

## Notes on Powdery Mildew of Dahlia in Korea

Hyeon-Dong Shin\* and Hyun-Tae Lee

Department of Agricultural Biology, Korea University, Seoul 136-701, Korea

### 다알리아 흰가루병균에 관한 소고

신현동\* · 이현태

고려대학교 농생물학과

**ABSTRACT:** *Sphaerotheca fuliginea* has previously been recorded as a powdery mildew fungus on dahlia (*Dahlia pinnata*) in Korea. Six collections of the dahlia mildew by the authors since 1993, however, show that the fungus does not contain conspicuous fibrosin bodies and has sinuate edge lines on conidiophores. These characters clearly indicate that the fungus causing the powdery mildew on dahlia in Korea is *Erysiphe cichoracearum*. On the other hand, one plant of dahlia grown in a pot was found to be infected with *S. fusca* (= *S. fuliginea* s. lat.). It is supposed to be unusual. Therefore, two species of dahlia mildew fungi are distributed and *E. cichoracearum* is the main cause of dahlia mildew in Korea.

**KEYWORDS:** Dahlia, Powdery mildew, *Erysiphe*, *Sphaerotheca*

Powdery mildew is the only fungal disease recorded from dahlia (*Dahlia pinnata* Cav.) in Korea (Anonymous, 1998). The disease is commonly found in flower gardens and gives poor beauty and reduced growth vigour. Lee and Lee (1969) first recorded the disease in Korea and identified the causal fungus as *Sphaerotheca fuliginea* (Schlecht.) Poll. based on the teleomorphic features. According to their description, the fungus has very small asci ( $28.4\sim44.0\times6.6\sim25.4\ \mu\text{m}$ ) and long conidia ( $14.4\sim26.8\times6.1\sim11.5\ \mu\text{m}$ ). Since these features are quite different from the known morphological characteristics of *S. fuliginea* s. lat. (Braun, 1987; Shin, 1988; Nomura, 1997), their record is doubtful. Unfortunately, their material was not preserved, and the present authors could not examine it to know the real identity of their collection. Since then, no additional record of the dahlia mildew has been made in Korea (Shin, 1997).

In September of 1996, the authors found the severe occurrence of a powdery mildew on dahlia planted in a flower garden at Kangnung (SMK 13661; 10 IX 1996, Kangnung). Both sides of leaves and young stems were covered with the fungus (Figs. 1-Ⓐ, Ⓑ). Microscopic examination showed that the fungus does not contain conspicuous fibrosin bodies in conidia (Fig. 2-Ⓑ) and has *Euoidium* type of conidiophores with sinuate edge line formed by chained immature conidia on conidiophores (Fig. 2-Ⓒ). These characters clearly indicate that the fungus is not *Sphaerotheca* but *Erysiphe* (Braun, 1987; Shin, 1988; Shin and La, 1993;

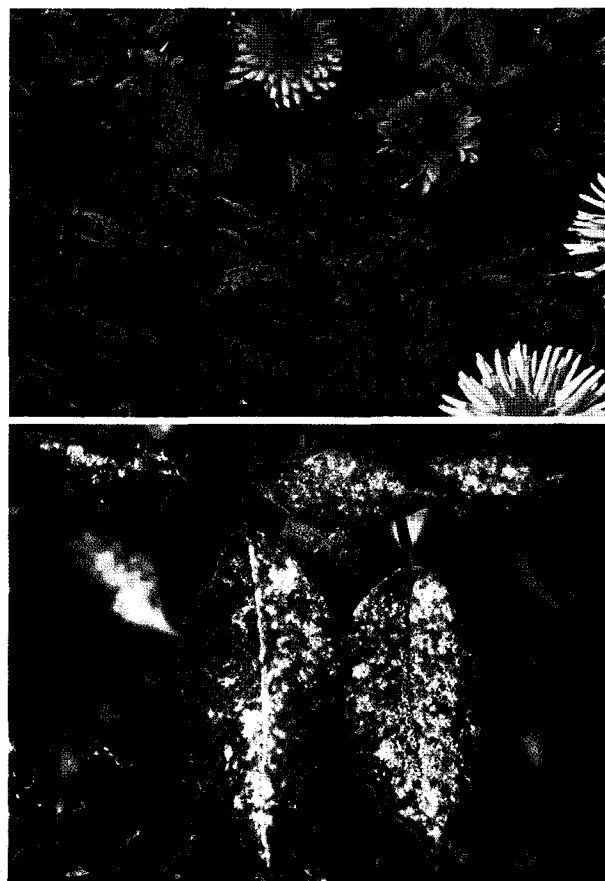
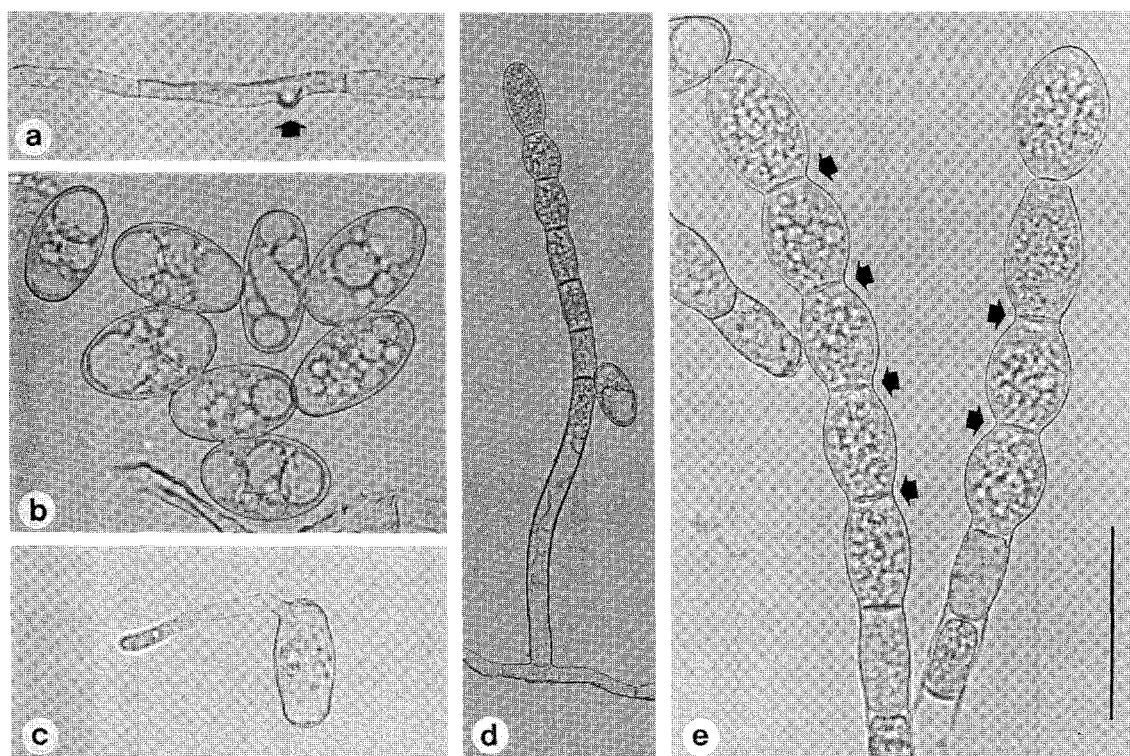


Fig. 1. Symptoms of the powdery mildew caused by *Erysiphe cichoracearum* on dahlia plants. Ⓐ Severe occurrence of the disease in a flower garden. Ⓑ Close-up of the disease, showing heavy fructification of the mildew fungus on the upper surface of leaves.

\*Corresponding author <E-mail: hdshin@kuccnx.korea.ac.kr>



**Fig. 2.** Photomicrographs of *Erysiphe cichoracearum* causing the powdery mildew on dahlia. (a) Nipple-shaped appressorium (arrow) formed on the hypha. (b) Conidia without fibrosin bodies. (c) Conidium in germination, producing a germ tube on the shoulder of conidium. (d) Conidiophore showing a long foot-cell and chained immature conidia on the upper portion. (e) Upper part of conidiophores showing sinuate edge lines (arrows). Scale bar represents 50  $\mu\text{m}$  for (a), (b), (c), (e) and 100  $\mu\text{m}$  for (d).

Nomura, 1997). Additional collections of the dahlia mildew at different localities in Korea during the 1998 season were identical to the Kangnung collection. The teleomorphic state of the fungus was not observed.

For the microscopic observation of the fungus, a small amount of fungal structures was carefully detached from the leaf lesion with a razor blade and water-mounted without staining. The morphological characteristics of the anamorphic state based on one of collections (SMK 14986; 1 IX 1998, Suwon) are as follows: Mycelial appressorium poorly developed, nipple-shaped, occasionally slightly lobed, single; conidiophores 70~260(~400)  $\times$  10~12  $\mu\text{m}$ , having a basal septum 0~12  $\mu\text{m}$  displaced from the branching point, having a foot-cell of 40~120  $\mu\text{m}$  long (usually less than 50% of total length), following 2~3 straight cells, producing immature conidia in chains of 2~8 with sinuate edge; conidia ellipsoidal to oval, 30~40  $\times$  16.5~21  $\mu\text{m}$ , without conspicuous fibrosin bodies, producing germ tubes on the shoulder (Figs. 2-(a), (b), (c), (d), (e)).

Two additional collections (SMK 15280; 1 X 1998, Suwon and SMK 15424; 9 X 1998, Chunchon) were also in close accordance with the above characteristics. Also, two dried materials collected by the senior author (SMK 12712; 13 X 1993, Kangnung and SMK 12745; 23 X

1993, Kangnung) were examined by the lactic acid technique (Shin, 1988) and proved to be similar to *E. cichoracearum* sensu Braun (1987). Although the species concept in *E. cichoracearum* varies among workers (Pascoe, 1999; personal communication), the fungus causing the powdery mildew on dahlia in Korea could be identified as the *Oidium* anamorph of *E. cichoracearum* DC. based on the anamorphic characteristics (Braun, 1987; Shin, 1988; Nomura, 1997). This fungus has been recorded as a causal organism of the dahlia mildew from nearly all countries wherever the plant is cultivated (Amano, 1986). However, another powdery mildew fungus, *S. fuliginea* (= *S. fusca*), has been recorded from 9 countries including Formosa (Hsieh, 1983) and Japan (Nomura, 1997).

On the other hand, we collected the anamorphic state of *S. fusca* from a dahlia plant grown at home in a small pot (SMK 15552; 24 X 1998, Taegu). The fungus clearly contained conspicuous fibrosin bodies and had crenate edge lines on conidiophores. Since the disease was mild with thin mycelial mats and occurred only on several leaves of the plant, it is considered to be a result of sporadic infection. This is the only one authentic collection for *S. fusca* as a dahlia mildew in Korea. Therefore *E. cichoracearum*, not *S. fusca*, is the main fungus causing epidemic of the powdery mildew on dahlia in Korea. This is the first re-

cord of *E. cichoracearum* as dahlia mildew in Far East region.

### Acknowledgements

This study was partly supported by a grant from the National Institute of Agricultural Science and Technology, Rural Development Administration. We are very grateful to Dr. Ian Pascoe, Institute for Horticultural Development, Australia, for his comments on the species and for acting as a presubmission reviewer.

### 적 요

한국에서 다알리아의 흰가루병균으로 *Sphaerotheca fuliginea*가 기록되었다. 그러나, 1993년 이후 본인들이 채집한 6개 시료의 다알리아 흰가루병균은 모두 분생포자에 fibrosin체를 함유하지 않으며 분생포자경에 형성된 외선이 능상(陵狀)이었다. 이러한 특징으로 보아 한국에서 다알리아 흰가루병균은 *Erysiphe cichoracearum*이 확실하다. 한편, 독립된 화분에 심겨진 1그루의 다알리아에서 *S. fusca* (= *S. fuliginea* s. lat.)가 흰가루병균으로 동정되었지만, 발병양상으로 보아 우연한 감염으로 판단된다. 따라서 한국에는 2종의 다알리아 흰가루병균이 분포하지만 *E. cichoracearum*이 다알리아 흰가루병의 주요 원인균이다.

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