A Strawberry Fruit Rot Caused by Dendrophoma obscurans

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ABSTRACT

During recent years a new fruit rot has caused severe fruit losses in some Florida strawberry plantings of the cultivars Tioga and Fresno. Isolations from the fruit rot lesions consistently yielded *Dendrophoma obscurans*, the incitant of strawberry leaf blight. Inoculation of fruit and leaves of potted plants with isolates from leaf blight lesions and from fruit rot lesions proved that isolates from either source could cause fruit rot or leaf blight. When the isolates were grown on potato-dextrose agar, cultural characteristics and spore sizes were identical and were within the ranges previously described for *D. obscurans*.

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Strawberry leaf blight was apparently first described in 1893 by Halstead (6), who placed the causal organism in the genus *Aposphaeria*. Ellis & Everhart (4) described the causal organism in 1895 and named it *Phoma obscurans*. Anderson then renamed the pathogen *Dendrophoma obscurans* (El. & Ev.) Anderson in 1920. There is currently some confusion as to the proper generic name of this pathogen (7, 8); therefore, the established name *D. obscurans* will be used in this paper.

Leaf blight is a well-known disease in areas where strawberries are grown, but *D. obscurans* apparently has not previously been reported to cause a fruit rot. Alexopoulos & Cation (1) originally attributed stem-end rot to *D. obscurans*, but later (2) reported that it was caused by *Gnomonia fragariae* Klebahn [=*G. fructicola* (Arnaud) Fall].

The California cultivars 'Tioga' and 'Fresno' were first grown extensively in central Florida in 1968. During 1969 and 1970, an apparently new fruit rot caused extensive losses in some fields of these cultivars, with 60 to 80% of the fruit from individual harvests being infected. In early stages, the rot generally appears as round, light-pink, water-soaked lesions flush with the surface, which occur anywhere on the fruits (Fig. 1-A). Two or more lesions often

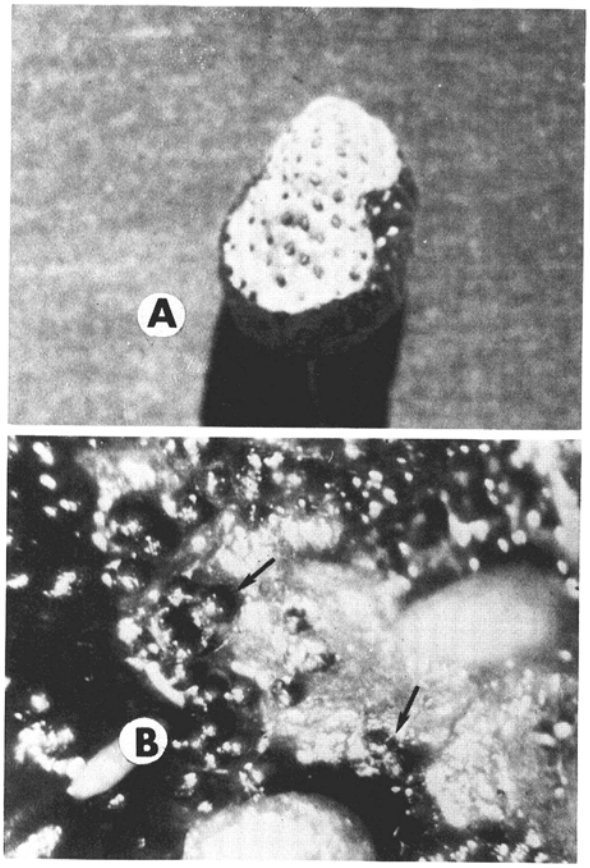

Fig. 1. A) Strawberry fruit rot caused by *Dendrophoma obscurans*. **B)** *D. obscurans* pycnidia (arrows) formed on inoculated fruit.

coalesce. The infected parts later turn brown and the entire fruit is invaded and becomes soft. Pycnidia can often be found in the lesions at this stage (Fig. 1-B). Infected fruits eventually mummify, and sometimes appear black after numerous pycnidia develop. Isolation from these lesions usually yielded only a fungus tentatively identified as *D. obscurans*. Therefore, experiments were undertaken to determine whether leaf blight and this fruit rot were caused by the same pathogen.

MATERIALS AND METHODS.–Isolates used in this study were obtained from typical leaf blight and fruit rot lesions. The isolates were grown on potato-dextrose agar (PDA) in petri dishes until spore masses could be seen on the pycnidia. The cultures were then flooded with sterilized distilled water, and the resulting spore suspensions poured into sterilized flasks. The concentration of spores varied from ca. 800 to 40,000 spores/ml, depending on the experiment. Ripe and green Tioga berries were surface-sterilized by immersion for 1 min in 95% ethyl alcohol, followed by 20 min in a 0.5% sodium hypochlorite solution. They were then rinsed 4 times in sterilized distilled water and placed aseptically in autoclaved jars, one fruit/jar. Lids were placed on the jars loosely to maintain sterility but to allow excess moisture to escape. After dying, small droplets of the spore suspension were placed at two points on the uninjured surface of each berry. Controls received sterilized distilled water. The jars containing the fruit were then placed under fluorescent lights (175 ft-c) in the laboratory where the temperature fluctuated from 24 to 27 C. The numbers of lesions in each series of 10 ripe and 10 green berries were recorded after 5 and 7 days of incubation.

The remainder of each spore suspension (ca. 25 ml) was atomized onto six potted Tioga plants. Sterilized distilled water was used on control plants. All plants were then covered with clear polyethylene bags and placed under a greenhouse bench to prevent leaf scald until the bags were removed 5 days later. Blight lesions were counted 7 days after inoculation, and the plants were observed for an additional 3 weeks.

These experiments were repeated three times. Berries for two of the experiments were obtained from fields where little of this rot was present. The results of these experiments were similar, and are presented as an average of the two experiments. Berries for the third experiment were obtained from a field where this rot was severe, and lesions developed on many of the control fruits. Data from this experiment are not included in the results. Results of the three experiments on plants were variable.

Five groups of 25 spores of each isolate were measured. The measurements in each group were averaged to obtain a range of average spore size for each isolate. Measurements were made from 24-day-old cultures grown on PDA under constant fluorescent lighting (40 w cool-white, 175 ft-c), and temperatures that fluctuated between 24 and 27 C.

RESULTS AND DISCUSSION.–Within 5 days after inoculation, lesions had developed at 83% of the inoculation points on ripe berries inoculated with either isolate, and at 25 and 20% of the inoculation points on green fruit inoculated with the fruit rot and leaf blight isolates, respectively. Within 7 days, lesions had developed at 93 and 83% of the inoculation points on ripe berries inoculated with the fruit rot and leaf blight isolates, respectively, and at 70% of the inoculation points on green berries inoculated with either isolate. There were no lesions visible on ripe or green control fruits 5 days after inoculation. Seven days after inoculation, lesions had developed at 8 and 10% of the inoculation points on ripe and green control fruits, respectively.

The greatest differences between the two experiments in regard to numbers of lesions formed on berries inoculated with the same isolate were 25% on ripe and green berries at 5 days, 5% on ripe berries at 7 days, and 40% on green berries at 7 days. The number of lesions that develop on green berries appears to depend on the maturity of the berry and the degree of ripening that occurs after inoculation. As more ripening occurs, more lesions develop. There was no more than 10% difference between

experiments in numbers of lesions on ripe or green control fruits.

In two of the repetitions of this experiment, one to three blight lesions developed on leaves of each plant within 7 days after inoculation with either isolate, and no lesions developed on any of the control plants. *Dendrophoma obscurans* was readily isolated from the lesions. In the third repetition, no lesions developed on any of the plants. Anderson (3) and Fall (5) also reported light infections from artificial inoculation with *D. obscurans*. In our study, when a freshly isolated culture was used to inoculate Tioga plants with 16 to 20 expanded leaves and the plants were held at 27 C, 12 blight lesions developed on the three control plants and 45 lesions developed on the three inoculated plants. These results on older plants may partially explain the inconsistency of our earlier pathogenicity tests because in those, younger plants were used and were incubated at lower temperatures. Anderson (3) also apparently inoculated plants having only young leaves. This fresh isolate also caused fruit rot when berries were inoculated with it.

The ranges of average spore measurements were 6.2 to 6.7 μ X 2.9 μ and 6.4 to 6.5 μ X 2.9 μ for the fruit rot and leaf blight isolates, respectively. All spores measured were 2.9 μ in diam. Anderson (3) reported that spores exuded on leaves were 5 to 7 μ X 1.5 to 2 μ, and that those produced in culture were slightly larger. Mature pycnidia produced by the cultures used in this study were within the range of 200 to 300 μ in diam reported by Anderson (3), and had branched conidiophores.

It is concluded from the evidence presented that *D. obscurans* caused a fruit rot as well as strawberry leaf blight in Florida. Isolates from rotting fruit and foliar lesions were capable of causing either disease in this study.

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