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Data Sheets on Quarantine Pests

Aphelenchoides besseyi

IDENTITY

Name: *Aphelenchoides besseyi* Christie
Synonyms: *Aphelenchoides oryzae* Yokoo
Asteroaphelenchoides besseyi (Christie) Drozdovski
Taxonomic position: Nematoda: Aphelenchida: Aphelenchoididae
Common names: Rice white tip nematode, strawberry crimp disease nematode (English)
Nématode foliaire (French)
Bayer computer code: APLOBE
EPPO A2 list: No. 122
EU Annex designation: II/A1 on rice and II/A2 on strawberry

HOSTS

The main host plants are strawberries and rice, which are the main crops at risk in the EPPO region. *A. besseyi* has also been found on *Boehmeria nivea*, numerous ornamental plants (including chrysanthemums, *Ficus elastica*, *Hibiscus*, *Polianthes tuberosa* and *Saintpaulia ionantha*), and grasses (*Panicum*, *Pennisetum*, *Setaria*, *Sporobolus*).

GEOGRAPHICAL DISTRIBUTION

A. besseyi is not found beyond latitude 43° N on rice or beyond 40° N on strawberries.
EPPO region: Locally established in Bulgaria, Hungary (Javor, 1970), Italy, Russia (European), Slovakia; reported from but not established in Israel and France.
Asia: Afghanistan, Azerbaijan, Bangladesh, Cambodia, China (widespread), India (widespread), Indonesia, Iran, Israel (reported but not established), Japan (unconfirmed), Korea Republic, Lao, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Taiwan, Tajikistan, Thailand, Uzbekistan, Viet Nam.
Africa: Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Egypt, Gabon, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Nigeria, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe.
North America: Mexico, USA (Arizona, California, Florida, Hawaii, Louisiana, Texas).
Central America and Caribbean: Cuba, Dominica, Dominican Republic, El Salvador, Guadeloupe, Panama.
South America: Argentina, Brazil (Bahia, Minas Gerais, Parana, Rondonia, Santa Catarina, São Paulo), Ecuador.
Oceania: Australia (Queensland, Northern Territory), Fiji.
EU: Present.

BIOLOGY

On rice, infested seed is the primary inoculum source. When the crop is sown, the nematodes become active and move to the growing points of leaves and stems where they feed ectoparasitically. *A. besseyi* may reproduce parthenogenetically. The optimum temperature for development is 21-25°C, the life cycle taking 10 days at 21°C and 8 days at 23°C, and there are several generations in a season. Up to 14 nematodes, mostly pre-adults, have been found on a single seed, where they remain coiled up inside the palea. The grain itself is never invaded. *A. besseyi* can withstand desiccation, retaining viability for 2-3 years on dry grain, but dies in 4 months on grain left in the field; the nematode is not thought to survive long periods in the soil between crops.

On strawberries, the nematode is also ectoparasitic, feeding on young tissue. It has been reported, in North Carolina (USA), that the strawberry form of the parasite can survive in soil over winter and that larval stages can withstand moderate desiccation in plant material.

For further information, see Yokoo (1948), Yoshii & Yamamoto (1950), Franklin & Siddiqi (1972).

DETECTION AND IDENTIFICATION

Symptoms

On rice

There is a characteristic whitening of the top 3-5 cm of the leaf tips, which later become necrotic, and a crinkling and distortion of the flag leaf enclosing the panicle; the latter is reduced in size, as are the grains. Symptoms may be confused with calcium and magnesium deficiency.

On strawberries

There is leaf crinkling and distortion, and dwarfing of the plant with an associated reduction in flowering.

On other hosts

A. besseyi may be endoparasitic, as in *Ficus elastica* and *Polianthes tuberosa*, in which it causes leaf drop and leaf lesions, respectively. In the grass *Sporobolus poirettii*, the nematode stimulates growth, resulting in increased inflorescences.

For additional information, see Yoshii & Yamamoto (1950), Todd & Atkins (1958), Feakin (1971), Franklin & Siddiqi (1972), Luc *et al.* (1990).

Morphology

A. besseyi has a slender body 0.44-0.84 mm long and 14-22 µm wide. In females, the excretory pore is usually near the anterior edge of the nerve ring; the spermatheca is elongate-oval and packed with sperm; the ovary is relatively short, the post-vulval uterine sac narrow, and the terminus bears a mucro of diverse shape with three to four pointed processes. In males, the proximal end of the spicule lacks a dorsal process.

MEANS OF MOVEMENT AND DISPERSAL

The pest is liable to be carried on rice seed and accompanying chaff, and also on strawberries and other host plants.

PEST SIGNIFICANCE

Economic impact

Since early in the 20th century, *A. besseyi* has been reported causing serious losses to rice in Japan and parts of the USA (especially from 1935 to 1945). However, attacks have

become less important with the use of resistant cultivars and other control measures (Vuong & Rodriguez, 1970). Attack results in poorly filled or unfilled, chaffy grains; the proportion of the latter may be as high as 40% in some cultivars, but early-ripening cultivars are relatively less affected. Yield reductions in rice of 17-54% and 0-24% have been recorded for susceptible and resistant cultivars, respectively. For more information, see Todd & Atkins (1959b).

On strawberries, *A. besseyi* was recorded over 70 years ago in the USA as the incitant of summer dwarf or crimp disease, and causing much reduced strawberry fruit yields.

Control

Control in rice by seed disinfestation (warm water and chemical treatments) and soil disinfection (chemical treatments) has been successful (Todd & Atkins, 1959a). Rice seeds can be soaked in water at 55-61°C for 10-15 min to destroy the nematode. Various chemical seed and soil treatments are recommended. Other methods which can contribute to a reduction of nematode populations include the use of resistant or tolerant cultivars, early planting when the rice season is preceded by a cooler period, and low seed-bed planting densities.

Nematicides, applied either as foliar sprays or as soil treatments, can reduce the nematode population sufficiently to prevent symptom expression. Strawberry runners may also be treated prior to planting by immersion in water for 10 min at 46°C; the nematode numbers can thus be markedly reduced but not always eliminated, and symptoms can be expected to be expressed in a later growing season. Ideally, however, strawberry planting material should be free from nematodes; this is best achieved within a certification scheme, which produces planting material from nematode-free nuclear stock; such a certification scheme is being prepared by EPPO.

Phytosanitary risk

EPPO has listed *A. besseyi* as an A2 quarantine pest (OEPP/EPPO, 1981), and CPPC, JUNAC and IAPSC also consider it of quarantine significance. It presents a risk to rice and strawberry cultivation in Mediterranean countries, but is unlikely to be important on strawberries in the more northern areas of the EPPO region. It has the potential to become a problem on ornamental plants in heated glasshouses. However, it may also be noted that records of *A. besseyi* as a significant pest of strawberries come from the older literature, and that the nematode has been locally present in some EPPO countries for many years without any significant expression of its pest potential.

PHYTOSANITARY MEASURES

EPPO recommends that rice seed from infested countries should have been tested by an EPPO-recommended method (OEPP/EPPO, 1990; 1992; 1993), based on the principle that nematodes leave the tissues of rice seed soaked in water for several days. It also recommends that plants for planting of strawberries from infested countries where the nematode occurs should come from an area where the pest does not occur or should have been treated. When an EPPO certification scheme for strawberries is accepted, it should provide equivalent protection.

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