EPPO Datasheet: *Orthotospovirus impatiensnecromaculae*

Last updated: 2022-09-19

IDENTITY

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Preferred name: *Orthotospovirus impatiensnecromaculae*
Taxonomic position: Viruses and viroids: Riboviria: Orthornavirae: Negarnaviricota: Polyploviricotina: Bunyaviricetes: Elliovirales: Tospoviridae
Other scientific names: *INSV*, *Impatiens necrotic spot orthotospovirus*, *Impatiens necrotic spot tospovirus*, *Impatiens necrotic spot virus*
Common names: necrotic spot of impatiens
[view more common names online...](#)
EPPO Categorization: A2 list
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EU Categorization: RNQP (Annex IV)
EPPO Code: INSV00

Notes on taxonomy and nomenclature

The virus strains previously constituting serogroup III of tomato spotted wilt tospovirus (TSWV) were subsequently distinguished as the separate species INSV (de Avila *et al*., 1992; Vaira *et al*. 1993). In 1995, INSV was assigned to the genus *Tospovirus*, which was later renamed *Orthotospovirus* (family *Tospoviridae*, order Bunyavirales; **[ICTV online](#)**; Abudurexiti *et al*., 2019). Species demarcation within the genus is based on nucleoprotein (N) sequence (new species are defined as having less than 90% amino acid sequence similarity to all other described species within the genus); in addition, species are often biologically distinguished by their host range and vector specificity (Plyusnin *et al*., 2011; Kormelink *et al*., 2021).

HOSTS

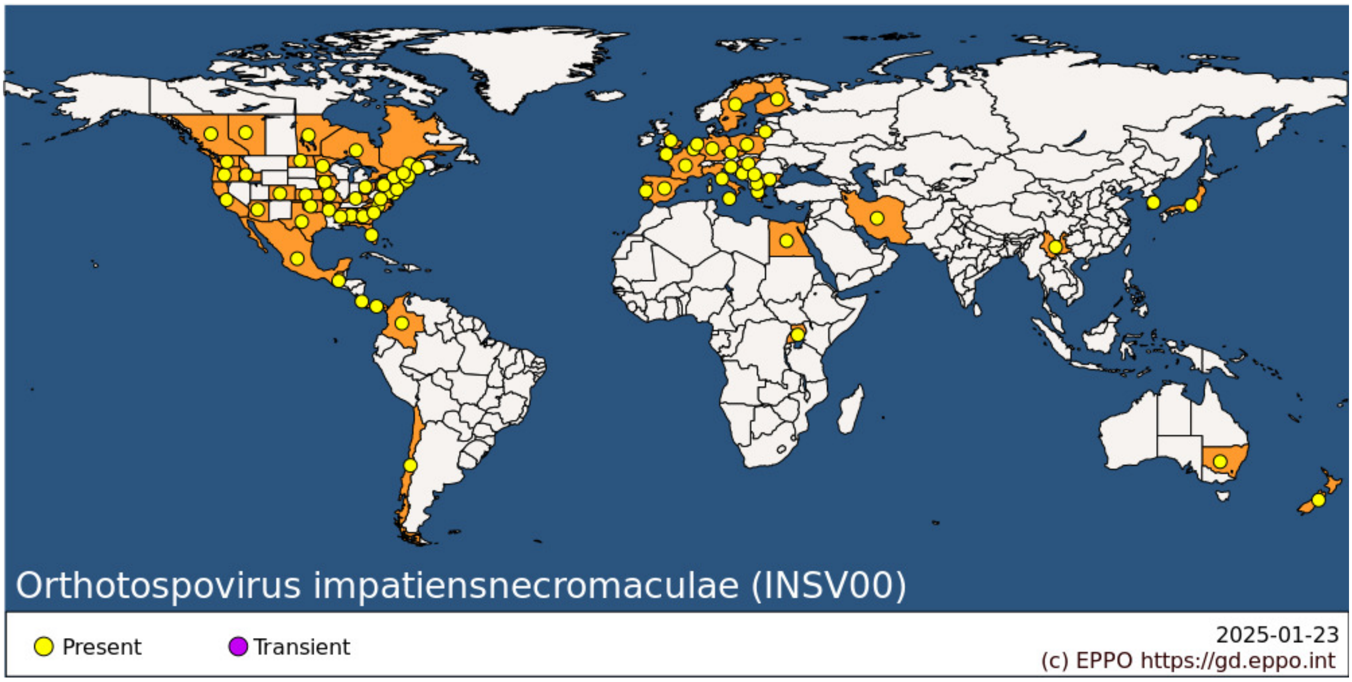
INSV has been reported to infect more than 300 plant species belonging to 85 different dicotyledonous and monocotyledonous families (Lebas & Ochoa-Corona, 2007).The main hosts of INSV are ornamentals such as *Aconitum*, *Alstroemeria*, *Anemone*, *Antirrhinum*, *Begonia*, *Bouvardia*, *Calceolaria*, *Callistephus*, *Chrysanthemum (Dendranthema* x *grandiflorum), Cineraria*, *Columnea*, *Cyclamen persicum*, *Dahlia*, *Dianthus*, *Dracaena*, *Eustoma russellianum* (synonym *Eustoma grandiflorum*), *Exacum affine*, *Ficus*, *Freesia*, *Gardenia*, *Gentiana*, *Gerbera*, *Gladiolus*, *Impatiens*, *Iris*, *Kalanchoe*, *Limonium*, *Lobelia*, *Pelargonium*, *Pericallis cruenta* (synonym *Senecio cruentus*), *Petunia*, *Phalaenopsis*, *Pittosporum*, *Primula*, *Ranunculus*, *Sinningia speciosa* (synonym *Gloxinia speciosa*), *Spathiphyllum*, *Tulipa*, *Verbena*, *Zantedeschia aethiopica*, *Zinnia*. INSV is the first virus to be recorded from a fern (the glasshouse ornamental *Asplenium nidus-avis*). Vegetable hosts include *Allium cepa*, *A. porrum*, *A. sativum*, *Capsicum annuum*, *Cucumis sativus*, *Lactuca sativa*, *Ocimum basilicum* and *Solanum lycopersicum*. It has also been shown to infect potatoes (*Solanum tuberosum*) and tobacco (*Nicotiana tabacum*). Weed species such as *Cardamine scutata*, *Stellaria media* and *Cerastium glomeratum* can be important reservoirs for INSV (Okuda *et al*., 2010).

Host list: *Abelia x grandiflora*, *Acanthospermum hispidum*, *Aconitum sp.*, *Adenium obesum*, *Aeschynanthus sp.*, *Ageratum houstonianum*, *Agrostemma githago*, *Allium cepa*, *Allium cernuum*, *Allium cristophii*, *Allium lusitanicum*, *Allium moly*, *Allium oleraceum*, *Allium oreophilum*, *Allium porrum*, *Allium rotundum*, *Allium sativum*, *Allium scorodoprasum*, *Allium sphaerocephalon*, *Allium tuberosum*, *Allium zebdanense*, *Alstroemeria aurea*, *Alstroemeria sp.*, *Althaea sp.*, *Amaryllis sp.*, *Anemone coronaria*, *Anemone sp.*, *Anthemis sp.*, *Anthriscus cerefolium*, *Anthurium andraeanum*, *Anthurium scherzerianum*, *Anthurium sp.*, *Antirrhinum majus*, *Antirrhinum sp.*, *Aphelandra sp.*, *Arabidopsis sp.*, *Arachis hypogaea*, *Ardisia sp.*, *Asparagus densiflorus*, *Asplenium nidus*, *Begonia cucullata*, *Begonia leathermaniae*, *Begonia peltata*, *Begonia semperflorens hybrids*, *Begonia sp.*, *Begonia tuberhybrida hybrids* , *Begonia x hiemalis*, *Bougainvillea sp.*, *Bougainvillea spectabilis*, *Bouvardia sp.*, *Browallia sp.*, *Browallia speciosa*, *Calceolaria herbeohybrida hybrids*

, *Calceolaria sp.*, *Calendula sp.*, *Callistephus sp.*, *Calycanthus floridus*, *Canna x generalis*, *Capsicum annuum*, *Cardamine hirsuta*, *Cardamine scutata*, *Cerastium glomeratum*, *Chenopodium album*, *Chrysanthemum sp.*, *Chrysanthemum x morifolium*, *Cichorium intybus*, *Cineraria sp.*, *Cissus sp.*, *Clarkia amoena subsp. lindleyi*, *Clivia sp.*, *Codiaeum variegatum*, *Coleus scutellarioides*, *Columnea sp.*, *Cordyline fruticosa*, *Cucumis sativus*, *Curcuma longa*, *Curcuma sp.*, *Cycas sp.*, *Cyclamen persicum*, *Cyclamen sp.*, *Cyperus esculentus*, *Cyperus rotundus*, *Cyrtomium falcatum*, *Dahlia sp.*, *Datura innoxia*, *Datura stramonium*, *Delphinium sp.*, *Dendrobium sp.*, *Desmodium tortuosum*, *Dianthus caryophyllus*, *Dianthus chinensis*, *Dianthus sp.*, *Diascia rigescens*, *Diascia sp.*, *Dieffenbachia seguine*, *Digitalis sp.*, *Dischidia sp.*, *Dracaena fragrans*, *Dracaena sp.*, *Echeveria sp.*, *Epipremnum pinnatum*, *Episcia cupreata*, *Erica sp.*, *Erigeron canadensis*, *Eruca vesicaria subsp. sativa*, *Erysimum x cheiri*, *Eupatorium capillifolium*, *Euphorbia seguieriana*, *Eustoma russellianum*, *Eustoma sp.*, *Exacum affine*, *Fatsia sp.*, *Ficaria verna*, *Ficus benjamina*, *Ficus elastica*, *Franklinia alatamaha*, *Freesia refracta*, *Freesia sp.*, *Gardenia jasminoides*, *Gazania sp.*, *Gentiana macrophylla*, *Gentiana sp.*, *Geranium carolinianum*, *Geranium sp.*, *Gerbera jamesonii*, *Gerbera sp.*, *Gladiolus sp.*, *Gladiolus x gandavensis*, *Gnaphalium sp.*, *Gomphrena globosa*, *Halesia carolina*, *Hedera helix*, *Helianthus annuus*, *Helichrysum sp.*, *Heptapleurum actinophyllum*, *Hibiscus rosa-sinensis*, *Hippeastrum hybrids*, *Hippeastrum sp.*, *Hosta sp.*, *Hoya carnosa*, *Hoya sp.*, *Hoya wayetii*, *Hydrangea quercifolia*, *Hydrangea sp.*, *Hymenocallis littoralis*, *Ilex glabra*, *Impatiens New Guinea hybrids*, *Impatiens hawkeri*, *Impatiens sp.*, *Impatiens walleriana*, *Ipomoea tricolor*, *Iris pumila*, *Iris x hollandica*, *Isotoma axillaris*, *Jacquemontia tamnifolia*, *Kalanchoe blossfeldiana*, *Kalanchoe farinacea*, *Kalanchoe sp.*, *Kalanchoe thyrsiflora*, *Kohleria sp.*, *Lactuca sativa*, *Lavandula sp.*, *Leucanthemum sp.*, *Limonium sinuatum*, *Limonium sp.*, *Lobelia erinus*, *Lobelia sp.*, *Lysimachia congestiflora*, *Maranta leuconeura*, *Matricaria chamomilla*, *Mollugo verticillata*, *Monarda didyma*, *Nemesia strumosa*, *Nepenthes x coccinea*, *Nicotiana benthamiana*, *Nicotiana tabacum*, *Ocimum basilicum*, *Oncidium sp.*, *Opuntia microdasys*, *Osteospermum sp.*, *Oxydendrum arboreum*, *Pelargonium peltatum*, *Pelargonium radens*, *Pelargonium sp.*, *Pelargonium x hortorum*, *Penstemon sp.*, *Peperomia obtusifolia*, *Peperomia rotundifolia*, *Pericallis cruenta*, *Pericallis x hybrida*, *Petunia hybrids*, *Petunia sp.*, *Phalaenopsis amabilis*, *Phalaenopsis hybrids*, *Philodendron sp.*, *Phlox sp.*, *Photinia x fraseri*, *Physalis ixocarpa*, *Pilea cadierei*, *Pittosporum sp.*, *Plantago asiatica*, *Platycodon grandiflorus*, *Portulaca grandiflora*, *Portulaca oleracea*, *Primula obconica*, *Primula sp.*, *Ranunculus asiaticus*, *Ranunculus sp.*, *Raphanus raphanistrum*, *Rhaphiolepis indica*, *Richardia scabra*, *Rosa sp.*, *Rubus sp.*, *Rubus*, *Ruscus sp.*, *Salvia sp.*, *Salvia splendens*, *Saxifraga stolonifera*, *Schefflera sp.*, *Schizanthus sp.*, *Schizanthus x wisetonensis*, *Scindapsus sp.*, *Sinningia sp.*, *Sinningia speciosa*, *Solanum brevicaule*, *Solanum lycopersicum*, *Solanum mochiquense*, *Solanum muricatum*, *Solanum tuberosum*, *Sonchus oleraceus*, *Spathiphyllum sp.*, *Spinacia oleracea*, *Stachys floridana*, *Stellaria media*, *Stephanotis sp.*, *Streptocarpus ionanthus*, *Streptocarpus sp.*, *Syngonium podophyllum*, *Torenia fournieri*, *Trachelium sp.*, *Tradescantia albiflora*, *Tripleurospermum maritimum*, *Tulbaghia violacea*, *Tulipa sp.*, *Verbena hybrids*, *Verbena rigida*, *Verbena sp.*, *Viola sp.*, *Wahlenbergia marginata*, *Zantedeschia aethiopica*, *Zantedeschia albomaculata*, *Zantedeschia odorata*, *Zantedeschia sp.*, *Zingiber sp.*, *Zinnia elegans*, *Zinnia sp.*

GEOGRAPHICAL DISTRIBUTION

INSV was first isolated from *Impatiens* sp. in North America in 1989 (described as TSWV-Impatiens strain; Law & Moyer, 1990; Law et al., 1991). Since then, INSV has been detected in many countries worldwide, including several countries in the EPPO region.



EPPO Region: Belgium, Bosnia and Herzegovina, Bulgaria, Czech Republic, Finland, France (mainland), Germany, Greece (mainland), Guernsey, Hungary, Italy (mainland, Sicilia), Lithuania, Netherlands, North Macedonia, Poland, Portugal (mainland), Serbia, Slovenia, Spain (mainland), Sweden, United Kingdom (England)
Africa: Egypt, Uganda
Asia: China (Yunnan), Iran, Japan (Honshu), Korea, Republic
North America: Canada (Alberta, British Columbia, Manitoba, Ontario, Québec), Mexico, United States of America (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Texas, Vermont, Virginia, Washington)
Central America and Caribbean: Costa Rica, Guatemala, Panama
South America: Chile, Colombia
Oceania: Australia (New South Wales), New Zealand

BIOLOGY

INSV exhibits some genetic diversity, but epidemiological studies indicated no evidence of host specificity among INSV isolates and demonstrated that isolates introduced via different routes can be circulating within the same areas (Kuo *et al.,* 2014, Nekoduka *et al*., 2015; Adegbola *et al.,* 2019).

Orthotospovirus particles are transmitted and spread in natural conditions by thrips - insects of the genera *Frankliniella* and *Thrips* (family Thripidae). Thrips species known to transmit INSV are *Frankliniella fusca*, *F. occidentalis* and *F. intonsa* (Naidu *et al*., 2001; Sakurai *et al*., 2004; Jones, 2005; Rotenberg & Whitfield, 2018). In the EPPO region, *F. occidentalis and F. intonsa* are widely distributed (EFSA, 2012b). Both thrips species are very polyphagous. Orthotospoviruses are transmitted by thrips in a persistent manner. Only individuals which have acquired the virus at the larval stages can transmit it. Virus transmission occurs after a latent period of circulation and multiplication of the virus in the thrips vector. Once acquired, the virus is transmitted transstadially and thrips remain infectious for life, however there is no evidence of transovarial transmission (Wijkamp & Peters, 1993; Jones, 2005; Rotenberg & Whitfield, 2018).

Orthotospoviruses are also transmitted mechanically by wounding, a process that is only of experimental significance (EFSA, 2012b). Like all viruses, orthotospoviruses are disseminated with infected plant tissues used for vegetative propagation hence all plants infected with orthotospoviruses contribute to virus spread when cuttings are used for vegetative propagation (EFSA, 2012b). Although orthotospoviruses are considered not to be seed-transmitted (Pappu *et al.*, 2009), an as yet unconfirmed first report of seed transmission of an orthotospovirus (soybean vein necrosis virus) has been published by Groves *et al.* (2016).

DETECTION AND IDENTIFICATION

Symptoms

INSV can cause a variety of symptoms that may vary in the same host species depending on the variety and age as well as the nutritional and environmental conditions of the plant. Symptoms of INSV infection also vary depending on the developmental stage of the plant at the time of inoculation and on the virus isolate. INSV symptoms include necrosis, chlorosis, ring patterns, mottling, stunting, local lesions, and death of the plant. Several other orthotospoviruses, as well as even more genetically distinct viruses, can cause symptoms similar to those seen in INSV infection. However, it should be noted that infection of host plants by INSV may be asymptomatic in some host plants, or the symptoms may be mild due to environmental conditions, or the infection may be too recent to reach full symptom expression (Daughtrey *et al*., 1997; Roggero *et al*., 1999; Lebas & Ochoa-Corona, 2007; Okuda *et al*., 2010; EFSA, 2012b; Nekoduka & Sano, 2018).

Symptomatology of some ornamentals:

- *Begonia x hiemalis*: yellow mottling of leaf, large brown circular necrotic spots, browning of the veins at the petiole end of the leaf; petiole may turn brown or necrotic (Lebas & Ochoa-Corona, 2007)
- *Begonia tuberhybrida* hybrids: foliar chlorotic rings and zonal spots accompanied by leaf necrosis and distortion of (Trkulja *et al*., 2013)
- *Chrysanthemum*: chlorotic mottle and necrosis on the leaves (Kondo *et al*., 2011)
- *Eustoma russellianum*: necrotic ringspots, leaf distortion, systemic necrosis, wilting, stunting, and death of the plant (Lebas & Ochoa-Corona, 2008)
- *Impatiens New Guinea hybrids:* brown or purple leaf spots, ringspots on petals, black diffuse spotting on leaves, black stem sections, leaf distortion, chlorotic mottling, and stunting (Lebas & Ochoa-Corona, 2008)
- *Phalaenopsis* orchids: chlorotic and necrotic ringspots (Baker et al., 2007; Cheng *et al*., 2010)
- *Primula* spp.: necrotic veins, irregular necrotic lesions, mottling, and stunting (Lebas & Ochoa-Corona, 2008)
- *Sinningia speciosa* (synonym *Gloxinia speciosa*): chlorosis, necrosis streaking, brown spots, ringspots, wilting, and death of the plant (Lebas & Ochoa-Corona, 2008)
- *Spathiphyllum:* concentric chlorotic ringspots, line patterns, and irregular chlorotic blotches on leaves, which developed into localized necrosis (Materazzi & Triolo, 2001)

Symptomatology of some vegetables, aromatic herbs and other crops:

- *Capsicum annum* (pepper): dark necrotic spots on some leaves and on the stems (Gonzalez-Pacheco & Silva-Rosales, 2013), dwarfing, leaf chlorotic ringspots, and distorted apical buds (Chen *et al*., 2016)
- *Lactuca sativa* (lettuce): leaf chlorosis, brown ringspots, necrotic lesions, vein necrosis, leaf distortion and/or plant stunting (Koike *et al*., 2008; Beris *et al*., 2020; Hasegawa *et al*., 2022)
- *Ocimum basilicum* (basil): foliar symptoms consisting of chlorotic spots, ring spots, leaf distortion, and stem necrosis (Poojari & Naidu, 2013)
- *Solanum lycopersicum* (tomato): small necrotic spots to large circular blotches on leaves and sometimes on fruit (Lebas & Ochoa-Corona, 2008)
- *Solanum tuberosum* (potato): leaves of greenhouse-grown potato exhibiting necrotic lesions with a concentric pattern (Perry *et al.,* 2005)

Morphology

Orthotospoviruses form enveloped spherical particles with a diameter of 80-120 nm. The lipid envelope of orthotospoviruses contains transmembrane tips composed of two glycoproteins that form oligomeric structures on the outside of the envelope. The cytoplasmic tails of the glycoproteins interact with the nucleoproteins encapsulating at least one copy of the three linear ssRNA segments (Butkovi? *et al.*, 2021).

Detection and inspection methods

The plants, especially the leaves, should be examined for symptoms. Particular attention should be paid if thrips are present. If necessary, samples should be taken for laboratory testing for definitive identification of the pest.

The tests recommended for the detection and identification of INSV are described in EPPO Standard PM 7/139 Tospoviruses (genus *Orthotospovirus*) (EPPO, 2020). Electron microscopy can be used for the detection of INSV and other viruses of the same genus, as they share a typical morphology. Mechanical inoculation of test plants can be used for detection and subsequent identification by other methods. Several ELISA kits and serological tests for on-site detection are commercially available and can be used as screening tools for INSV. Several molecular tests have been described for the detection of INSV, and some for identification. Sequence analysis of amplicons obtained by the generic conventional PCR tests can also be used for INSV identification. The de?nite identi?cation should be based on the sequence of the complete N gene according to the species demarcation criteria of ICTV. In addition, high-throughput sequencing is a technology that can obtain (nearly) complete genome sequences, and analysis of these sequences can be used to identify a virus isolate.

PATHWAYS FOR MOVEMENT

INSV is a systemic pathogen and as such it is transmitted very efficiently by all vegetative propagation techniques. In international trade, INSV can be transmitted by susceptible host plants for planting (whether potted or not), and is particularly able to spread further if these plants also carry vectors. Thrips are easily transported on above-ground fresh plant parts (e.g. cut foliage, cut flowers and cut branches) hidden under bracts, in buds and leaf bases. Insect vectors that have acquired INSV and that invade new areas can transmit INSV to new hosts. Short distance spread of thrips vectors by natural means within and between adjacent greenhouses, orchards, and other production sites is likely, but long-distance spread, even in strong winds is less common. Weeds can provide a virus reservoir from which thrips vectors can migrate into cultivated ornamentals or crop fields, which then become heavily infected. Mechanical transmission of INSV only plays a limited role in virus epidemiology in the ornamental industry and agriculture. Transmission through seeds is considered not to be a pathway or to be a highly unlikely pathway (see Biology) (Mound, 1983; Kirk & Terry, 2003; Okuda *et al*., 2010; EFSA, 2012b; Joseph & Koike, 2021).

PEST SIGNIFICANCE

Economic impact

The greatest economic losses due to INSV infection have been reported in crops of cut flowers and potted plants, especially when infested with *F. occidentalis* (Lebas & Ochoa-Corona, 2008). Severe losses due to INSV infection have been reported in *Cineraria, Ranunculus, Impatiens, New Guinea Impatiens, Cyclamen, Exacum, Begonia, Primula*, and *Sinningia* (synonym *Gloxinia*) (Daughtrey *et al.*, 1997). This was due to symptoms such as necrotic spots, necrotic veins, ringspots and stem necrosis, which make ornamental plants quite unattractive and thus unsaleable (EFSA, 2012b). However, EFSA (2012b) classified the impact of orthotospovirus diseases on ornamental plant production as moderate; as damage may be limited to a few leaves and flowers and does not necessarily affect entire plants.

Although INSV is found in vegetable crops, its impact is not apparently as great on these hosts as that of TSWV. However, there are some cases in which important damage is reported. For example, due to INSV infection, 30 to 40% of lettuce plants in four fields in Greece were affected (Beris *et al*., 2020), and severe outbreaks were recorded in lettuce crops in California (Kuo *et al*., 2014).

Control

The use of healthy planting material and a management strategy based on a combination of thrips and weed control, the use of resistant plant varieties and other measures is considered crucial for orthotospovirus control (EFSA, 2012b; Zhang *et al.*, 2021).

INSV is included in the certification scheme for herbaceous ornamentals (EPPO, 2008), among which there are specific certification schemes for chrysanthemums, pelargoniums, begonias, New Guinea hybrids of impatiens, kalanchoe and petunias (EPPO, 2000a-f). This reduces the impact and spread associated with the plants for the planting pathway.

The same control measures as for TSWV (EPPO, 2022) are suggested and described further on: Seedling beds should be separated from flowering ornamental plants or susceptible crops and surrounding areas kept free of weeds. Greenhouse and outdoor crops should be inspected regularly and as often as possible after planting, and can be tested during the entire propagation scheme. The presence of thrips in crops should be monitored with yellow sticky card traps. If the disease appears in a crop, infected plants should be immediately uprooted and destroyed, and the greenhouse/ field treated with an insecticide against thrips.

Thrips are difficult to control because they can become resistant to several insecticides used (Gao *et al.*, 2012). To avoid the development of resistance mechanisms, it is important to rotate insecticides with different active ingredients (Bielza, 2008). The prevalence of thrips vectors under protected conditions can be reduced by introducing biocontrol agents. These include predatory mites, entomopathogenic fungi and nematodes, parasitic wasps and generalist predators (Sánchez & Lacasa, 2002; Blaeser *et al.*, 2004; Ansari *et al.*, 2008; Messelink *et al.*, 2008; Cloyd, 2009). To prevent infestation of a new crop with a thrips population, it is recommended that greenhouses be kept completely free of crop residues and weeds for at least six weeks prior to planting and that seedlings be treated with insecticides before planting (EFSA, 2012a). In addition, fine-mesh netting can be potentially useful to exclude thrips in greenhouses (EFSA, 2012a).

Cultivation of INSV resistant (tolerant/immune) cultivars would reduce the incidence of the disease, but unfortunately, resistant varieties of the vast majority INSV host plants are not available (Peng *et al*., 2014; Sears, 2017; Simko *et al*., 2018).

Phytosanitary risk

Originally, INSV was thought to be of importance only to ornamentals. However, subsequent reports have shown that the host range of the virus has expanded to include several horticultural, agricultural, and field crops. It is reported from many European and Mediterranean countries. In addition, its thrips vector species are widely distributed in these countries. Spread can occur through thrips vector activity and through movement of infected hosts. Because INSV can cause both yield and quality losses in a variety of hosts, significant impacts are expected in regions where thrips vectors are present if appropriate control measures are not taken.

PHYTOSANITARY MEASURES

To prevent the introduction, spread and impact of INSV, requirements at production and/or import for different host species apply worldwide. These requirements can vary with regards to crop and prevalence at the place of origin.

EPPO countries where INSV does not occur or is not widespread may consider regulation as a quarantine pest. If they do so, these countries may require that plants have been produced in a pest free area, in a pest-free place/site of production or be subject to inspection and/or testing e.g. as performed in certification schemes.

In areas where INSV does occur, it was assessed during the EU Quality pest project as fulfilling the minimum criteria for listing as a regulated non-quarantine pest (RNQP) for propagating and planting material (other than seeds) of *Begonia x hiemalis* and *Impatiens* New Guinea hybrids (Picard *et al*., 2018). In particular, before starting the propagation and/or production of plants, it should be ensured that the planting material is free from INSV (INSV is included in certification schemes for various ornamental plants, see Control section). During the EU Quality pest project, in addition to the monitoring and treatments to ensure effective suppression of populations of relevant thrips vectors, it was recommended that no symptoms have been observed at the site of production during the current growing period, or that any plants at the production site showing symptoms of INSV during the current growing period have been rogued out and a representative sample of the plants to be marketed has been tested and found free from INSV. In the EU, INSV is regulated as a Union RNQP for such material.

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