Scab of Pyracantha, Loquat, Toyon, and Kageneckia

Robert D. Raabe and M. W. Gardner

Professor and Professor Emeritus, respectively, Department of Plant Pathology, University of California, Berkeley 94720.

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ABSTRACT

Typical scab symptoms resulting from infection by a species of *Spilocaea* were found on plants of *Kageneckia oblonga*. Cross inoculations with *Spilocaea* conidia from toyon, loquat, pyracantha, and kageneckia were successful. Because of this, and because the conidia and conidiophores are morphologically similar, the scab fungus on these plants should be known as *Spilocaea pyracanthae* (Otth) v. Arx.

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Additional key words: Heteromeles arbutifolia, Eriobotrya japonica, Pyracantha coccinea, Spilocaea eriobotryae, Fusicladium photinicola.

Two plants of *Kageneckia oblonga* Ruiz & Pav., a Chilean rosaceous tree, in the University of California Botanical Garden in Berkeley were found to be infected with a species of *Spilocaea*. Typical scab lesions resulting from spread of the subcuticular hyphae were found on both leaf surfaces, petioles, calxy lobes, petals, stamens, pedicels, and capsules. Defoliation as a result of infection was so severe that one of the trees died. Inasmuch as scab of toyon, *Heteromeles arbutifolia* Roem., and of loquat, *Eriobotrya japonica* (Thunb.) Lindl. are common in the area, cross inoculations were made and, as was previously reported (8), scab on *K. oblonga*, loquat, and toyon results from infection by a single species; on the basis of priority, the name of the fungus should be *Spilocaea eriobotryae* (Cav.) Hughes.

Although pyracantha, *Pyracantha coccinea* Roem., is commonly grown in the area and frequently is infected with scab, initial inoculations of pyracantha were not successful (8). As conidiophores, conidia, and growth in culture of the fungus from pyracantha were similar to those of the fungus from loquat, toyon, and kageneckia, many additional inoculations were made, both out of doors and in the greenhouse.

In the field, inoculations were made during the winter and spring months over a period of 4 years. Conidial suspensions were made from infected leaves and were sprayed with a hand atomizer on the new growth of desired plants just prior to periods of high humidity and rain. Minimum temperatures during the rainy periods ranged from 6 to 9 C, whereas maximum temperatures ranged from 10 to 17 C. Symptoms appeared within 3 to 5 weeks. Leaf infections on loquat resulted with use of conidia from kageneckia, toyon, and pyracantha; infections on pyracantha resulted with conidia from loquat and toyon; leaf infections on toyon resulted with conidia from loquat; and inflorescence and fruit infection of loquat resulted with conidia from kageneckia.

Conidia produced in culture on potato-dextrose agar were partially embedded in the agar and were difficult to obtain free from the medium. Such conidia, from an isolate originally from loquat, when painted on with a brush, infected toyon leaves.

In the greenhouse, inoculations were made in a moist chamber regulated at ca. 15.5 C. Conidial suspensions were made by the brushing of the conidia from infected leaves submerged in distilled water. In inoculation, conidial suspensions were atomized on desired plants. After 2 days in the moist chamber, plants were put in a greenhouse at 15.5 C. Symptoms began to appear within 15 days and by 21 days, symptoms and signs were well developed. Most inoculations were successful though some were not, particularly on pyracantha. Most significant, however, were two cross inoculations in which conidia from kageneckia, loquat, toyon, and pyracantha were used successfully to inoculate and infect all four hosts.

In greenhouse inoculations, young rooted cuttings or seedlings were used. Only young leaves and twigs were susceptible. Plants grown in a lath house were more susceptible than those grown in the greenhouse. This was particularly true of pyracantha, the leaves of which tended to mature rapidly making it difficult to infect.

In the inoculation experiments, *Pyracantha coccinea* Roem., *P. coccinea* Roem. var. *lalandii* Dipp., *P. coccinea* Roem. 'Wyatti', *P. atalantioides* (Hance) Stapf., *P. crenato-serrata* Rehd., and *P. crenulata* Roem. var. *rogersiana* A. B. Jackson were susceptible. The island toyon, *Heteromeles arbutifolia* Roem. var. *macrocarpa* (Munz) Munz, was more susceptible than the common toyon. Apple, *Malus sylvestris* Mill., and pear, *Pyrus communis* L., were not susceptible to this fungus. *Kageneckia angustifolia* D. Don also was not susceptible. The fact that a tree of this species growing several years near heavily infected *K. oblonga* trees was not infected confirmed this conclusion. Toyon, loquat, and pyracantha failed to become infected when inoculated with a *Spilocaea* from *Sorbus*.

Although Otth was given credit for first naming the fungus, he was not the first to describe the disease. Berkeley (3) in 1848 described a disease on pyracantha resulting from infection by a *Cladosporium*. He gave no species name, but indicated that it was the same fungus which injured

pear. He was in contact with Desmaziers (6), who in 1849 described a fungus on *Crataegus pyracantha* and *Sorbus domestica* as *Cladosporium orbiculatum*. Later, Berkeley (4) listed a fungus on the leaves of *Pyracantha* as *Cladosporium dendriticum* Wallr. β *orbiculatum* Desm. Saccardo (13) listed *Fusicladium dendriticum* (Wallr.) Fuck. var *orbiculatum* as occurring on *Sorbus terminalis, S. aucuparia,* and *Crataegus pyracanthae*. Von Thümen had already separated them as two distinct fungi and classified the fungus on *Sorbus* as *Fusicladium orbiculatum* (Desm.) Thüm. (16) and classified the fungus on pyracantha as *Fusicladium pyrinum* Fuck. var. *pyracanthae* Thüm. (17). The fungus on *Sorbus* sp. was eventually classified as *Venturia inaequalis* (Cooke) Ad. var. *cinerascens* Fuck. by Aderhold (2).

The binomial *Fusicladium pyracanthae* presumably was first used in a paper by Aderhold (1) in which he credited its use to von Thümen. Rostrup (12) also used the same binomial crediting von Thümen, but when Bubak (5) published some of the fungi in Rostrup's herbarium, he listed the fungus as *Fusicladium pyracanthae* (Otth) Rostrup. Gram & Weber (9) also used the binomial, but gave credit to von Thümen. A search of all available papers of von Thümen did not reveal his use of this binomial.

The change of the genus name was made by Hughes (11), who showed that on the basis of type species, the fungi in this group having conidiophores with annellations belong in the genus *Spilocaea*, whereas those with denticulate conidiophores are in the genus *Fusicladium*. Included in the resulting changes was that of *Fusicladium eriobotryae* (Cav.) Cav. to *Spilocaea eriobotryae* (Cav.) Hughes. Shortly after, von Arx (15) changed the name of the fungus on pyracantha to *Spilocaea pyracantha* (Otth) v. Arx. All of the synonomy reported here is based upon a survey of the literature listed.

Inasmuch as field and greenhouse inoculations have shown that the fungus from kageneckia, loquat, toyon, and pyracantha cross-inoculated, and as the conidia and conidiophores are morphologically similar, the fungi from all these host plants are identical and should be grouped under a single name. As the fungus was apparently first described on pyracantha, the name should be *Spilocaea pyracanthae* (Otth) v. Arx (15). The synonomy of the fungus is as follows:

Passalora pyracantha Otth. Mitt. naturf. Ges. Bern 1868:37-88. (1869).

Fusicladium pyrinum Fuck. var. *pyracanthae* Thüm. Myco. Univ. N° 874. (1877).

Fusicladium dendriticum var. *pyracanthae* Thüm. Hedwigia 18:153-156. (1879).

Fusicladium pyracanthae (Otth) Rostrup. Hedwigia 52:265-273. (1912).

Fusicladium pyracanthae (Otth) Viennot-Bourgin. Rev. Mycol. 6:147-155. (1941).

Basiascum eriobotryae Cav. Atti. Ist. Bot. di Pavia Ser. II v. 1:425-436. (1888).

Fusicladium eriobotryae (Cav.) Br. & Cav. I funghi parasitti della piante coltv. od utili Esiccate, delineati e descritti No. 186. (1891).

Fusicladium dendriticum (Wallr.) Fuck. var. *eriobotryae japonicae* Scalia. Boll. Accad. Gioenia di Sci. Nat. in Catania 70:15-19. (1901).

Fusicladium dendriticum (Wallr.) Fuck. var. *eriobotryae* (Scalia) Ferraris. Ann. Mycol. 7:273-286. (1909).

Fusicladium melanconioides Ferraris. Ann. Mycol. 7:273-286. (1909).

Spilocaea eriobotryae (Cav.) Hughes. Can. J. Bot. 31:560-576. (1953).

Fusicladium photinicola McClain. Phytopathology 15:178-182. (1925).

DISCUSSION.—Of the three species most commonly infected with this fungus in California, only the toyon is a native plant. Pyracantha and loquat were commonly grown in Europe, and when these plants were introduced, the fungus apparently was introduced with them. From them it presumably spread to toyon and later to the introduced kageneckia. Harkness listed as No. 2617X in his collection, which was later destroyed by fire: "*Cladosporium dendriticum* var. *heteromeles* Hark. on *Heteromeles arbutifolia*, Golden Gate Park, J. 1881." In 1883, Harkness (10) attributed the toyon scab as well as the apple scab and pear scab to *Fusicladium dendriticum*.

The scab fungus on loquat was first reported in California in 1909 (14). According to University of California Department of Plant Pathology records, the first collection of scab on kageneckia was made by H. Earl Thomas in Golden Gate Park on September 21, 1933.

In the descriptions of this fungus, only the conidial stage is reported and in many, the sexual stage is listed as not forming. D'Oliviera & D'Oliviera (7), however, reported finding immature perithecia in loquat leaves, and as a result named the fungus *Venturia eriobotryae* (Cav.) D'Oliviera. A search for the perfect stage here has been unsuccessful. Inasmuch as all the listed hosts are evergreen plants, the need for a perfect stage in its life cycle is diminished, thus helping to explain the difficulty in finding it.

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