EPPO Datasheet: *Venturia nashicola*

Last updated: 2020-12-18

IDENTITY

Preferred name: *Venturia nashicola*
Authority: Tanaka & Yamamoto
Taxonomic position: Fungi: Ascomycota: Pezizomycotina: Dothideomycetes: Venturiales: Venturiaceae
Common names: scab of Chinese pear, scab of Japanese pear
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EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: VENTNA



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Notes on taxonomy and nomenclature

Tanaka & Yamamoto (1964) first described *V. nashicola* as a pathogen of Asian pear scab based on comparative studies on morphological, cultural and pathological characteristics of Japanese isolates. Although this species was regarded as a synonym of *V. pyrina* (Sivanesan, 1977), Ishii & Yanase (2000) concluded that *V. nashicola* is distinct from *V. pyrina*. Although ascospore formation was observed in a cross between Japanese and Chinese pear isolates, neither asci nor ascospores were produced when Japanese or Chinese pear isolates were crossed with those from European pear. Phylogenetic studies using rDNA-ITS, ?-tubulin, elongation factor 1?, and endo-polygalacturonase genes supported taxonomic separation of *V. nashicola* from *V. pyrina* (Zhao *et al*., 2012, 2016). Whole genome sequences were analysed (Johnson *et al*., 2019) and comparative research indicated the close relationship of *V. nashicola* with *V. pyrina*, but they were in separate phylogenetic clades (Prokchorchik *et al.*, 2020). In the Republic of Korea, *V. nashicola* was also found to be the pathogen causing scab of pear (Cho *et al*., 1985).

HOSTS

The principal hosts are Asian pears (‘nashi’) including Japanese pear (*Pyrus pyrifolia* var. *culta*) and Chinese pears (*P. bretschneideri*, and *P. ussuriensis*). *V. nashicola* has also been reported on various wild *Pyrus* spp. such as *P. betulifolia* (hokushimamenashi and manshumamenashi), *P. aromatica* (iwateyamanashi), *P. vilis* (Ishii *et al*., 2002). However, these wild species are not widely distributed and are not a significant reservoir of the pathogen. Pathological specialization has been found in *V. nashicola* and 7 races have been identified so far (Ishii *et al*., 2002; Ishii *et al*., in press). European pear (*P. communis*) has been shown not to be a host (Tanaka & Yamamoto 1964; Ishii & Yanase 2000; Ishii *et al.*, in press). Asian pears are grown in the EPPO region, but at a much smaller scale than European pear.

Host list: *Pyrus betulifolia*, *Pyrus bretschneideri*, *Pyrus calleryana*, *Pyrus pyrifolia var. culta*, *Pyrus pyrifolia*, *Pyrus ussuriensis var. aromatica*, *Pyrus ussuriensis var. hondoensis*, *Pyrus ussuriensis*

GEOGRAPHICAL DISTRIBUTION

V. nashicola is indigenous to Eastern Asia and has no history of wider spread to new areas.



Asia: China (Anhui, Hebei, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Yunnan), Japan (Hokkaido, Honshu, Kyushu, Shikoku), Korea, Republic of, Taiwan

BIOLOGY

The fungus overwinters in infected leaves on the orchard floor and forms ascospores in a pseudothecium in the following spring. The fungus also overwinters in the inner tissues of bud scales on the tree, resulting in the production of conidia. The ascospores and conidia thus formed play an important role in the primary infections. The discharge of ascospores and the dispersal of conidia occur mainly in rainy periods. The incubation period of the fungus in leaves and fruit is influenced by weather conditions and is 3-4 weeks or even longer. The fungus repeats secondary infections several times a year. In the rainy season (June to July in Japan), the conidia are actively disseminated. In the hot summer, however, the fungus is usually inactive. In autumn, it becomes active again and new infection of buds occurs. The infection tends to last until the middle or late autumn in Japan.

For more information on the biology or physiology of the pathogen, see Yamamoto & Tanaka (1962; 1963), Tanaka & Yamamoto (1964), Misonou & Fukatsu (1970; 1971), Takanashi *et al.* (1970), Umemoto & Nagai (1985), Umemoto (1990, 1991a, 1991b), Eguchi & Yamagishi (2008), Asari (2016), and Ishii *et al*. (in press).

DETECTION AND IDENTIFICATION

Symptoms

In early spring, bud scales infected the previous year develop and form conidia, which infect the basal portion of young clusters and produce black sporulating lesions. Subsequently, abundantly sporulating lesions can be observed on leaves, petioles, fruit and young shoots. Infections of petioles and peduncles result in premature abscission of leaves and fruit, respectively. Uneven development or cracking of the fruit occurs after infections. The quantity of conidia formed on leaves decrease after summer has passed.

Morphology

Conidia occur singly and are one-celled, pale-brown, ovate, but sometimes irregular in shape, 6.4-27.9 x 3.7-14.7 µm. Ascospores are unequally two-celled, with a septum near the base, pale-brown, 10.0-15.0 x 3.8-6.8 µm.

A full description is given by Tanaka & Yamamoto (1964), Ishii & Yanase (2000), Ishii *et al*. (2002), and Ishii *et al*. (in press).

Detection and inspection methods

Typical symptoms of scab may be observed on fruit. Host plants for planting at the dormant stage may carry the pathogen in the form of mycelia in the inner tissues of bud scales without showing any symptoms, thus, escaping detection via visual inspection (EFSA, 2017).

Based on a nucleotide sequence of the rDNA-ITS (ribosomal DNA-internal transcribed spacer) regions, a PCR (polymerase chain reaction) test was developed to identify *V. nashicola* (Le Cam *et al*., 2001; Zhao *et al*., 2016). For quarantine inspection of fruit, a real-time PCR test was also developed using a nucleotide sequence of the translation elongation factor-1 ? gene (Yun *et al*., 2015).

PATHWAYS FOR MOVEMENT

Under natural conditions, *V. nashicola* spreads by conidia or ascospores within orchards. In international trade, *V. nashicola* is liable to be carried on infected plants for planting (with or without leaves) of the host *Pyrus* as well as on fresh fruit of host plants (EFSA, 2017; USDA, 2009).

PEST SIGNIFICANCE

Economic impact

In Eastern Asia, *V. nashicola* is one of the most serious pathogens in *Pyrus pyrifolia* var. *culta*, *P. bretschneideri*, and *P. ussuriensis*. The pathogen causes fruit drop, cracking, and malformation. A very small number of scab-resistant cultivars are commercially available, and these are all within the variety *Pyrus pyrifolia* var. *culta* (Ishii & Kimura 2018; Ishii *et al*. in press).

Control

Commercial orchards have been successfully protected by chemical spraying coupled with routine inspections, and removal of infected parts, and of pear leaves from the ground in particular, to reduce primary infection source. However, strains of *V. nashicola* resistant to benzimidazole (MBC) fungicides are widely distributed throughout Japan, making it difficult to control the disease with this group of fungicides (Ishii *et al*., 1985; Ishii, 2012). MBC resistance has also been found in the Republic of Korea (Kwak *et al*. 2017) and China (Ishii *et al*. 2009). Since 1986, sterol demethylation inhibitors (DMIs), such as triflumizole, bitertanol, fenarimol, hexaconazole, fenbuconazole, difenoconazole and others have been introduced into Japan for the control of pear scab, and have replaced benzimidazoles for this purpose. Subsequently, the pathogen developed resistance to DMIs as well (Kikuhara & Ishii, 2008; Ishii, 2012). DMI resistance has also been reported in the Republic of Korea (Kwon *et al*. 2010).

Phytosanitary risk

V. nashicola is undoubtedly of considerable economic importance on Asian pears, but its significance for the EPPO region is questionable now that it has been demonstrated that *P. communis* is not a host of *V. nashicola.* EFSA (2017) notes that the impact at the EU level is expected to be limited because Asian pears are not major crops in the EU but that the impacts of the pathogen to individual growers and enterprises could be significant. If the pathogen was introduced in the EPPO region, it could establish on Asian pears as the climate is likely to be suitable.

PHYTOSANITARY MEASURES

Phytosanitary measures, in particular for host plants for planting, may be justified in countries where Asian pears are

important crops. Biosecurity New Zealand (2009) estimated that the likelihood of introduction of *V. nashicola* with fruit is low as the fungus could only spread from an infected fruit to an orchard if infected fruit is disposed underneath or in the immediate vicinity of a nashi tree or orchard.

EFSA (2017) suggest the following mitigation methods to prevent the introduction of *V. nashicola* into the EU: host plants for planting (including plants at dormant stage) and fresh fruit should be imported from pest-free areas or pest-free places of production and inspected both at the place of origin and at the EU entry point. Biosecurity New Zealand (2009) and USDA (2009) recommend that fruit comes from a pest-free area or a pest-free place of productions, or that fruit lots are inspected for symptoms before export.

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Datasheet history

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CABI/EPPO (1992/1997) *Quarantine Pests for Europe (1st and 2nd edition)*. CABI, Wallingford (GB).

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