

## *Valsa mali* Miyabe et Yamada, the Causal Fungus of Apple Tree Canker in East Asia

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In this paper, the distribution, host restriction, and taxonomic position of *Valsa mali* are discussed.

**KEYWORDS:** Apple tree, Canker, *Valsa mali*

The fungal parasites causing canker of apple trees are very diverse; *Valsa* spp., *Leucostoma personii* Höhn, *Nectria* spp., *Botryosphaeria* spp. and some other fungi (Farr *et al.*, 1989; Landis and Hart, 1967; Leonian, 1921; Nichols and Wilson, 1956; Powell and Naik, 1971; Roberts, 1935). During field investigation in 1999, we usually observed a species of *Valsa* (Ascomycota, Diaporthales, Valsaceae) on dead and detached branches of apple trees in various locations of Korea and the Primorsky Territory in the Russian Far East. It was tentatively identified as *Valsa mali* Miyabe et Yamada described from Japan. A great number of apple trees throughout Hokkaido and the Northern provinces of Japan were known to be severely affected with a canker disease caused by this fungus (Togashi, 1924). The fungus was also reported in Korea (Nakata and Takimoto, 1928) and China (Chen *et al.*, 1987). The reports on distribution suggest that *V. mali* infects cultivated apple trees (*Malus* spp.) and occurs in certain areas of East Asia including Korea, northern Japan, some provinces of China and the south extreme of the Russian Far East (Chen *et al.*, 1987; Nakata and Takimoto, 1928; Togashi, 1924; Vasilyeva, 1998). The whole region of distribution may correspond to the fragment of ancient Tertiary floras that is characterized by the very unique species of vascular plants (Fig. 1), and we may expect the peculiar fungal species in this area too.

Unfortunately, there have been some confusion about the fungal name, *V. mali* in the literatures. In Nakata and Takimoto's list (1928) of crop diseases in Korea, *V. mali* was described that the size of asci was 20~30 × 5~8 μm, and ascospores and pycnidiospores had the similar size, 7~10 × 1.0~1.5 μm in the list. Ryu *et al.*, (1993) recorded *V. mali* as a synonym of *V. ceratosperma* (Tode : Fr.) Maire in a compendium. The authors of the compendium followed Kobayash's treatment (1970) that seems to be warranted because available descriptions of *V. mali* (Ideta, 1909; Tanaka, 1919; Togashi, 1924) show asci and ascospores comparable with those in *V. ceratosperma*. Maybe, this also explains Japanese

reports on *Valsa* canker of apple trees as caused by *V. ceratosperma* (Shioiri *et al.*, 1981; Mizuno and Kumagai, 1981, 1982). However, the latter species is very common on various plants and may be found on *Malus* spp. too. However, it occurs most often in forests where the vegetation was destroyed by fire. Besides, *V. mali* differs from *V. ceratosperma* in characteristics of a cluster of beaks penetrating and sometimes obscuring the disk (Spielman, 1985).

In Vasilyeva's monograph (1998), *V. mali* was indicated as a synonym of *V. acclinis* (Fr.) Fr. which was reported in the Russian Far East (Ablakatova, 1965). However, it was a suspicion that *V. mali* was a synonymous species of *V. acclinis* (Vasilyeva, 1998), but now it is considered that *V. mali* is an independent species with its own and very peculiar area. *V. acclinis* on *Malus* sp. described from Europe (De Notaris, 1863) is poorly known species.

In characters of stromata, *V. mali* is similar to *V. sordida* Nitschke that occurs on *Populus* spp. and *Salix* spp. Surely, these two species are closely related because *V. mali* has pathogenicity to the species of *Populus* and *Salix* under favorable conditions (Togashi, 1924). It should be also emphasized that Gvritishvili (1973) described the anamorph of *V. mali* as *Cytospora orientis-extremi* Gvrit. (Fig. 2) and noted that it is most closely related to *C. chrysoesperma* (Pers. : Fr.) Fr., the anamorph of *V. sordida* Nitschke. However, *V. mali* has smaller asci and ascospores than those of *V. sordida*. Besides, *V. mali* always has black ectostromatic disk surrounded by black semiglobous apices of perithecial beaks, whereas *V. sordida* is usually characterized by a whitish gray ectostromatic disk.

It was reported that *V. mali* was described by Takahashi and Okamoto in the Circular of the Hokkaido Agricultural Experimental Station (Tanaka, 1919). Nevertheless, it was accepted that the authors of the species were Miyabe and Yamada because the latter published this name in 1903 (Togashi, 1924), although the original description was usually cited as that in Ideta's report (1909). In fact, the name was invalidly published because even the latter description was written in Japanese, not in Latin as necessary for the

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Fig. 1. The tentative area of distribution of *Valsa mali* in East Asia.

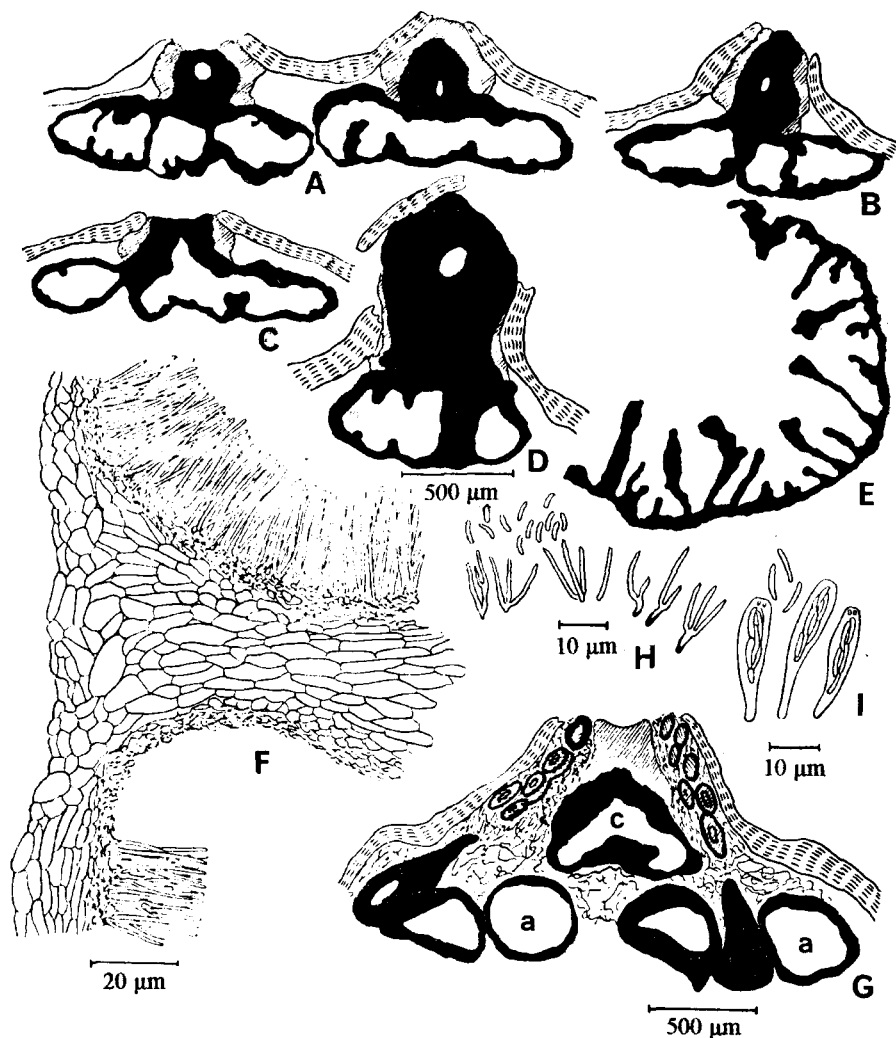
validation of species. Besides, no type specimen of *V. mali* is available and even the type locality is not given (Tanaka, 1918). In view of these circumstances, it seems appropriate to designate the neotype and to re-describe the species as follows:

*Valsa mali* Miyabe et Yamada in Ideta, *Handbook of the Plant Diseases of Japan*, 1: 295, 1909, emend. L. N. Vasilyeva and W. G. Kim.

Pustulae ramicola, immersa, 0.5–1.0 mm diam.; disci ectostromatici nigri; perithecia globosa, circinata, nigra, 100–

200  $\mu\text{m}$  diam., colli elongati, nigri, 200–300  $\mu\text{m}$  longi, apice rodundati. Asci numerosi, clavati, 20–32  $\times$  (5–)6–9(–10)  $\mu\text{m}$ , paraphysati, 8-spori. Ascospores unicellulae, allantoideae, hyalinae, aggregate, 4–8  $\times$  1–2  $\mu\text{m}$  (Fig. 2, G and I, and Fig. 3, A, C, D and E).

Pustules on bark, immersed, 0.5–1.0 mm diam., ectostromatic disk black; perithecia globose, 100–200  $\mu\text{m}$  in diameter, with elongated necks up to 200–300  $\mu\text{m}$  long, rounded at black tops and surrounding ectostromatic disk in a circinate manner. Asci numerous, clavate, 20–32  $\times$  (5–)6–9(–10)



**Fig. 2.** *Valsa mali* and its anamorph, *Cytospora orientis-extremi* (after Gvritshvili, 1973). A-D, longitudinal sections of the anamorph stromata; E, a transverse section of the anamorph stromata; F, a part of inner wall of a stroma with conidiophores; G, a transverse section of an ascogonic stroma with ascomata (a) and a conidial cavity (c); H, conidiophores and conidia; I, asci and ascospores.

μm, paraphysate, 8-sporous. Ascospores one-celled, allantoid, hyaline, 4~8 × 1~2 μm.

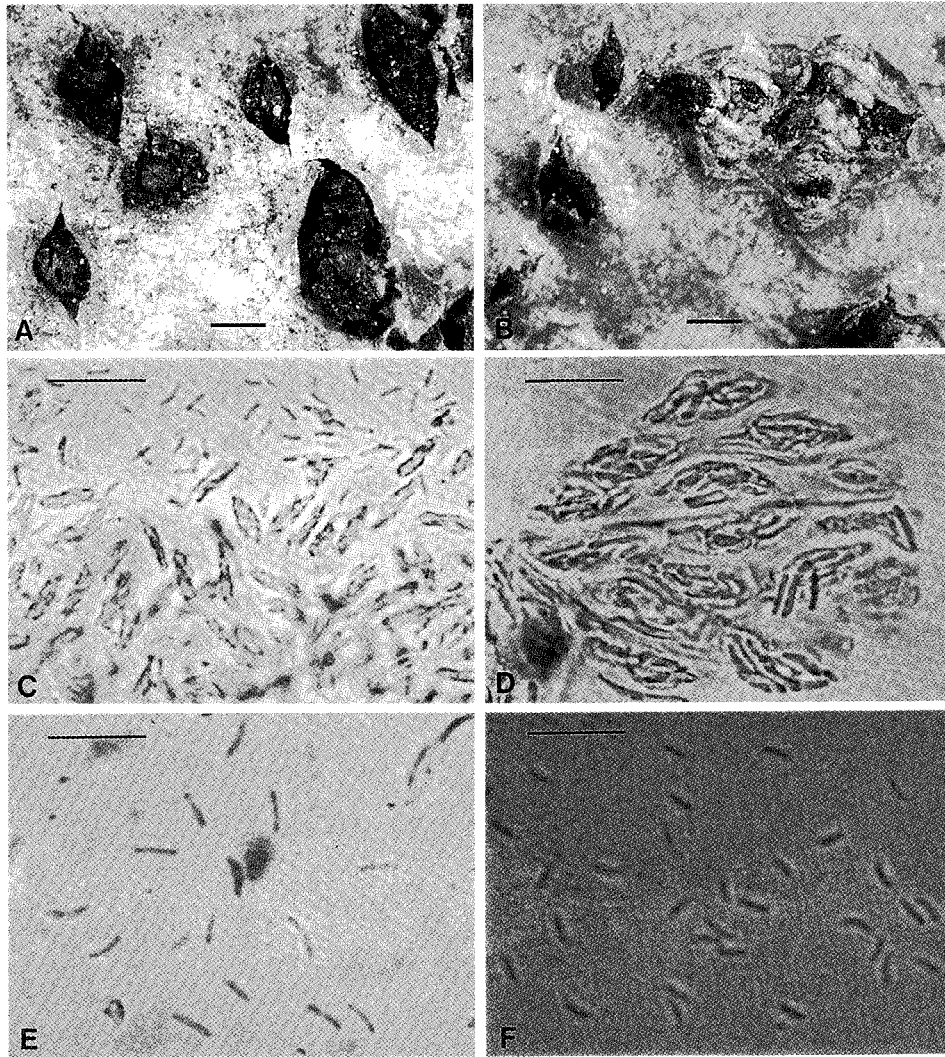
Neotype: Russia, Primorsky Territory, Vladivostok vicinity, on dead branches of cultivated *Malus* sp., February 5, 1984, deposited at the Herbarium of the Institute of Biology and Soil Science, Far East Branch of the Russian Academy of Sciences (VLA).

**Anamorph: *Cytospora orientis-extremi* Gvrit., Mikologiya i fitopatologiya, 7: 546, 1973.**

Stroma on bark, immersed, black, conical, more or less elevating periderm, 0.8~1.5 mm diam., ectostromatic disk prominent, with a single central porus. Cavity simple or imitates a multiloculate condition. Conidiophores simple or slightly branching, hyaline, up to 22.5 μm long and 2 μm wide. Conidia allantoid, hyaline 4~7 × 0.8~1.2 μm (Fig. 2, A-H, and Fig. 3, B and F).

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**Fig. 3.** Morphological features of *Valsa mali* detected from stems of apple trees. A, ascomata in stromata (scale bar = 500  $\mu\text{m}$ ); B, pycnidia of the anamorph in stem cuticles (scale bar = 500  $\mu\text{m}$ ); C, asci and ascospores (scale bar = 30  $\mu\text{m}$ ); D, asci including ascospores (scale bar = 15  $\mu\text{m}$ ); E, ascospores (scale bar = 15  $\mu\text{m}$ ); F, pycnidiospores (scale bar = 15  $\mu\text{m}$ ).

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