A Gummosis Disease of Peach Trees Caused by Botryosphaeria dothidea

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ABSTRACT

A gummosis bark disease of peach trees has seriously affected many thousands of trees in the Fort Valley area of Georgia in the past 4 yr. Cultures of *Botryosphaeria dothidea* were isolated from bark of peach trees that had numerous gum deposits on trunks, limbs, and twigs. Symptoms included sunken lesions around lenticels, circular to oval-shaped necrotic areas in bark beneath infected lenticels, and blisters on surfaces of shoots and twigs. Symptoms were reproduced within 18 mo after wounded limbs were inoculated with mycelia of *B. dothidea*. Stromata containing pycnidia and perithecia were produced in lenticels of infected bark and in culture. Optimum temp for fungal growth in vitro was 28 C, but good growth was obtained at 36 C, and slight growth at 38 C.

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A new gummosis disease of peach trees [*Prunus persica* (L.)] Batsch, characterized by deposits of gum that has exuded through the bark of trunks, limbs, and twigs (Fig. 1-A, B), has affected thousands of trees in central Georgia during the past 4 yr. The disease occurs mainly on trees 2 (or more) yr old in the Fort Valley area, where the majority of Georgia's peaches are grown.

Isolations from diseased bark consistently yielded *Botryosphaeria dothidea* (Moug. ex Fr.) Ces. & de Not. (*B. ribis* Gross & Dugg.). Diseases formerly reported to be caused by *B. ribis* are now ascribed to *B. dothidea* since their synonomy was established (1, 8). In 1926, Stevens (6) found *B. dothidea* on branches of peach trees in Florida, but he did not associate the fungus with any disease. To the author's knowledge, this is the first report of a disease of peach trees caused by *B. dothidea*.

These studies were initiated to determine the causal agent of peach tree gummosis.

MATERIALS AND METHODS.—Numerous isolations of fungi were made from affected peach trees in commercial orchards. Sections of diseased bark were collected from trunks, limbs, suckers, and twigs of peach trees in each orchard. An area of bark, which included one or more gum deposits or blisters, was treated with a 0.26% solution of sodium hypochlorite and rinsed 2 min later with sterile water. The surface of the bark was removed with a sterile scalpel, and a piece of bark ca. 5 mm square was cut from the edge of the diseased area and transferred to a sterile 8-ml screw-cap vial. Sections of apparently healthy bark were also collected from areas

located between infections, and an area 15-25 mm from the edge of the nearest infection. The pieces of bark were inserted into acidified potato-dextrose agar (PDA) contained in petri dishes and incubated at 25 C for 8 days.

Botryosphaeria dothidea isolated from diseased bark tissue was used in pathogenicity and cultural studies.

The relationship of temp to fungal growth was determined by placing 5-mm disks of the fungus mycelia on PDA plates, incubating them at 8, 12, 16, 20, 24, 28, 32, 36, 38, and 40 C in the dark for 3 days, and measuring colony diam. Fifteen isolates of *B. dothidea* were tested for chromogenesis by growing them in Czapek's solution at pH 7.0 in the dark for 12 days (8).

RESULTS.—*Symptoms.*—Symptoms of the gummosis disease of peach included sunken lesions (10-25 mm in diam) on the bark around lenticels (Fig. 1-D) and gum exudation from lenticels, with or without lesions. When the outer surface of the bark was removed from

Fig. 1-(A to F). Symptoms of gummosis on a peach tree attacked by *Botryosphaeria dothidea*. **A)** Deposits of gum on trunk and limbs of infected tree; **B)** limb with gum exuded through lenticels; **C)** trunk with surface of bark removed, showing necrotic bark beneath lenticels (a = moist, gummy area; b = dried area; **D)** sunken lesion around lenticel; **E)** necrotic area in xylem; and **F)** blisters on the surface of a new shoot growing from a diseased limb.

diseased trunks or limbs, circular or oval brown necrotic areas (7-25 mm in diam) were found (Fig. 1-C). The diseased areas were gummy and moist or dried out. They ranged from 1.0 to several millimeters in depth, depending on the thickness of the bark. A few infections extended into the xylem and caused it to be dark brown and gummy (Fig. 1-E). Protuberances of bark, resembling tiny blisters 2-6 mm in diam, were often found on twigs and shoots attached to infected limbs or trunks (Fig. 1-F). Diseased tissue was found inside each blister.

In severely affected orchards, gum deposits were scattered over the surface of entire trees. Copious amounts of gum were exuded after a heavy rainfall and often covered much of the ground beneath the trees. Spread of the disease from older to younger trees in nearby orchards was observed in several locations.

During the winter months, black stromata were observed embedded in the lenticels on the bark of diseased trees. Both the pycnidia and perithecia containing fungal spores were found.

Fungus isolations.—In attempts to isolate fungi from bark, samples were collected from 10 peach trees in each of seven orchards. These included 200 samples from apparently healthy bark, 700 samples from diseased bark, and 250 samples from blisters. *Botryosphaeria dothidea* was isolated from 9, 74, and 98.4% of the samples from healthy bark, diseased bark, and blisters, respectively.

Species of *Alternaria, Cladosporium,* and *Pestalotia,* were also isolated from 3-12% of the samples.

Fungus description.—Black pycnidial and ascogenous stromata of *B. dothidea,* found in lenticels on the bark of diseased peach trees, were also produced in culture. The pycnidia (Fig. 2-A) contained hyaline, nonseptate, fusiform conidia (Fig. 2-B) measuring 15.2 - 28.8 μ long ×

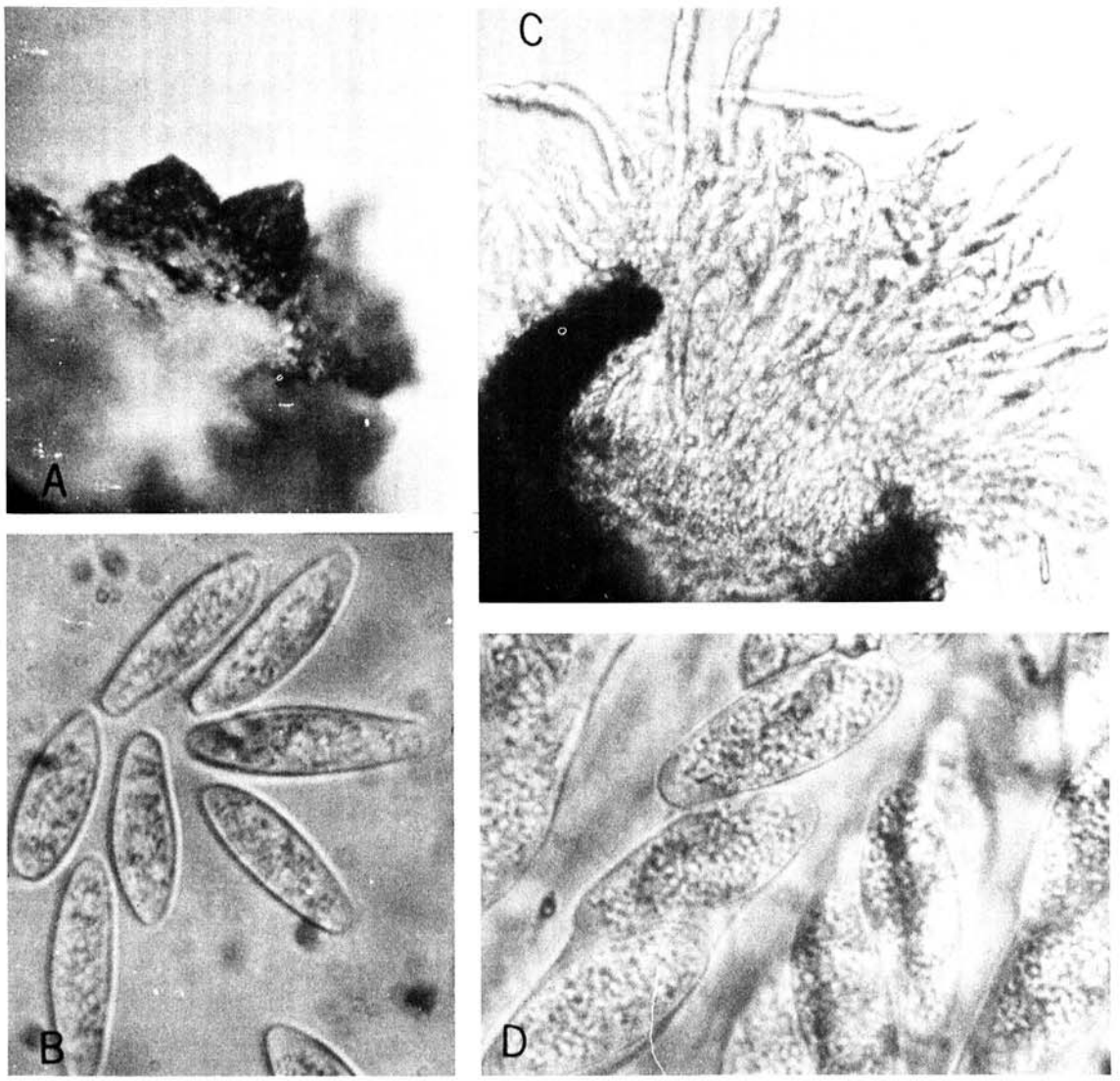

Fig. 2-(A to D). Morphology of *Botryosphaeria dothidea*: **A)** pycnidia produced in lenticel of peach bark; **B)** conidia (length ranged from 17.3 - 21.8 μm); **C)** perithecium, containing asci; and **D)** ascospores (length ranged from 21.4 - 25.8 μm), contained in asci.

4.8 - 8.0 μ wide. Perithecia (Fig. 2-C) of *B. dothidea* contained clavate asci, which averaged 120 × 19 μ and were separated by pseudoparaphyses. Each ascus contained eight hyaline, nonseptate, fusiform ascospores (Fig. 2-D), which were 17.5 - 28.0 × 9.3 - 12.0 μ. Microconidia were often produced in locules contained in pycnidial and ascogenous stromata.

Colonies of *B. dothidea* grown on PDA produced mycelia which were initially white and cottony, but turned gray and then black as they matured. The diam after 3 days at 8, 12, 16, 20, 24, 28, 32, 36, 38, and 40 C was 3, 13, 20, 27, 50, 61, 55, 30, 4, and 0 mm, respectively. None of the 15 isolates tested was chromogenic.

Pathogenicity studies.—Pathogenicity studies were carried out in the field on 3-yr-old 'Elberta' peach trees grown at the Southeastern Fruit and Tree Nut Research Station where no symptoms of gummosis were observed. Three limbs on each of 20 trees were surface-sterilized and then wounded with a sharp blow from a hammer. Plugs 20 × 20 mm of *B. dothidea* on PDA were placed in three wounds on each of 10 trees, and immediately wrapped in tape to prevent desiccation.

Winthin 3 mo after inoculation, a gummy canker developed in the wounded portion of each limb inoculated with *B. dothidea;* those inoculated with PDA alone healed over and no gum was exuded. Symptoms of gummosis developed on all limbs inoculated with *B. dothidea* within 18 mo after inoculation. Gum deposits and sunken areas around lenticels typical of peach tree gummosis were observed up to a distance of 40 cm below the point of inoculation, as well as tiny blisters on shoots growing out of diseased limbs. Pycnidial and ascogenous stromata were observed in lenticels of diseased areas of bark. The pathogen was isolated from 86 of 100 bark samples collected from diseased areas beneath gum deposits.

DISCUSSION.—Inoculation experiments on other host plants have indicated that *B. dothidea* is usually a wound parasite (2, 5, 7, 8). However, the conidia of the fungus have been shown to invade nonwounded stems of blueberry (4) and elm (3).

It is not known how *B. dothidea* infects the bark of peach trees, but the presence of numerous scattered localized infections in the bark beneath lenticels suggests that invasion is through the lenticels. Although a gummy canker developed at each inoculated site within 3 mo, 14-18 mo were required for typical symptoms of gummosis to develop on portions of the limbs below the inoculations.

Symptoms of gummosis in orchards were often observed to occur on portions of limbs below gummy cankers, suggesting that a period of time was required for the production and spread of conidia from the canker before the scattered local infections could be established. Therefore, I consider *B. dothidea* to be both a wound and a nonwound parasite on peach trees. Studies are under way to determine the role of conidia in the spread and development of gummosis.

Cultural studies indicated that the morphological characteristics of isolates of *B. dothidea* from peach were similar to those described for isolates from other hosts (3, 7, 8). Temperature requirements of the peach isolates were also similar to those previously reported for *B. dothidea* (7, 8). However, the peach isolates grew fairly well at 36 C and made slight growth at 38 C, whereas the fungus had not been previously reported to grow at temp above 35 C. A broad temp range for growth suggests that *B. dothidea* may be active in peach bark during all but the coldest months in Georgia.

None of the isolates of *B. dothidea* from peach was chromogenic. This supports the conclusion of others (7, 8) that pathogenicity of *B. dothidea* is not correlated with chromogenesis.

The rapid rate of spread of this new disease of peach trees in Georgia during the past 4 yr raises the possibility of its future movement into other peach-growing areas in the southeast. Apparently healthy trees are attacked and probably weakened by the loss of nutrients in the gum that is exuded. Such weakened trees could die during periods of stress brought about by moisture or temp extremes.

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