A canker of western flowering dogwood caused by *Sclerophoma ambigua* n. sp.

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Sclerophoma ambigua Funk and Parker, n. sp., is described from diseased flowering dogwood (*Cornus nuttallii* Audubon) in British Columbia, Canada. The canker disease is described and discussed; evidence of pathogenicity of the fungus is presented. The fungus is also associated with dieback of branch tips.

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Les auteurs donnent une description de ***Sclerophoma ambigua*** Funk et Parker, n. sp., récolté sur des cornouillers du Pacifique (*Cornus nuttallii* Audubon) malades, en Colombie britannique. Une description du chancre observé et la preuve qu'il est causé par ce champignon sont aussi présentées, aussi bien qu'une discussion à ce propos. Cette espèce est aussi impliquée dans le dépérissement terminal des rameaux.

Introduction

A problem of stem cankering of mature flowering dogwood (*Cornus nuttallii* Audubon), commonly resulting in the death of the tree, exists in southwestern British Columbia, Canada. The disease is frequently associated with land clearing where dogwoods are preserved for ornamental purposes. Undisturbed, forest-grown trees are rarely affected nor are open-grown trees, even though in residential and exposed areas.

The cause of the disease was first investigated in 1952, when cultural isolations were made from cankers in southern Vancouver Island. These studies yielded a fungus which characteristically produced large quantities of a yellow-red crystalline substance in culture. Subsequently, numerous other cultural studies in canker outbreaks have yielded this fungus. Collections were also made of dying twigs and branches of dogwood that exhibited signs and symptoms of fungal attack, and a pycnidial fungus was usually found fruiting on them. Cultures made from the conidia of this fungus yielded the same crystal-producing colonies.

This report presents some etiological factors of disease development and describes the associated fungus. Evidence of the pathogenicity of the fungus is shown by artificial inoculations.

Etiology

CAUSAL FUNGUS

Sclerophoma ambigua Funk et Parker, sp. nov. Figs. 1, 2, 5

Fungi Imperfecti, Sphaeropsidales

Pycnidia erumpentia, subglobosa vel discoidea, atro brunnea, 150–700 μ diametro, 100–200 μ alto, uniloculata vel multiloculata et labyrinthiformia, ostiolo absentis sed in parietibus apicali aparientibus; phialides globosae, ex cellulis interioribus parietis pycnidiorum formatae; phialoconidia hyalina, continua vel nonnunquam uniseptata, oblonga vel irregularia, 4–10 × 2.5–4 μ.

Hab. in rami *Corni nuttallii* Aud. in parte regionis austro-occidentalis, "British Columbia, Canada." Typus DAVFP 20200.

Pycnidia erumpent, subglobose to discoid, dark brown, 150–700 μ diam, 100–200 μ high, uniloculate or multiloculate and labyrinthiform, ostiole absent but upper wall disintegrating for spore discharge; phialides globose, formed from cells lining inner wall of pycnidium; phialoconidia hyaline, continuous or occasionally uniseptate, oblong or irregular, 4–10 × 2.5–4 μ.

TYPE: DAVFP 20200 on branches and stems of *Cornus nuttallii* Aud. Brentwood Bay, B.C., 4 May 1970.

SPECIMENS EXAMINED: CANADA: British Columbia: (all numbers refer to specimens deposited in Herb. DAVFP) Cordova Bay, 20201; Haney, 20202, 20203, 16967; Hatzic, 20074.

In the Dearness herbarium now in Ottawa (DAOM) there is a record of a specimen on cankered dogwood from Vancouver, B.C. (No. 8896). The fungus was named '*Phoma cancri*' by Dearness but this name was never published. The specimen is missing but the brief description

on the packet indicates that it was probably *Sclerophoma ambigua*.

The fungus conforms well to the genus *Sclerophoma* in pycnidium type (i.e., thick-walled, no distinct ostiole) and method of conidium production (i.e., globose phialides lining inner wall) (Sutton 1964) but differs slightly in that uniseptate conidia are occasionally produced, and in culture it does not produce *Aureobasidium*-type growth. The genus *Sclerophoma* is considered by some to be synonymous with *Dothichiza* (von Arx 1970).

The pycnidia of *Sclerophoma ambigua* vary considerably in size and shape, depending on the substrate. In young twigs, pycnidia are usually small and rounded with a uniform locule. In mature bark, the pycnidia become large and discoid with irregular labyrinthiform locules.

Cultural Studies

Colonies growing on 2% malt agar at 15–20C attain a diam of about 7 cm in 2 weeks; the surface is covered with floccose, whitish-tan mycelium, margin even, reverse brown with pale brown diffusion zone. Many hyphae contain dense yellow contents and enlarged cells (14 μ). Yellow to red crystalline material appears in the agar in the form of needles or rosettes. Pycnidia with typical conidia may form after the colony matures in 2–5 weeks.

Optimum temperature for conidial germination and mycelial growth is about 15–20C. Although conidia do not germinate at room temperature (22–23C), growth does occur at this temperature if conidia have been germinated at 15C, but the appearance of the colony is quite different; at room temperature the colony is covered with low, yellowish-green aerial mycelium and a faint reddish zone appears in the agar, whereas at 15C, the colony is covered with floccose, tan-colored aerial mycelium.

ENVIRONMENTAL FACTORS

The badly cankered trees are most frequently found and reported on recently cleared building sites where the dogwoods have been preserved for ornamental trees. The removal of the surrounding vegetation has several effects on the dogwoods that could promote disease development. First, the increased exposure of the dogwoods to sun and wind probably increases transpiration to an excessive point where the tree, at times, becomes partially desiccated. Bier (1959) and Bloomberg (1962) have documented the correlation between canker development and bark moisture for other native hardwoods. Second, there is the possibility of increased soil temperature with a change in surface moisture conditions. Edaphic changes, due to drainage and construction, may also determine rapidity of development of moisture stress. Third, there is the direct action of sun on unacclimatized bark tissues. Direct sunscald of bark is known to permit entry of pathogenic fungi (Riley 1948) in poplars. These factors could render the tree more susceptible to invasion by weakly pathogenic fungi. While no experimental data have been obtained to show quantitatively that these conditions are actually produced, the often repeated picture in newly developed areas supports this hypothesis.

Release of dogwoods by a gradual thinning process might result in lower incidences of the disease by providing additional time for the trees to adapt.

Shoot and Branch Dieback

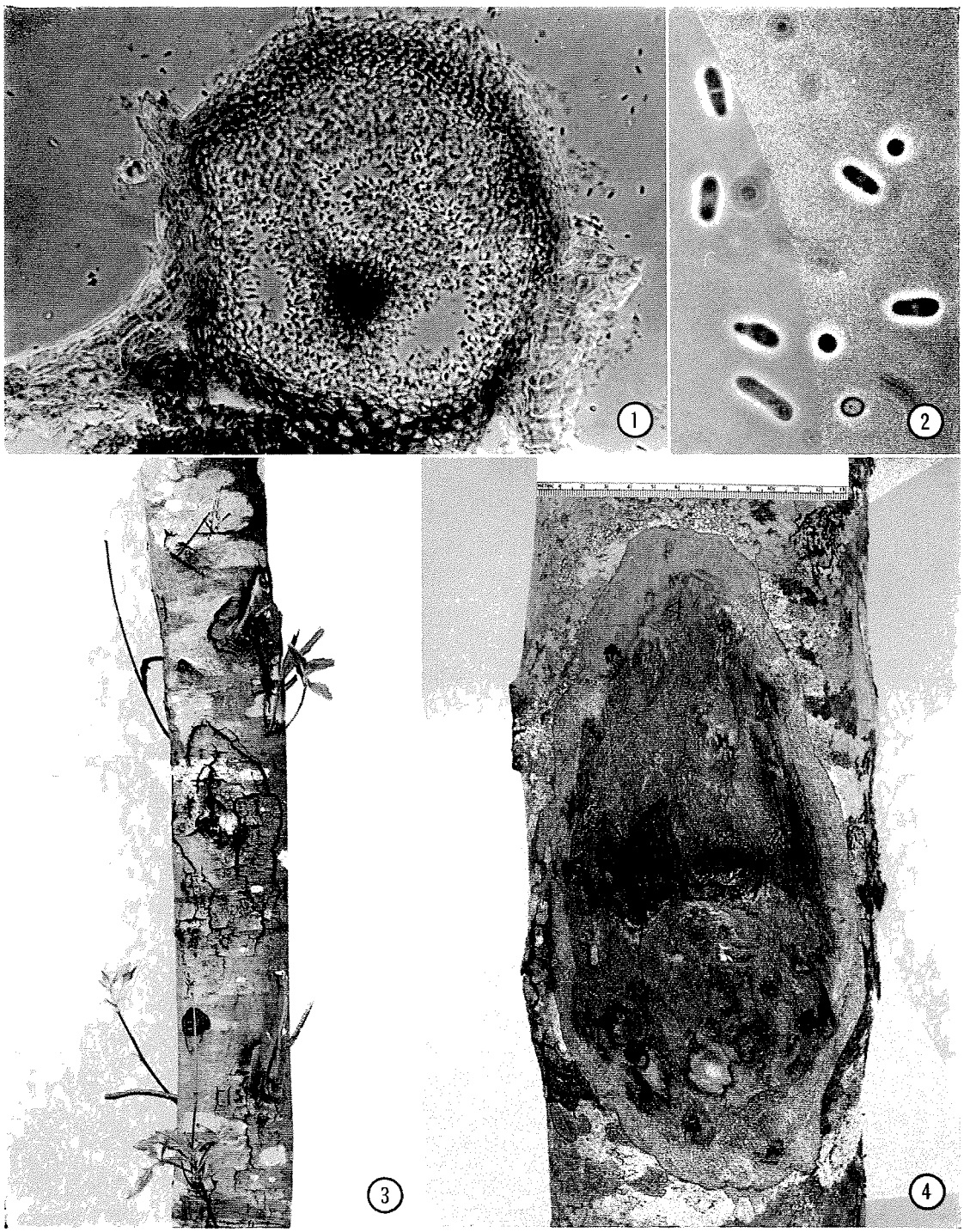
A very common condition of suppressed branches and epicormic shoots or suckers is the limited dieback of their tips. This condition occurs in healthy forest-grown trees as well as in those in developed areas, and may have no deleterious effects. Sometimes, however, stem cankers are formed around the base of dead epicormic shoots, which suggests that the fungus progressed into the mainstem from the infected shoot (Fig. 3).

While dieback probably causes negligible damage to the tree if confined to small branches, it possibly forms the chief source of inoculum of *Sclerophoma*. The conidial state of the fungus is frequently produced in dead shoots and is present in a viable form throughout most of the year.

SYMPTOMS

Young cankers appear as slightly sunken areas in the bark but, in older cankers, the bark is characteristically dead and cracked in the center, adhering loosely to the wood; beyond the cracked bark is a broad necrotic zone extending into the healthy bark. Beneath the canker, the wood is usually stained grayish-brown to a depth of 1 cm or more.

Cankers may occur at any height and may vary in length from a few centimeters to several



FIGS. 1, 2. *Sclerophoma ambigua*. Fig. 1. Pycnidium, cross section. × 110. Fig. 2. Conidia. × 1200. FIGS. 3, 4. Disease in flowering dogwood. Fig. 3. Stem cankers and dead shoots. × ⅓. Fig. 4. Stem canker with bark removed, showing necrotic area. × ½ (approx.).

meters. The large cankers are usually found only on one side of the stem.

Cankers extend more rapidly vertically than laterally, resulting in confluence of cankers, but little girdling. Callusing may occur at the edges of the canker but the dead bark is sloughed and wood is exposed to decay. Complete recovery of a tree seems to be rare, but even if badly cankered, it may continue to live for several years.

The fungus may fruit in the dead bark of the large cankers, but the presence of epiphytic lichens tends to obscure the pycnidia.

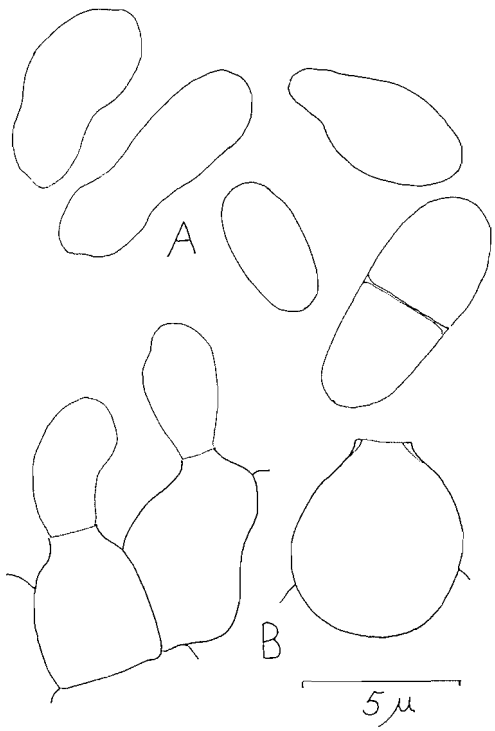


FIG. 5. *Sclerophoma ambigua*. (A) Phialoconidia, (B) phialides.

Inoculations

The fungus was orginally isolated from the edges of cankers (Fig. 4) and grown on potato-dextrose agar. Reinfection with an isolate was first attempted in May 1952, when three trees were inoculated, each at three points on the stem, according to the method of Wright (1933). Canker formation resulted from all inoculations and the fungus was reisolated in three out of six attempts 1 year later.

In May 1955, eight more trees were inoculated with the same isolate, all of which produced cankers. In October, four out of four attempted reisolations were successful.

The above experiments were repeated in September 1966, using mycelium grown from conidia of *Sclerophoma* from dieback branchlets. Canker formation occurred during the ensuing winter and the fungus was reisolated from all of them (6) in the following spring.

These experiments indicate that *Sclerophoma ambigua* is the causal organism of the large stem cankers. Inoculations were all made in healthy green trees not under stress. Uninoculated control trees established in each of the experiments remained free of cankers.

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