

Occurrence of Powdery Mildew on Safflower Caused by *Sphaerotheca fuliginea* in Korea

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The powdery mildew of safflower (*Carthamus tinctorius* L.) extensively occurred at 1999 at the experimental farm of Kyongsangnam-do Agricultural Research and Extension Services. Both sides of the leaves and the older stems were covered with the fungus, and then the leaves and stems turned yellow. The conidia, conidiophores and perithecia were observed on the leaf lesion. Perithecia were ellipsoidal, 80~117 μm in diameter. Asci were subglobose and 84~99 \times 59~73 μm in size. Ascospore were ellipsoidal to ovoid, and 15~34 \times 11~23 μm in size. Conidia were ellipsoid to barrel-shaped, 25~37 \times 11~22 μm in size and formed in long chains. The causal organism was identified as *Sphaerotheca fuliginea*. This is the first report on powdery mildew of safflower caused by *Sphaerotheca fuliginea* in Korea.

KEYWORDS: *Sphaerotheca fuliginea*, Safflower, Powdery mildew

Safflower is generally cultivated for oil seeds in middle East countries and other semi arid area. However, the crop is traditionally cultivated for medicinal purposes in Korea. In recent years, as the importance of safflower as medicinal crop become acknowledged, the intensive cultivation of safflower is popularized and cultivation area is also expanded throughout the country. It is commonly expected that previously unrecorded diseases may be occurred when a newly introduced crop is cultivated intensively.

Powdery mildews are probably the most common, conspicuous, widespread, and easily recognizable plant disease. Those are characterized by the appearance of spots or patches of a white to grayish powdery mildew growth on young plant tissues, or entire leaves and other organs being completely covered by the white powdery mildew.

Many genera and species of fungi are involved in powdery mildew diseases. *Sphaerotheca* is one of the most widespread genus that incite powdery mildew in numerous herbaceous plants. In September 1999, a widespread and severe powdery mildew symptom was found in greenhouses of Kyongsangnam-do Agricultural Research and Extension Services. We tried to describe the disease in safflower and identify the causal organism.

The symptoms were appeared both sides of leaves and young stems were covered with the fungus (Fig. 1A, B, C). The symptoms occurred on the leaves of safflower were tiny, pinhead-sized, spherical, at first then white mycelia expanded around the lesions white, later yellow-brown, and finally black perithecia may be present singly or in groups on the white to grayish mildew. The mildew is commonly observed on the upper, lower side of the leaves and stems.

On older leaves, large white patches of fungal growth appear, but seldom curled or distorted. Lesions on leaves appear more or less discolored and eventually become necrotic and die.

The detached mycelium, conidia and conidiophores from diseased leaves were carefully observed under the light microscope (Nikon. Fluophot, Japan). The fungus produces white mycelium on the surface of the plant tissues and globose haustoria into the epidermal cell. The mycelium forms a weft of hyphae on the surface. Occasionally brown when the lesion is old, usually evanescent but sometimes form persistent white circular to irregular patches on the upper, lower leaf and stem surface. Perithecia produced on the old mycelia formed on leaves and stems (Fig. 1D, E). Perithecia scattered to densely gregarious 80~117 μm in size (Fig. 2A). Appendages are variable in number, usually as long as the diameter of the ascocarp, Mycelioid, brown, tortuous, interwoven with mycelium, but sometimes long nearly straight and dark brown, and 84~248 μm in size. Ascus were 1, broadly ellipsoid to subglobose 84~99 \times 59~73 μm in size (Fig. 2B). Ascospores were 8, ellipsoid. to nearly spherical. 15~34 \times 18~23 μm in size (Fig. 2C). Conidia form in long chains, often with distinct fibrosin bodies, ellipsoid to barrel-shaped, 25~37 \times 11~22 μm in size (Fig. 2E). The morphological characteristics of the fungus were almost identical to *Sphaerotheca fuliginea* that described by Nakata *et al.* (Nakata, 1986. Table 1). Accordingly, we identified the causal agent as *Sphaerotheca fuliginea* (Schlecht.) Poll.

The powdery mildew fungi cause serious diseases in hot and humid climate. We could not found any other genera or species of fungi inciting powdery mildew on safflower plant. We assume that *S. fuliginea* is the main fungus that will cause epidemic of the powdery mildew on safflower in Korea. This is the first report of safflower in Korea

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Fig. 1. Symptoms of the powdery mildew of safflower plant caused by *Sphaerotheca fuliginea*. Typical powdery mildews symptoms formed on upper side (A) and lower side (B) of leaves, on the stem (C). The perithecia formed densely on leaf (D) and stem (E).

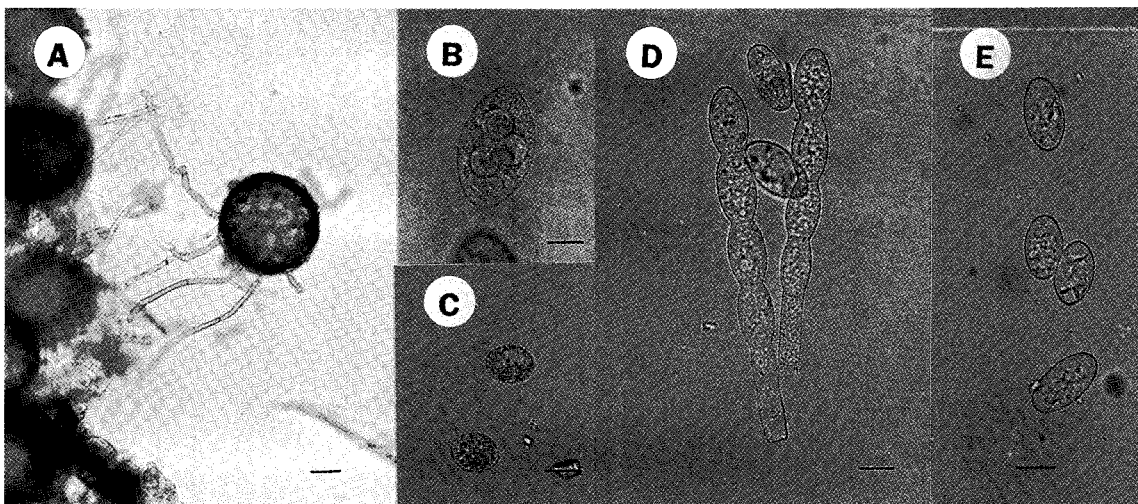


Fig. 2. Morphological characteristics of *Sphaerotheca fuliginea*, the casual fungus of powdery mildew of safflower. A: Perithecia with Appendages, B: Ascus, C: Ascospore, D: Conidiophores, E: Conidia, Scale bar indicate 10 μm .

Table 1. Comparison of morphological characteristics between the powdery mildew fungus parasitic on *Carthamus tinctorius* L.

Characters		Presented study	Tanaka(1986)
Conidia	size	25~37×11~22 μm	25.8~39.3×12.9~22.0 μm
	type	chains	chains
Perithecia	size	80~117 μm	85.3~113.7 μm
Ascospores	size	15~34×11~23 μm	14.7~22.0×10.3~16.5 μm
	number	8	8
Ascus	size	84~99×59~73 μm	69.5~95.1×40.8~56.3 μm
	number	1	1
Appendages	size	84~248 μm	96~290 μm
	shape	hypha-like	hypha-like
	number	5~13	513

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