Sclerospora sorghi in Corn: its Location in Carpellate Flowers and Mature Seeds

B. L. Jones, J. C. Leeper, and R. A. Frederiksen

Assistant Professor, Technician, and Associate Professor, respectively, Texas A&M University Agricultural Research and Extension Center, Weslaco, Texas 78596, and Department of Plant Sciences, Texas A&M University, College Station, Texas 77843.

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ABSTRACT

Hyphae were observed in the style, ovary wall, and nucellus of carpellate flowers of *Zea mays* inoculated with *Sclerospora sorghi*. The fungus was confined in mature seeds to the pericarp and pedicel. The embryo and endosperm were protected from the fungus by the aleurone layer which appeared to serve as a barrier. Infected plants developed from infected seeds planted when in the soft dough stage. Transmission was prevented by reducing moisture content to 9% and by storage for 40 days before planting.

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Additional key words: downy mildew, seed-borne.

As a result of the southern corn leaf blight epiphytotic of 1970 caused by *Helminthosporium maydis* race T, production of normal cytoplasm corn (*Zea mays* L.) has increased in the Lower Rio Grande Valley of Texas. *Sclerospora sorghi* Weston & Uppal, the causal organism of sorghum downy mildew, infects corn systemically and usually causes sterility (6). Occasionally, an infected plant produces viable seeds (3). These seeds could serve as a means of spreading downy mildew if the fungus were seed-borne. Other related fungi have been observed in corn kernels (2, 7, 8, 9). Chang (2) obtained infected corn plants from *S. sacchari*-infected corn kernels planted prior to drying. He found that drying the seeds to 20% moisture content before planting prevented infection. Semangoen (7) likewise obtained *S. maydis*-infected plants from immature, infected corn seeds. Infection was prevented, however, by air-drying seeds before planting. Ullstrup (8) observed *Sclerophthora macrospora* mycelium in the coleorhiza and scutellum of corn kernels harvested from infected plants. He also obtained a low percentage of infected plants from mature infected seeds.

The present investigation was conducted to determine if carpellate flowers and seeds of corn from systemically infected plants are invaded by *S. sorghi*, and to determine if downy mildew is seed-borne.

Sweet corn, Silver Queen, and white field corn, Tuxpan, grown in the greenhouse in autoclaved soil were inoculated with *S. sorghi* conidia by the infected leaf technique described previously (5). Several inoculated seedlings were hand-sectioned, stained with lactophenol-cotton blue, and examined for fungal invasion of the apical meristem. When flowering occurred on the remaining plants, carpellate flowers were removed from those systemically infected, fixed in formalin-acetic acid-alcohol (FAA), dehydrated in tertiary-butyl alcohol (TBA), and embedded in paraffin (4). Sections 20-30 μ thick were stained with basic fuchsin (4), counter-stained with picro-aniline blue (1), and mounted in balsam. Mature corn seeds harvested from infected plants in the field were prepared in the same manner. Observations were made with the aid of a phase contrast and bright field microscope.

Immature and mature seeds, harvested from systemically infected plants, were planted in autoclaved soil. The immature seeds, in the soft dough stage, were dried at 40 C to 30, 18, and 9% moisture and planted 7, 26, and 40 days after harvest. Five replicates of 15 seeds each were planted at each date. Mature seeds were planted 5 days after harvest.

S. sorghi hyphae were found in all flowers and mature seeds examined from systemically infected plants. The fungus invaded the style, ovary wall, and nucellus (Fig. 1-A, B). No hyphae were observed in either the embryo-sac or the developing embryo. Hyphae were most abundant in the base of the ovary. Hyphae were sparse in the nucellus and were confined to its outer periphery. Mature seeds contained hyphae in the pericarp and pedicel (Fig. 1-C, D). The fungus developed to the aleurone layer, but did not invade it (Fig. 1-E).

S. sorghi invaded the apical meristem of corn seedlings 4-5 days after inoculation (Fig. 1-F). Symptoms of systemic infection appeared at the base of the second or third leaf 7-9 days after inoculation.

Systemically infected plants developed from immature infected seeds planted at 30 and 18% moisture, and 7 and 26 days after harvest. Thirty per cent were infected after 7 days, and 4% after 28 days' storage at 30% moisture. Twenty-one per cent were infected after 7 days, and 2% after 28 days of storage at 18% moisture. Drying to 9% moisture and storage for 40 days irrespective of seed moisture prevented infection. No infected plants were obtained from mature seeds.

The results indicate that *S. sorghi* can survive only in immature seeds planted soon after harvest.

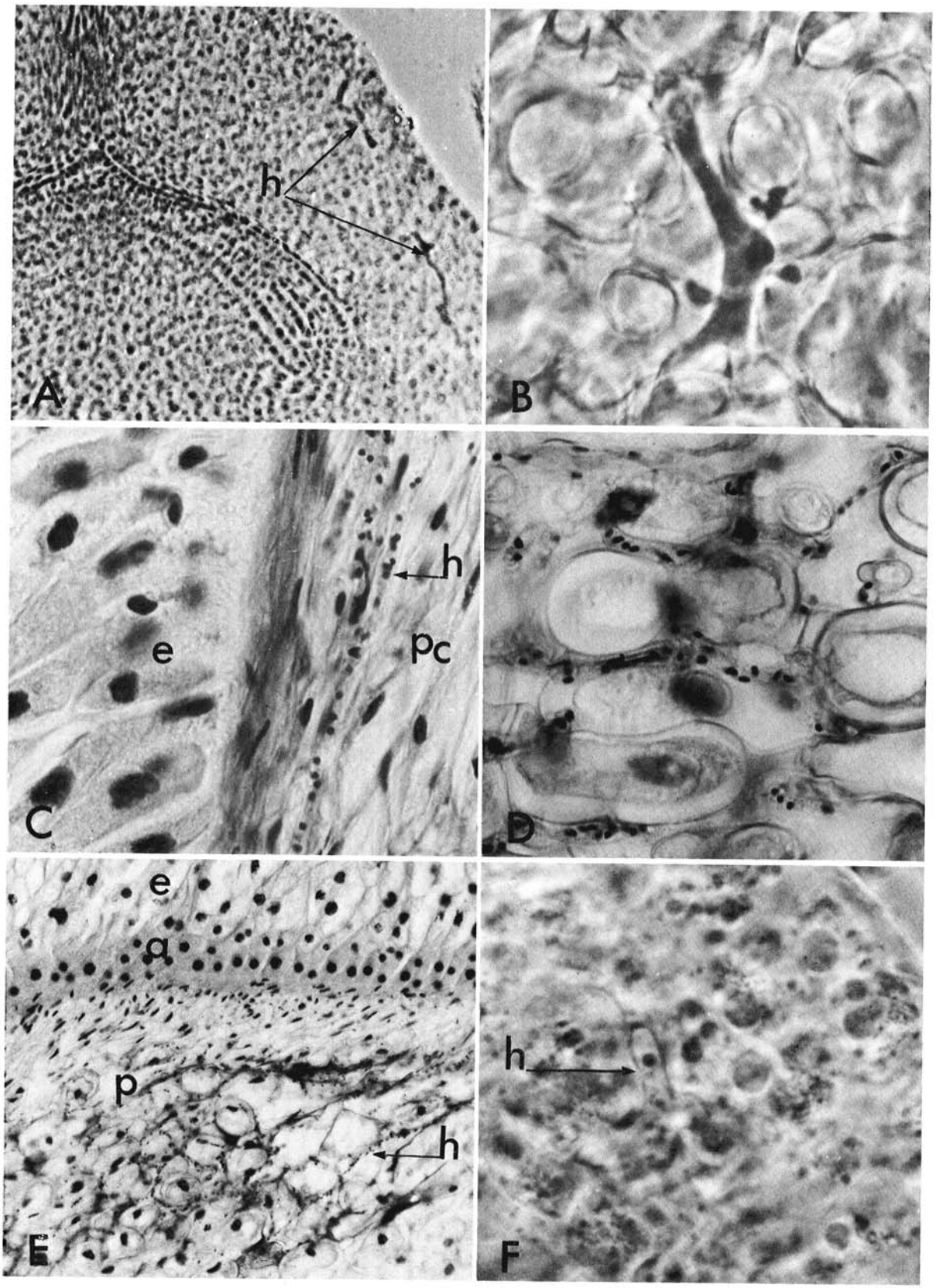
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Fig. 1. *Sclerospora sorghi* hyphae in the carpellate flower, seed, and apical meristem of corn. **A)** Hyphae (h) in ovary wall (× 120). **B)** Hypha with haustoria in nucellus (× 1,200). **C)** Coenocytic hyphae (h) in pericarp (pc) parallel to the endosperm (e) (× 480). **D)** Hyphae in the pedicel (× 480). **E)** Endosperm (e), aleurone layer (a), and pedicel (p); note hyphae in the pedicel (× 120). **F)** Hypha (h) in apical meristem of a 5-day-old seedling (× 1,200).

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