EPPO Datasheet: *Neofusicoccum laricinum*

Last updated: 2021-12-15

IDENTITY

Preferred name: *Neofusicoccum laricinum*
Authority: (Sawada) Y. Hattori & C. Nakashima
Taxonomic position: Fungi: Ascomycota: Pezizomycotina: Dothideomycetes: Botryosphaeriales: Botryosphaeriaceae
Other scientific names: *Botryosphaeria laricina* (Sawada) Shang, *Guignardia laricina* (Sawada) Yamamoto & K.Ito, *Physalospora laricina* Sawada
Common names: shoot blight of larch, twig die-back of larch
view more common names online...
EPPO Categorization: A2 list
view more categorizations online...
EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: GUIGLA

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HOSTS

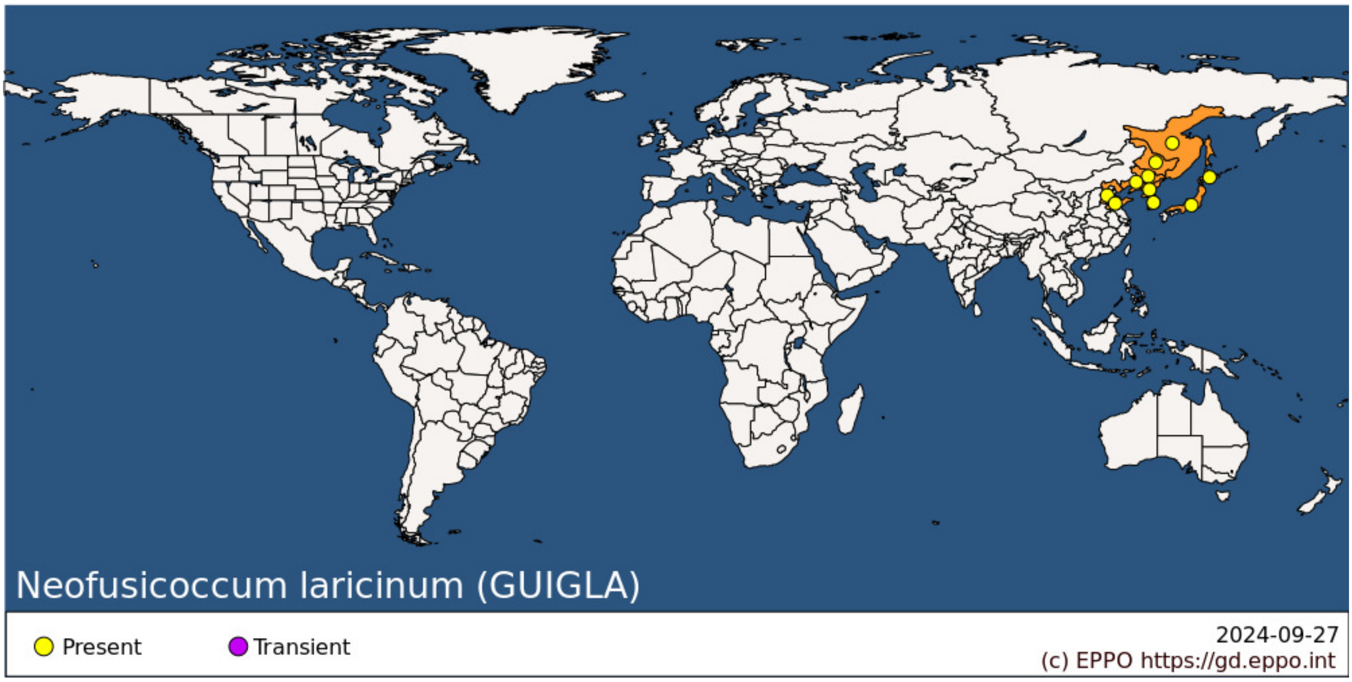
The principal hosts of *Neofusicoccum laricinum* are *Larix* spp. The most susceptible ones are *L. decidua*, *L. laricina* and *L. occidentalis*. Intermediate resistance has been observed on *L.* x *eurolepis* and *L. kaempferi*. Resistance has been shown on *L. gmelinii* and *L. olgensis* var. *koreana*. The only other host in nature is *Pseudotsuga menziesii*. Many other conifers can be infected by artificial inoculation. For additional information, see Sato & Shouji (1962), Sato *et al.* (1963), Ito (1963), Imazeki & Ito (1963), Oguchi (1970), Sato *et al.* (1971).

L. decidua is widely distributed in Europe at various altitudes (e.g. in the Alps and also in the Polish plains). *L. leptolepis* is also planted in the EPPO region. *Pseudotsuga menziesii* is an important forest tree.

Host list: *Larix decidua*, *Larix gmelinii var. japonica*, *Larix gmelinii var. olgensis*, *Larix gmelinii var. principis-ruprechtii*, *Larix gmelinii*, *Larix kaempferi*, *Larix laricina*, *Larix occidentalis*, *Larix sibirica*, *Larix x eurolepis*, *Pseudotsuga menziesii*

GEOGRAPHICAL DISTRIBUTION

N. laricinum is reported from East Asia, i.e. Eastern China, Japan, the Korean Peninsula and the Russian Far East.



EPPO Region: Russia (Far East)
Asia: China (Hebei, Heilongjiang, Jilin, Liaoning, Shandong), Japan (Hokkaido, Honshu), Korea Dem. People's Republic, Korea, Republic

BIOLOGY

The biology of *N. laricinum* has mainly been studied in Japan (Uozomi, 1961; Yokota, 1966; Sato *et al.*, 1971).

The asexual morph appears in abundance on the underside of needles and on young sprouts between July and November, and spores are dispersed by insects or rain. During this time, the pycnidiospores are released and give rise to secondary infections in late summer. Discharge of conidia occurs between 10 and 35°C (25°C optimum) and was observed to occur at 98% RH. A few spores in their pycnidia can overwinter until the following April.

The sexual morph appears on branches after October. The black pseudothecia, which occur in groups or singly, take 2 years to develop. Ascospores released between May and October (peak July-August) are the source of primary infections. Optimum temperature for infection is 20°C with free water. Ascospores can infect host plants throughout the season, but do so principally at the beginning of August; wounds do not appear necessary for penetration. Disease symptoms appear about 2 weeks after infection. Some spores may overwinter in the pseudothecia. Cool winters and short summers do not favour the disease.

DETECTION AND IDENTIFICATION

Symptoms

The disease is conspicuous as discoloration, wilting and death of the succulent current season's growth. Old twigs remain unaffected. Early attack, visible between June and September, causes hanging-down of the top of shoots, accompanied by a yellowing and browning of needles which may fall. The needles at the tops of shoots turn brown and often remain on the tree during winter. Dark, sunken lesions, abundant in sporulating bodies, and exuding resin appear on the stems of affected seedlings and on shoots, and usually girdle these parts. The resin hardens into whitish drops. Late infections, occurring in September to early October, do not show the characteristic hanging-down, owing to the lignified nature of the twigs. On needles, symptoms appear as brown spots with chlorotic haloes, which subsequently coalesce. Repeated infections result in stunted, bushy trees with many dead shoots.

For additional information, see Imazeki & Ito (1963), Ito (1963), Sato *et al*. (1971).

Morphology

Sexual morph: Diseased twigs defoliated from the middle to the tip, with exudate resin. Fruit bodies lined, erumpent. Ascomata epidermal, blackish, globose, 368 ?m diam; ostiole erumpent, 60 ?m diam; paraphyses developed, intricate, 3 ?m. Ascus clavate, rounded at the apex, stipitate at the base, hyaline, 114–135 × 22–26 ?m. Ascospores ellipsoid, smooth, hyaline, 24–27 × 13 ?m (Sawada, 1950).

Asexual morph: Conidiomata pycnidial, epidermal, merged, solitary, globose, dark brown, subglobose, unilocular, with a central ostiole, 204–246 × 207–212 ?m; pycnidial wall composed of depressed or irregular cells in three to four layers, brown to dark brown. Conidiophores reduced to conidiogenous cells; conidiogenous cells discrete, hyaline, cylindrical to ampulliform, determinate, with periclinal thickening, or proliferating percurrently, 9–23 × 2.4–5 ?m. Paraphyses not seen. Conidia holoblastic sporulation for first conidia, phialidic sporulation for following conidia, hyaline, smooth, aseptate, slightly colored and septate with age, ellipsoid to fusiform, granulate, subtruncate to bluntly rounded at the base, rounded to subacute at the apex, with a short frill at both ends, 23–38 × 7–12 ?m, 29.85 × 8.50 ?m on average, L/W = 3.57 (Hattori *et al*. 2021).

Detection and inspection methods

The fungal fruiting bodies may be observed directly or isolated and cultured on a medium containing 3 g yeast extract, 10 g soluble starch, 0.25 g $MgSO_4$ $7H_2O$, 15 g agar in 1 L distilled water, maintained at 20°C (Hara & Ito, 1963; Ito, 1963). To identify species in the genus *Neofusicoccum*, it is now essential to use molecular phylogenetic analysis using the regions of rDNA ITS, rpb2, tef1-?, and tub2. The deposit numbers for each ex-epitype (FFPRI 411215 = MUCC 2662) sequence are LC589129 for ITS, LC589140 for tef1, LC589151 for tub2, LC589164 for rpb2 (Hattori *et al*., 2021).

PATHWAYS FOR MOVEMENT

Under natural conditions, *N. laricinum* spreads by dispersal of ascospores and conidia. In international trade, spread is possible on diseased host trees, including artificially dwarfed plants. Cut branches may also be a possible pathway (EFSA, 2018). Pollen or seed is unlikely to harbour the pathogen.

PEST SIGNIFICANCE

Economic impact

N. laricinum caused the most serious disease of *Larix* forests and nurseries in Japan. It had long been known locally, but started to cause large-scale damage in *Larix* plantations after 1959 - at which time, areas planted with *Larix* were increasing rapidly. In 1963, more than 80 000 ha of plantations were diseased, with 100% of the trees affected. Although young diseased trees do not usually die, their subsequent growth is retarded or stopped. *N. laricinum* causes severe damage in areas with strong winds, but after changing the tree species planted in these areas and using appropriate management measures, this disease is now under control.

Control

In Japan, chemical control is applied against this disease (Oguchi, 1980; Okada, 2000). In addition, intensive testing of disease-resistant clones and observation of their growth in forest plantations has been carried out (Oguchi, 1963; Sato, 1970; Kobayashi, 1980).

In nursery fields, fungicides can be applied every 2 weeks during the infection period (June to September). In highly infested nurseries, dipping of *Larix* seedlings into fungicide solution in spring is also used. In forest plantations, it is important to avoid bringing in diseased seedlings. When the disease is not widespread, early detection is important to eradicate the disease. If damage is widespread, it is necessary to reduce the density of the pathogen by prioritizing the felling of diseased trees during thinning. Removal and burning of the infected trees and reforestation by other species are also carried out in heavily diseased stands.

Phytosanitary risk

In the EPPO region, *N. laricinum* could be potentially dangerous to *Larix* and *P. menziesii*, wherever present. Considering the distribution of *N. laricinum* in East Asia, climatic conditions prevailing in Europe are assumed not to be a limiting factor (EFSA, 2018).

PHYTOSANITARY MEASURES

Considering the risk that this fungus could present to the EPPO region it is recommended that all countries should prohibit importation of plants for planting and cut branches of *Larix* and *P. menziesii* from countries where *N. laricinum* this fungus occurs.

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 1978, revised in the two editions of 'Quarantine Pests for Europe' in 1992 and 1997, as well as in 2021. 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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