EPPO Datasheet: *Xiphinema bricolense*

Last updated: 2023-10-10

Datasheets on *Xiphinema americanum sensu lato, Xiphinema americanum sensu stricto, Xiphinema californicum* and *Xiphinema rivesi* are also available in Global Database.

IDENTITY

Preferred name: *Xiphinema bricolense*
Authority: Ebsary, Vrain & Graham
Taxonomic position: Animalia: Nematoda: Enoplea: Dorylaimida: Longidoridae
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EPPO Categorization: A1 list
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EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: XIPHBC

Notes on taxonomy and nomenclature

Xiphinema bricolense Ebsary, Vrain & Graham, 1989 is a member of the *Xiphinema americanum sensu lato (s.l.)* group which comprises 64 nominal species (EPPO, 2017; Mobasseri *et al.*, 2019; Lazarova *et al*., 2019 & Vazifeh *et al*., 2019). Most members of the group are difficult to distinguish both morphologically and biochemically. Furthermore, no reliable molecular tests to distinguish between members of *X. americanum s.l.* or for the identification of those species that have been confirmed as virus vectors can be recommended yet.Therefore, although it is difficult, identification remains reliant on morphological identification.

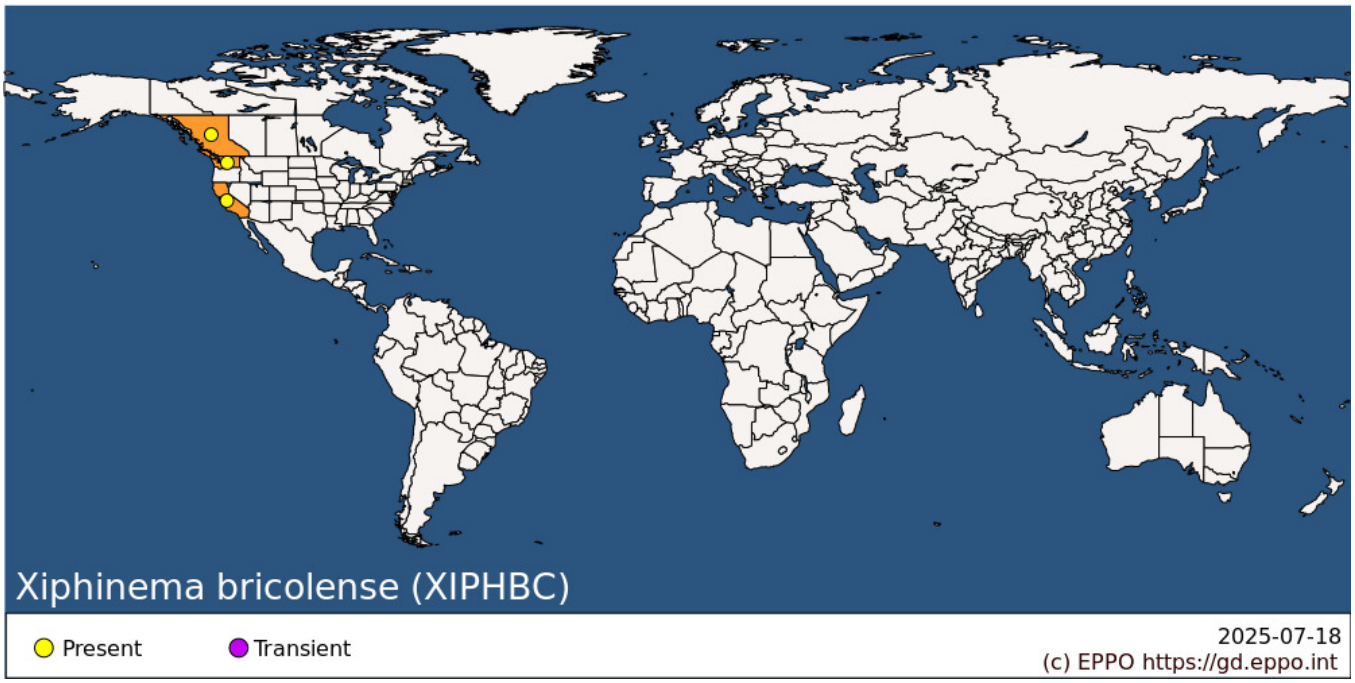
HOSTS

Xiphinema bricolense appears to be non-specific with regard to host plants, having been recorded from agricultural, horticultural and forest soils. The host plants of particular quarantine significance are those to and from which *X. bricolense* transmits *Tomato ringspot virus* (ToRSV) (*Nepovirus*) (Brown *et al*., 1993, 1994). The species was described from a population recovered from an apple orchard in Vernon, British Columbia, Canada (Ebsary *et al*., 1989). *X. bricolense* occurred mostly in vineyards (Graham *et al*., 1988) and with rare findings in peach and apple orchards in the Okanagan and Similkameen valleys (Vrain & Yorston, 1987), in British Columbia. It was therefore concluded that grapevine is a more suitable host for *X. bricolense* than fruit trees (Taylor & Brown, 1997). Important host plants of ToRSV include *Malus* spp., *Prunus* spp. (plum, cherry and peach) and *Vitis* spp. (Taylor & Brown, 1997). However, its host plant range is wide, including woody and ornamental plants and several weed species.

Host list: *Juncus sp., Malus domestica, Prunus persica, Vitis vinifera*

GEOGRAPHICAL DISTRIBUTION

X. bricolense is present in North America. It widespread in British Columbia, Canada (Vrain & Yorston, 1987; Graham *et al*., 1988; Ebsary *et al*., 1989), and it is also present in Washington (Brown *et al*., 1994) and California (Cho & Robbins, 1991), USA.



North America: Canada (British Columbia), United States of America (California, Washington)

BIOLOGY

X. bricolense is a migratory ectoparasite and spends its entire life cycle in the soil, moving in the moisture film covering soil particles. The individuals appear to be attracted to young growing roots where they feed by puncturing, with their stylet, several successive layers of cells and extracting cytoplasm. Females produce eggs parthenogenetically (males being rare or absent). The number of developmental stages for this species is unclear; data indicates the possibility of either 3 or 4 juvenile development stages. Alkemada & Loof (1989) reviewed the literature on *X. americanum* group juveniles and reported that some published measurements clearly indicated four juvenile stages, but three larval developmental stages for *X. bricolense* have also been reported (Halbrendt & Brown, 1992; Robbins *et al.*, 1996). The life cycle takes at least 1 year to complete and the optimum temperatures for reproduction are 20-24°C (Hunt, 1993). There is no specialized long term survival stage however, all stages have been found to survive and mature (but not multiply) in soil in the absence of a host. The nematode does not survive long periods in frozen soil, and in areas of low winter temperatures overwintering is mainly in the egg stage. Where the soil is not frozen, all stages can survive over winter.

X. bricolense transmits ToRSV (Taylor & Brown, 1997). When the nematode feeds on a virus-infected plant, virus particles are extracted from the cells within the cytoplasm, and these adhere to the lining of the stylet and pharynx. The virus particles are injected into the next healthy plant on which the nematode feeds. Nematodes may transmit virus acquired up to 2 years previously (Bitterlin & Gonsalves, 1987).

DETECTION AND IDENTIFICATION

An EPPO diagnostic protocol is available for *Xiphinema americanum sensu lato* (EPPO, 2017) as well as an IPPC Diagnostic Protocol (IPPC, 2016).

Symptoms

Plants whose roots are being attacked by *X. bricolense*, in the absence of a virus, generally exhibit no clear characteristic symptoms in the aerial parts. Symptoms are most often similar to those resulting from water and nutrient deficiencies and are shown as stunted plant growth. With high population densities, a general reduction in vigour is observed and this appears in characteristic patches in the crop corresponding to the highest concentration of nematodes (Heve *et al.*, 2015). When nematode feeding results in virus transmission the characteristic symptoms of

the virus develops in the crop concerned. These usually first appear in the aerial parts of the plant in the growing season after transmission to the roots has occurred. However, some host plants remain symptomless after infection and therefore may escape detection as symptoms are not always evident (NVWA, 2010).

Morphology

X. bricolense nematodes are minute, soft-bodied, vermiform and nearly transparent. They have a hard, needle-like stylet (odontostyle and odontophore) at the mouth-end of the body which is capable of being extruded to puncture plant cells. General morphological characteristics of *X. bricolense* are relatively short compared to other non *X. americanum* s.l. species (usually <150 ?m) stylet (odontostyle + odontophore), thick cuticular lining of the pharynx, males usually absent or rare, female genital branches equally developed, uterus short and without Z-organ, presence of symbiotic bacteria in the oocytes and in the intestines of juveniles, short conoid tail with rounded terminus, females without sperm present in uteri or oviduct.

Detection and inspection methods

X. bricolense can be detected by extraction from soil or growing media (as is the case for most ectoparasitic plant?parasitic nematodes). Nematode extraction techniques, such as the Flegg?modified Cobb technique (Flegg, 1967) or Oostenbrink (Oostenbrink, 1960) or other suitable elutriation methods can be used for extraction of longidorid nematodes. Migratory endoparasites may also be present in soil residues adhering to plant roots, bulbs and tubers. Consequently, *X. bricolense* may be found following processing of plant material using methods such as modified Baermann processes. Detailed descriptions of extraction equipment and procedures can be found in EPPO PM 7/119 (1) Nematode extraction (EPPO, 2013). After extraction, the nematodes are examined by high-power microscopy in order to identify the specimens.

PATHWAYS FOR MOVEMENT

X. bricolense spends its entire life cycle in the soil, feeding on roots of host plants. It can only live in moist soil where it can move at most 1 m per year, unless assisted by run-off. Bare rooted plants free from soil are not a pathway for movement. The pest is transported solely in soil associated with plants for planting, plant products (such as, soil associated with ware potatoes contaminated with soil), bulk soil and any other goods contaminated with soil. Spread over longer distances is possible in moist soil transported with or without plants. Soil and growing media attached to (agricultural) machinery, tools and packaging materials may also constitute a pathway for movement, but such soil may dry out and consequently lead to reduced viability of the pest.

PEST SIGNIFICANCE

Economic impact

The importance of *X. bricolense* is linked to its capacity to vector ToRSV (Taylor & Brown, 1997), which is important mainly on fruit crops. ToRSV has a wide host range. A review of effects of the viruses on economically important crops was performed by NVWA (2010) and is summarized here. Adverse economic effects caused by ToRSV are principally related to fruit crops, particularly grapes and raspberries. In grapes, yield reductions of between 37 and 63% were reported in vineyards in New York, USA. Fifty percent yield reductions were reported in some raspberry cultivars whilst other cultivars were unaffected. ToRSV was also implicated in apple union necrosis and decline in American apple orchards. Severe losses have also been reported on blueberry in New York and peach in Pennsylvania. The virus is known to infect species of *Prunus* (cherries and plum), *Ribes* and *Rubus* (some cultivars) but no reduction in yield has been reported in these crops. Among the horticultural crops ToRSV has been reported to produce symptoms on leaves of pelargonium, making plants unmarketable. In Türkiye, symptoms of infection were reported on wild blackberry plants, but not in neighbouring peach orchards (Sertkaya, 2010). In Lithuania, ToRSV was detected in 4.6% of one raspberry cultivar (Stankiene *et al*., 2012), but impacts due to the virus infection are unknown.

After introduction into the production area, the virus associated with its vector will spread slowly since the

nematodes will spread naturally 1 m at maximum per year. The virus and its vector may spread over longer distance mainly with trade of plants with soil attached but the total infested area will however increase slowly. Thus, on the short term, e.g. the first 10 years after introduction the impact is assessed to be low and only very locally impact may occur. On the long term (decades), the virus-vector combination is expected to spread further mainly by human assistance and the impact may become similar to that in the USA where both the virus and vector are present. In Europe the impact of ToRSV in combination with the vector may become higher than in the USA because of the limited availability of soil fumigants in Europe. The potential impact of the virus in combination with the vector in Europe was assessed as high for several fruit crops (NVWA, 2010).

Control

Control of viruliferous nematodes in the field is problematic. Disinfection of soil can be carried out by physical (heat, steam) or chemical (nematicides) treatments – the efficacy of these measures is limited (it is considered that the efficacy never reaches 100%) and the nematodes that remain in the soil can still transmit viruses to the roots of the host plants (EFSA, 2018). Soil disinfection by physical treatments does not eliminate nematodes under field conditions due to the vertical distribution (depth) of the nematode which depends on availability of roots of host plants and moisture regime (EFSA, 2018). The use of nematicides is restricted in EPPO countries (e.g. EU countries) and at present, no methods are available to control nematode populations in an established orchard (NVWA, 2010).

Keeping the soil free from plants for over 2 years will significantly reduce the nematode population.

Phytosanitary risk

The main phytosanitary risk is linked to the capacity of *X. bricolense* to transmit ToRSV, which is a quarantine pest. *X. bricolense* may introduce the virus.

Introduction of the vector nematodes into the EPPO region would increase the risk of new introductions of ToRSV and spread of the virus within the region, and more complex measures for the certification of virus-free material of fruit crops would be needed. Populations of *X. bricolense* from North America, could certainly establish and spread in the EPPO region.

There are numerous reports of ToRSV detection in the EPPO region, however, most relate to interceptions, are under eradication and are not known to be widely distributed.

PHYTOSANITARY MEASURES

It can be recommended that import of soil from countries where *X. bricolense* occurs should be prohibited. Plants with roots may also be prohibited from import or precautions should be taken to ensure that the nematodes will not be carried in the roots. The field from which the plants originate should have been tested and found to be free from the nematodes and, if the plants were in a growing medium, this medium should be either inorganic or have been tested, or treated against nematodes. If this is not the case, soil or growing medium attached to the plants can be removed and after removal, the plants can be repotted in pest-free soil or growing medium before export. Plants should then be kept under special conditions to avoid the risk of reinfestation.

Soil or growing medium can be treated to kill nematodes by heating to 60°C and maintaining at that temperature for 1 h.

The use of certified or tested plants for planting, grown under conditions that ensure pest freedom reduces the risk of introducing and spreading of viruses not present or having a limited distribution in the region, and of their vector nematodes. Only planting material originating from areas where the nematode has not been reported, and where surveillance is carried out to confirm the absence of the pest (Pest Free Area, Pest Free Production Site) can be declared as pest free material.

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 1984 and revised in the two editions of 'Quarantine Pests for Europe' in 1992 and 1997 (as part of *Xiphinema americanum*), as well as in 2023. 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.

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