschweig, Germany developed against a german ToBRV isolate and monoclonal antibodies developed against a recombinant epitope of the ToBRFV coat protein (5). The reagent is suitable for detecting ToBRFV in plant leaves, seeds and fruits. Leaf and fruit samples are homogenized 1:20 (w/v) in extraction buffer «General» (Art. No. 110120). Tomato seed samples are dry-homogenized followed by soaking at 4°C for 4 hours in extraction buffer «General» 1:20 (w/v).

Information on the antibodies

Coating IgG: polyclonal; conjugate: monoclonal

Specificity

All isolates of ToBRFV tested so far can be detected (isolates from locations in Germany (3), Netherland, Cyprus, Switzerland and Israel). The antibodies are very specific and show no cross-reactivity with all tested *Tobamoviruses*:

CGMMV (Cucumber green mottle mosaic virus)	TMV (Tobacco mosaic virus)
CMV (Cucumber mosaic virus)	TNV (Tobacco necrosis virus)
INSV (Impatiens necrotic spot virus)	ToANV (Tomato apex necrosis virus)
PaMMV (Paprika mild mottle virus)	ToMV (Tomato mosaic virus)
PMMoV (Pepper mild mottle virus)*	ToMMV (Tomato mottle mosaic virus)
PepMV (Pepino mosaic virus)	ToRSV (Tomato ringspot virus)
SHMV (Sunn-hemp mosaic virus)	TSV (Tobacco streak virus)
TBRV (Tomato black ring virus)	TSWV (Tomato spotted wilt virus)
TBSV (Tomato bushy stunt virus)	TVCV (Turnip vein clearing virus)
TMGMV (Tobacco mild green mosaic virus)	TYLCV (Tomato yellow leaf curl virus)

*Weak cross-reactivity was observed with certain PMMoV isolates in combination with *Nicotiana* spp. sample matrix

Sensitivity

The sensitivity of the ToBRFV DAS-ELISA is very high. The virus is well detected in infected plant tissue at the recommended dilution (1:20 (w/v)). The analytical sensitivity of the ToBRFV DAS-ELISA (relative) in leaves, fruits and seeds was measured by serial dilution of infected tissue as indicated in the table below:

Plant	Sample Type	Degree of infection	Analytical sensitivity	BIOREBA ToBRFV qPCR
Tomato	Leaves	Highly infected	Up to 1:3.9*10 ⁶ dilution	positive
Tomato	Fruit	infected	Up to 1:3.1*10 ⁴ dilution	positive
Tomato	Seeds	100%	Up to 1:1.9*10 ⁷ dilution	positive
Tomato	Seeds	40%	Up to 1:3.9*10 ⁶ dilution	positive
Tomato	Seeds	10%	Up to 1:1.5*10 ⁵ dilution	positive
Tomato	Seeds	1%	Up to 1:1.2*10 ³ dilution	positive
Tomato	Seeds	0.1%	Up to 1:2.5*10 ² dilution	positive

References

- (1) Salem N., Mansour A., Ciuffo M., Falk B., Turina M. 2016. A new tobamovirus infecting tomato crops in Jordan. Arch Virol. 161(2):503–6.
- (2) Luria, N., Smith, E., Reingold, V., Bekelman, I., Lapidot, M., Levin, I., Elad, N., Tam, Y., Sela, N., Abu-Ras, A. and Ezra, N., 2017. A new Israeli Tobamovirus isolate infects tomato plants harboring Tm-22 resistance genes. PloS one, 12(1), p.e0170429.
- (3) Menzel W., Knierim D., Winter S., Hamacher J., Heupel M. 2019. First report of tomato brown rugose fruit virus infecting tomato in Germany. New Disease Reports 39:1.
- (4) Clark, M.F., and Adams, A.N. 1977. Characteristics of method of enzyme-linked immunosorbent assay for the detection of plant viruses. J. gen. Virol. 34:475-483.
- (5) Bernabé-Orts, J.M., Torre, C., Méndez-López, E., Hernando, Y. and Aranda, M. 2021. New Resources for the Specific and Sensitive Detection of the Emerging Tomato Brown Rugose Fruit Virus. Viruses 35:1680

Ordering Information

BIOREBA offers the following formats:

Individual ELISA reagents for 100, 500 or 1000 assays: IgG and/or conjugate for the working volume of 200 µl/test/well.

Reagent sets for 480 or 960 assays: IgG and conjugate, positive and negative controls, and microtiter plates (F-96) for a working volume of 200 µl/test/well.

Complete kits for 96, 480 or 960 assays: All reagents, controls, microtiter plates (F-96), buffers, and substrate necessary for a working volume of 200 µl/test/well.

ELISA buffers, equipment for sample preparation and disposables are also available.

For all Art. No. please refer to our product catalogue or our homepage www.bioreba.com and for prices and further information on any other product from BIORÉBA, please contact your local distributor or our office in Switzerland.