EPPO Datasheet: *Nacobbus aberrans sensu lato*

Last updated: 2023-10-10

IDENTITY

[more photos...]

Preferred name: *Nacobbus aberrans sensu lato*
Authority: (Thorne) Thorne & Allen
Taxonomic position: Animalia: Nematoda: Chromadorea: Rhabditida: Pratylenchidae
Other scientific names: *Anguillulina aberrans* Thorne, *Nacobbus batatiformis* Thorne & Schuster, *Nacobbus serendipiticus bolivianus* Lordello, Zamith & Boock, *Nacobbus serendipiticus* Franklin
Common names: false root-knot nematode
[view more common names online...]
EPPO Categorization: A1 list
[view more categorizations online...]
EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: NACOBA

Notes on taxonomy and nomenclature

The genus *Nacobbus* is still in revision. Sher (1970) reviewed the genus and synonymized *N. batatiformis*, *N. serendipiticus* and the subspecies *N. serendipiticus bolivianus* as *N. aberrans*. Subsequently, the term *N. aberrans s.l.* was used because of the great variability observed in the new populations detected, mainly at morphological, physiological and genetic levels. Recently, in order to clarify the taxonomic status of this complex, an integrative taxonomic analysis was carried out, using morphometric and molecular data (Lax *et al*., 2021). The results supported the identification of three nominal species: i) *N. aberrans sensu stricto*, mainly distributed in Mexico and Ecuador; ii) *N. bolivianus* (ex *N. serendipiticus bolivianus*), present in Bolivia and Peru; iii) *N. celatus*, a new species widely distributed in the lowlands of Argentina. However, there are many populations that have not yet been correctly identified and should be considered as *N. aberrans s.l.*

HOSTS

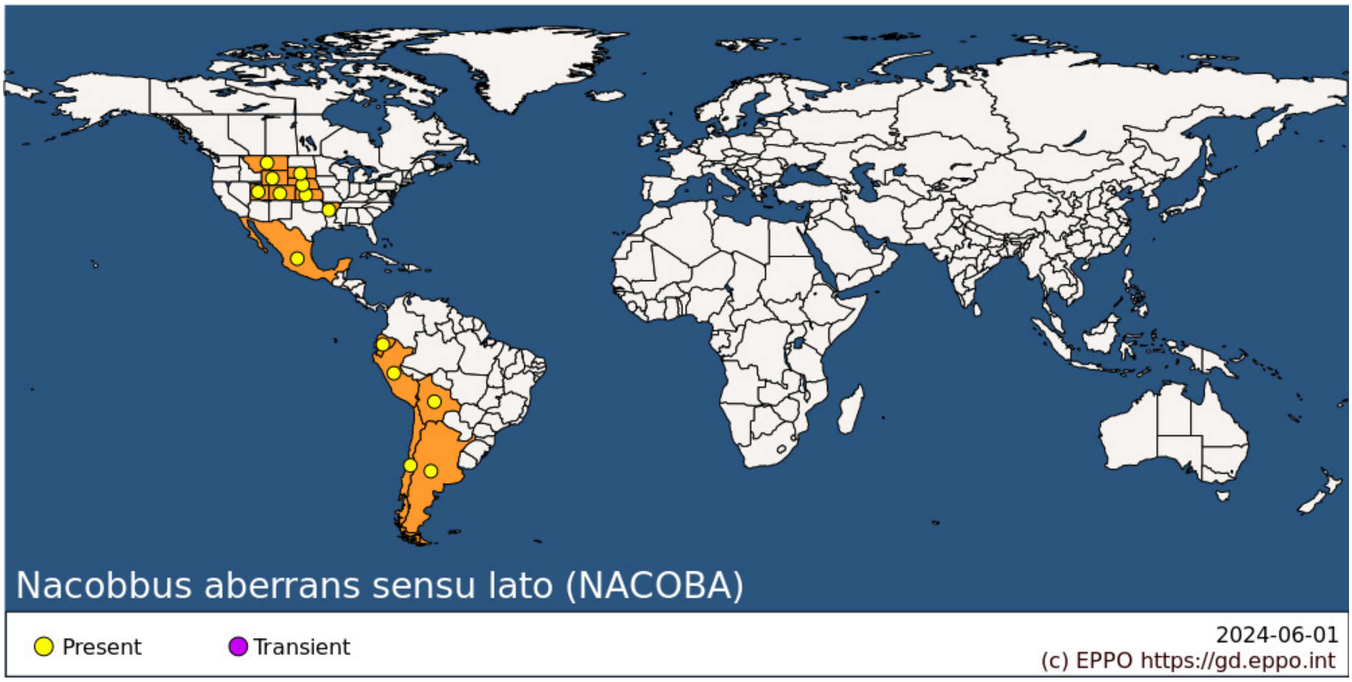
Nacobbus aberrans s.l. is highly polyphagous, attacking at least 84 plant species of 24 families, including crops, native plants, and weeds (Manzanilla-López *et al*., 2002; Doucet & Lax, 2005; EPPO, 2009). Potato, tomato, pepper, sugarbeet and bean are the most economically significant hosts. Weeds can function as a permanent source of inoculum in cultivated crops or as reservoirs in the absence of the culture (Inserra *et al.*, 1984; Doucet & Lax, 2005). Nematode populations from different geographic origins may show distinct behaviours when interacting with the same plant species or cultivar. This indicates that certain populations possess the ability to invade and proliferate within roots of a given plant, while others are unable to infest them. Consequently, based on these host preferences, populations can be differentiated into groups, races, biotypes or pathotypes (Castiblanco *et al*., 1999; Manzanilla-López *et al*., 2002; Inserra *et al*., 2005; Franco & Main, 2008; Lax *et al*., 2011), which are associated with specific host ranges and geographic areas (EFSA PLH *et al*., 2018).

Host list: *Amaranthus hybridus*, *Amaranthus hypochondriacus*, *Amaranthus quitensis*, *Amaranthus retroflexus*, *Amaranthus sp.*, *Amaranthus spinosus*, *Anoda cristata*, *Atriplex confertifolia*, *Baccharis salicifolia*, *Bassia scoparia*, *Beta vulgaris*, *Brassica juncea*, *Brassica napus*, *Brassica nigra*, *Brassica oleracea*, *Brassica rapa subsp. sylvestris*, *Brassica rapa*, *Capsella bursa-pastoris*, *Capsicum annuum*, *Capsicum baccatum var. pendulum*, *Capsicum frutescens*, *Capsicum pubescens*, *Cestrum roseum*, *Chenopodiastrum murale*, *Chenopodium album*, *Chenopodium berlandieri var. berlandieri*, *Chenopodium quinoa*, *Cucumis sativus*, *Cucurbita maxima*, *Cucurbita pepo*, *Datura ferox*, *Datura stramonium*, *Daucus carota*, *Dysphania ambrosioides*, *Escobaria vivipara*, *Ipomoea batatas*, *Lactuca sativa*, *Malva parviflora*, *Nicotiana tabacum*, *Opuntia fragilis*, *Origanum vulgare*, *Oxalis tuberosa*, *Phaseolus vulgaris*, *Physalis sp.*, *Pisum sativum*, *Plantago lanceolata*, *Portulaca oleracea*, *Raphanus sativus*, *Salsola kali*, *Senecio vulgaris*, *Sisymbrium irio*, *Solanum lycopersicum*, *Solanum melongena*, *Solanum tuberosum*, *Spergula arvensis*, *Spinacia oleracea*

, *Stellaria media*, *Taraxacum officinale*, *Tribulus terrestris*, *Trifolium sp.*, *Tropaeolum tuberosum*, *Ullucus tuberosus*

GEOGRAPHICAL DISTRIBUTION

The pest is indigenous to the American continent (Sher, 1970). Although quarantine records and interceptions of contaminated plant material have been reported in other countries, such as England, the Netherlands and Russia, there is so far no evidence of establishment of this nematode outside the Americas (Manzanilla-López *et al*., 2002).



North America: Mexico, United States of America (Arkansas, Colorado, Kansas, Montana, Nebraska, South Dakota, Utah, Wyoming)
South America: Argentina, Bolivia, Chile, Ecuador, Peru

BIOLOGY

The life cycle of *Nacobbus aberrans s.l.* has four juvenile stages (J1 inside the egg, J2-J4) and the adults (male, immature and mature female). The J2-J4 and immature female (filiform) are infective, migratory and endoparasitic stages and can be found inside the roots and/or in the soil. The immature female establishes near the central root cylinder, becoming a sedentary endoparasite with a fusiform body. Feeding and development is accompanied by histological changes and gall formation by the roots, and eggs are laid in a gelatinous matrix which protrudes from the root surface into the soil. Development can be completed in about 37-48 days at 22-24 °C and even extend up to almost a year (observed when the nematode infests potato tubers). J3 and J4 are able to survive for more than 10 months in a quiescent state under the lenticels of stored potato tubers (Costilla, 1985a). The nematode is adapted to a wide range of climatic conditions; it is resistant to low temperatures (below -10 °C) and above 30 °C (Manzanilla-López *et al*., 2002). Under laboratory conditions, *N. aberrans s.l.* survived after 4 months in infested roots and soil at -13 °C, and 8 months in air-dried soil (7-9% RH) (Jatala & Kaltenbach, 1979).

DETECTION AND IDENTIFICATION

Symptoms

The galls are similar to those caused by the root-knot nematodes (*Meloidogyne* spp.) and it is not possible to differentiate these nematodes from *N. aberrans s.l.* based on this root symptom. Infested potato tubers do not show visible symptoms.

Morphology

The genus *Nacobbus* is characterized by the females having a single ovary (two in *Meloidogyne*) and males having a bursa. Mature females in the root galls are fusiform with tapered posterior position contrasting with the rounded posterior end of *Meloidogyne* mature females. Although the *Nacobbus* mature female can be easily identified, the free mobile stages can be confused with other species, especially those of the family Pratylenchidae (Anthoine & Mugniéry, 2005). The immature female is vermiform and is found in roots and in soil. The tail of immature females and juveniles (J2-J4) is rounded whereas *Meloidogyne* J2 has a tapered tail. See also Manzanilla-López *et al*. (2002) and Lax *et al*. (2021).

Detection and inspection methods

The detection technique will depend on the type of material to be tested (roots, potato tubers, or soil samples). In roots, direct dissection of the galls can reveal the presence of fusiform females. Roots or potato peelings can be processed using the maceration-centrifugal-flotation (Coolen, 1979) or maceration-flotation method (Costilla, 1985b). During periods of temperature decline and drought, dormant stages of *N. aberrans s.l.* in soil can tolerate desiccation for 24 months. As a consequence, the nematode extraction from the soil using routine methods may be nil or very low. This makes it difficult to accurately assess the level of population density prior to sowing or transplanting a susceptible crop (Cristóbal *et al*., 2001). The main techniques for nematode detection in soil samples are Baermann funnel or its modification, flotation-centrifugation with sugar (Manzanilla-López *et al*., 2002) and 'the closed bag method' described by Ortuño *et al*. (1996). A molecular diagnostic method for detecting *N. aberrans s.l.* in soil and in potato tubers was developed by Atkins *et al*. (2005). More details are given in the EPPO diagnostic protocol EPPO (2009).

PATHWAYS FOR MOVEMENT

N. aberrans s.l. can be spread in contaminated potato tubers (Lax *et al*., 2013), as well as with the movement of infested plants and soil (EFSA PLH *et al*., 2018).

PEST SIGNIFICANCE

Economic impact

N. aberrans s.l. is ranked as one of the top ten nematode pests in the world (Jones *et al*., 2013). The impact on yield depends on different factors, such as population pathotype/group, initial density, climatic conditions, soil type, and the crop/cultivar selected (Lax *et al*., 2022). In the Andean region, it is one of the main pests of the potato crop, reducing yields by about 10-73% (Canto-Saenz *et al*., 1996; Franco *et al*., 1996). Tomato production is reduced by around 60-75% in Ecuador (Corrales Arango, 2007) and by 12-83% in Mexico (Cristóbal-Alejo *et al*., 2006). In sugarbeet, losses range between 10-20% in the USA (Inserra *et al*., 2005), and up to 36% on bean in Mexico (Manzanilla-López *et al*., 2002).

Control

Nematicides alone do not effectively reduce populations of *N. aberrans s.l.* (Manzanilla-López *et al.*, 2002)**.** The main strategies that need to be rationally applied include: crop rotation, use of tolerant/resistant cultivars, use of trap and antagonistic plants, avoiding the spread of infected tubers, use of non-infested seed potato, application of organic amendments, solarisation, stubble burning, weed control, cleaning of farm machinery, and chemical and biological control (Franco, 1994; Jones *et al*., 2013). Biological control strategies using different organisms (such as bacteria, fungi and entomopathogenic nematodes) and other eco-compatible approaches (metabolites, essential oils, plant extracts, phytohormones and amendments), either alone or as part of a combined control strategy show good results to reduce the root damage (less galls) and the nematode reproduction (Lax *et al*., 2022). However, field evaluations need to be further developed.

Phytosanitary risk

Due to its adaptive capacity to different environments and its wide host range, *N. aberrans s.l.* is a major threat if it were to be introduced into new regions or if new pathotypes/groups were to be introduced into new areas (Inserra *et al*., 2005; Lax *et al*., 2022).

PHYTOSANITARY MEASURES

Although *N. aberrans s.l.* distribution is restricted to the American continent, it has quarantine importance and is subject to international legislation to prevent its spread to other regions, such as the European Union. Detection in potato tubers is very important for regulatory and seed certification purposes. Post-entry quarantine procedures in the EPPO region are needed, together with equivalent checks before export to avoid the introduction of the South American potato pathotype/group. Only material for scientific purposes should normally be imported from South and North America. From other countries where *N. aberrans s.l.* is known to occur, the simplest practical measure is to restrict the introduction of soil, as such or accompanying plants (EPPO, 2021).

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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. 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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