

## Unrecorded Host Plants of Powdery Mildew in Korea<sup>1</sup>

—Powdery Mildew of Oriental Cherry, European Bird Cherry,  
Korean Bittersweet and Ash Tree—

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### 國內 未記錄 樹木흰가루病 寄主植物 4 種에 대한 報告<sup>1</sup>

—벗나무, 귀룽나무, 푼지나무, 물들메나무 흰가루病—

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#### ABSTRACT

The leaves and young shoots of several broad leaf trees infected with powdery mildew fungi were collected and observed for the purpose of seeking for the host plants and identifying its pathogenic fungi in the arboretum of Forest Research Institute, Seoul from October to November 1982. Of these, *Prunus serrulata* var. *spontanea*, *Prunus padus*, *Celastrus flagellaris*, and *Fraxinus x chiisanensis* were found out to be new host plants of powdery mildew fungi in Korea. Morphological characteristics of imperfect state and perfect state of powdery mildew fungi on 4 new host plants were examined. These pathogenic fungi were identified as *Podosphaera tridactyla*, *Uncinula sengokui*, and *Uncinula fraxini*.

*Uncinula fraxini*.

*Key words:* powdery mildew; *Podosphaera tridactyla*; *Uncinula sengokui*; *Uncinula fraxini*; identify.

#### 要 約

1982年 10월부터 11월까지 國內 未記錄 흰가루病菌과 寄主植物을 찾기 위하여 林業試驗場 構內 樹木園에서 흰가루病症狀을 나타낸 樹木의 잎과 가지를 採取하여 病原菌을 同定하였다. 이 중, 벗나무(*Prunus serrulata* var. *spontanea*), 귀룽나무(*Prunus padus*), 푼지나무(*Celastrus flagellaris*), 물들메나무(*Fraxinus x chiisanensis*) 등 4種의 樹木이 흰가루病 寄主植物로 國內에서 처음 發見되었으며, 이들의 흰가루病菌은 *Podosphaera tridactyla*(DC.)DE BARY, *Uncinula sengokui* SALM., *Uncinula fraxini* MIYABE로 同定되었기에 이에 報告하는 바이다.

#### INTRODUCTION

“Diseases of cultivated plants in Korea” written by Nukata and Takimoto in 1928 was the first

report on powdery mildew in Korea.

Thereafter, studies on powdery mildew were carried out by Park<sup>20,21</sup>, Kim<sup>10,11</sup> and Lee et al.<sup>14,15,16,17,18</sup> etc. At present, 141 host plants and 52 species belonging to 8 genera of

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powdery mildew fungi are reported in Korea<sup>2,10, 11,13,14,15,16,17,18,19,20,21,22,23</sup>.

The present study was undertaken for the purpose of seeking unrecorded host plants and pathogenic fungi of powdery mildew in Korea.

## MATERIALS AND METHODS

The leaves and shoots of forest trees infected with powdery mildew fungi were collected in the arboretum of Forest Research Institute from October to November 1982. Identification of host plants was based on "Illustrated flora of Korea" written by T.B. Lee<sup>12</sup>. Mycelium and perithecia were detached from both sides of leaves infected with powdery mildew and then the size of conidiophores, conidiospores and perithecia as well as the size and number of appendages, ascus and ascospores were examined fifty each.

## RESULTS

4 host plants i.e., Oriental cherry (*Prunus serrulata* var. *spontanea*), European bird cherry (*Prunus padus*), Korean bitter sweet (*Celastrus flagellaris*) and Ash tree (*Fraxinus* × *chiisanensis*) were found out to be the new host plants of powdery mildew fungi in Korea. Symptoms of powdery mildew and morphological characteristics of pathogenic fungi are as follows.

### 1. *Podosphaera tridactyla* on *Prunus serrulata* var. *spontanea*.

Mycelium was amphigenous, mostly epiphyllous and evanescent. Mature conidia were ellipsoidal, formed on septate conidiophores in chains and measured 24.0-32.0 × 12.0-21.0 μ. Perithecia were scattered, globose to subglobose, yellow, brown, dark brown and measured 75.0-120.0 μ (average 90.9 μ) in diameter. Appendages were produced from the upper part of the perithecium, 2-4 in number, 70.0-145.0 μ (average 103.0 μ) in length. Appendages were 2-3 septate, hyaline in the upper part, brown in the lower part, broader at base and

dichotomously branched 3-6 times at the apex. Perithecium had one ascus. Ascus was oblong and measured 55.0-120.0 × 50.0-87.5 μ (average 72.9 × 61.6 μ). Eight ascospores were contained in one ascus, ovate to ellipsoidal and measured 15.0-30.0 × 10.0-17.5 μ (average 21.6 × 14.2 μ).

### 2. *Podosphaera tridactyla* on *Prunus padus*.

Mycelium was amphigenous, mostly epiphyllous and white powdery spots were formed evanescently. Subglobose or ellipsoidal conidia were borned in chains on conidiophores with septate and measured 22.0-30.0 × 13.0-22.0 μ (average 27.3 × 14.5 μ). Conidiophore was measured 90.0-115.0 × 7.0 μ. Perithecia were scattered or grouped and measured 70.0-120.0 μ (average 85.7 μ) in diameter. Appendages were 2-7 in number, springing from the upper part of perithecium, 1-3 septate, brown colored to half length or more, dichotomously branched 4-6 times at the apex and measured 80.7-170.0 μ (average 131.7 μ) in length. Each perithecium contained one ascus. Mature ascus was globose to subglobose, contained 8 ascospores and measured 50.0-90.0 × 50.0-70.0 μ (average 62.7 × 60.8 μ). Ascospores were ovate to ellipsoidal and measured 21.3-35.0 × 12.5-18.8 μ (average 26.4 × 14.1 μ).

### 3. *Uncinula sengokui* on *Celastrus flagellaris*.

Mycelium was amphigenous, mostly epiphyllous and evanescent on the lower surface. Perithecia were scattered, globose, brown to dark brown and 90.0-122.5 μ in diameter. Appendages were hyaline, aseptate, circinate at the apex, 15-35 in number and 97.5-175.0 μ in length. 4-6 asci were contained in one perithecium, ovate or oval with a stalk and 42.5-60.0 × 28.8-33.8 μ. Ascospores were usually 5 in number, oval or ellipsoidal and 17.5-20.0 × 10.0-12.5 μ.

### 4. *Uncinula fraxini* on *Fraxinus* × *chiisanensis*.

Mycelium was formed on both leaves and shoots evanescently. Perithecium was globose and 75.0-95.0 μ in diameter. Appendages were hyaline,

aseptate, 14-19 in number and 125.0-215.0  $\mu$  in length. Asci were 4-6 in number, ovate to globose and 40.5-52.5  $\times$  37.5-42.5  $\mu$ .

Ascospores were 6-8 in number, ellipsoidal and 15.0-22.5  $\times$  9.5-10.0  $\mu$ .

## DISCUSSION

It has been reported that 52 species belonging to 8 genera of powdery mildew fungi are parasitic on 141 host plants in Korea.

However, host of powdery mildew are amount to 145 species including 4 host plants newly investigated by this survey. Appendages of *Podosphaera tridactyla*(DC.) DE BARY on *Prunus serrulata* var. *spontanea* and *P. padus* were 2-5 in number and produced from the upper part of perithecium. On the contrary, *Podosphaera oxycanthae*(DC.) DE BARY reported on *Prunus avium*, *P. cerasus*, *P. pennsylvanica*, *P. persica* and *P. virginiana* in Europe and United States has the morphological characteristics that appendages are 8-16 in number and produced from the basal part of perithecium(5). Also, it seems that powdery mildew fungi parasitic on *Prunus* spp. are different in geographical distribution; *Podosphaera oxycanthae*, *P. leucotricha*, *P. clandestina* and *Sphaerotheca pannosa* are reported in Europe and United States. On the other hand, only *Podosphaera tridactyla* is reported in Korea and Japan. *Celastrus arbutifolia* reported as host plant of powdery mildew was synonymous with *C. orbiculatus* reported in Korea. *Celastrus flagellaris* found out by this survey had not been reported in Korea as well as in Japan.

*Uncinula salmoni*, *U. fraxini*, *Phyllactinia fraxini*, *Ph. guttata* are reported on *Fraxinus* spp. in Japan (7,24). However, only *Uncinula fraxini* is reported on *Fraxinus rynchophyllus*(14) and *Fraxinus x chisanensis* in Korea. *U. fraxini* is characterized by longer appendages than other *Uncinula* spp.(7). Powdery mildew fungi already reported on 3 genera of host plant, i.e., *Prunus*, *Celastrus* and *Fraxinus* are as follows. From now on, it is recommended to examine many samples collected from the broader areas.

## *Prunus* spp.

### *Podosphaera tridactyla*(WALLR.) DE BARY

- \* on *Prunus serrulata* var. *spontanea*(Oriental cherry)
- \* on *Prunus padus*(European bird cherry)
- on *Prunus amygdalus*(Almond) : U.S.A. (26)
- on *Prunus armeniaca* var. *ansu*(Apricot) : Japan (7)
- on *Prunus avium*(Sweet cherry) : New Zealand (1)
- on *Prunus buergeriana* : Japan (7)
- on *Prunus cerasus* : Japan (7)
- on *Prunus domestica*(Garden plum) : Sweden, New Zealand (1, 8)
- on *Prunus grayana* : Japan (7)
- on *Prunus insititia* : Sweden (8)
- on *Prunus leveilleana* var. *typica* : Korea (14)
- on *Prunus lusitanica* : New Zealand (1)
- on *Prunus mume*(Japanese apricot) : Japan (7)
- on *Prunus padus* : Japan, Sweden (1, 7, 8)
- on *Prunus persica*(Peach) : Korea (21)
- on *Prunus persica* var. *vulgaris*(Peach) : Japan (7)
- on *Prunus salicina* : Korea (21)
- on *Prunus serrulata* var. *albida* subvar. *speciosa* (Oriental cherry) : Japan (7)
- on *Prunus spinosa*(Sloe, Blackthorn) : Denmark (8)
- on *Prunus triflora* : Japan (7)
- on *Prunus yedoensis*(Yoshino cherry) : Japan (7)

### *Podosphaera oxycanthae*(DC.) DE BARY

- on *Prunus avium* : U.S.A. (5)
- on *Prunus cerasus*(Sour cherry) : U.S.A. (5)
- on *Prunus pennsylvanica*(Pin cherry) : U.S.A. (5)
- on *Prunus persica* : U.S.A. (3, 5, 9)
- on *Prunus virginiana*(Common chokecherry) : U.S.A. (5)

### *Podosphaera leucotricha*(ELL. & EVERH) SALM.

- on *Prunus amygdalus* : U.S.A. (29)

***Podosphaera clandestina*(WALLR. ex FR.) LÉV**on *Prunus cerasifera* : U.S.A. (4)***Podosphaera pruni-ulgifoliae* GOLOV. (6)*****Sphaerotheca pannosa*(WALLR.) LÉV**on *Prunus persica* : New Zealand, Sweden,  
U.S.A. Malta (1, 3, 8, 25, 27, 28)***Uncinula prunastri*(DC. MERAT) SACC**on *Prunus spinosa* : Sweden (8)***Microsphaera alni* var. *extensa*(Cke & Peck) SALM.**on *Prunus* sp. (5)***Phyllactinia salmonii* (*P. corylea*)**on *Prunus amygdalus* : India (25)***Celastrus* spp.*****Uncinula sengokui* SALM.**

- \* on *Celastrus flagellaris*(Korean bittersweet)
- on *Celastrus orbiculata*(Oriental bittersweet) :  
Japan (7)
- on *Celastrus orbiculatus*(Oriental bittersweet):  
Korea (15)

***Fraxinus* spp.*****Uncinula fraxini* MIYABE**

- \* on *Fraxinus* × *chiisanensis*
- on *Fraxinus japonica* : Japan (7)
- on *Fraxinus longicuspis*(Japanese ash) : Japan  
(7, 24)
- on *Fraxinus mandschurica*(Manchurian ash) :  
Japan (7)
- on *Fraxinus rynchophyllus* : Korea (14)
- on *Fraxinus sieboldiana* : Japan (7)
- on *Fraxinus chinensis*(Chinese ash) : China  
(24)

***Uncinula salmoni* SYDOW**on *Fraxinus japonica* : Japan (7)  
on *Fraxinus longicuspis* : Japan (7, 24)on *Fraxinus longicuspis* var. *sieboldiana* :  
Japan (24)on *Fraxinus mandschurica* : Japan (7)on *Fraxinus ornus*(Flowering ash) : Japan (7)on *Fraxinus sieboldiana* : Japan (7)on *Fraxinus sieboldiana* var. *pubescens* :  
Japan (7)***Phyllactinia fraxini*(DC.) HOMMA**on *Fraxinus championii* : China (24)on *Fraxinus chinensis*: China (24)on *Fraxinus mandschurica* : Japan, Siberia  
(7, 24)on *Fraxinus pubinervis* : Japan (7)on *Fraxinus sieboldiana* : Japan (7)***Phyllactinia guttata*(WALLR. ex FR.) LÉV**on *Fraxinus excelsior*(European ash) : Den-  
mark, France, Norway, Poland (24)on *Fraxinus mandschurica* : Japan (24)on *Fraxinus ornus* : Denmark (4, 24)***Microsphaera penicillata*(WALLR. ex FR.) LÉV**on *Fraxinus ornus* : U.S.A. (4)***Typhulochaeta japonica* S. ITO & HARA**on *Fraxinus japonica* : Japan (7)

\* New host plants of powdery mildew in Korea

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## EXPLANATION OF PLATES

### Plate I

1. Evanescent mycelium of powdery mildew fungus on *Prunus serrulata* var. *spontanea*.
2. Yellow, brown and dark brown perithecia scattered on *Prunus serrulata* var. *spontanea*. (× 40).
3. Perithecium, ascus, 8 ascospores and 2-septate dichotomously branched appendage of *Podosphaera tridactyla* (× 280).

4. White powdery spots formed on *Prunus padus*.
5. Dark brown perithecia scattered or grouped on *Prunus padus* ( $\times 40$ ).

#### Plate II

6. 3-septate, dichotomously branched, upper part hyaline and lower part brown appendages ( $\times 280$ ).
7. Ellipsoidal conidia formed on septate conidiophores in chains ( $\times 280$ ).
8. White mycelium of *Uncinula sengokui* on *Celastrus flagellaris*.

9. Globose and dark brown perithecia of *U. sengokui* scattered on *Celastrus flagellaris* ( $\times 40$ ).

#### Plate III

10. Oval ascus with a stalk and hyaline, aseptate, uncinatate at the apex appendage ( $\times 400$ ).
11. Leaves and shoots of *Fraxinus*  $\times$  *chiisanensis* infected with powdery mildew.
12. Uncinate appendages, asci and ascospores of *Uncinula fraxini* formed on *Fraxinus*  $\times$  *chiisanensis* ( $\times 66$ ).

Plate I

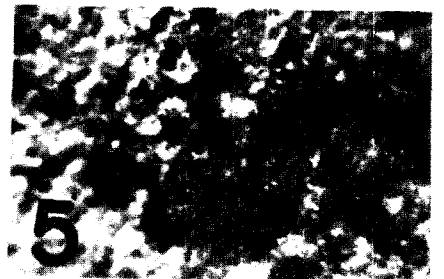
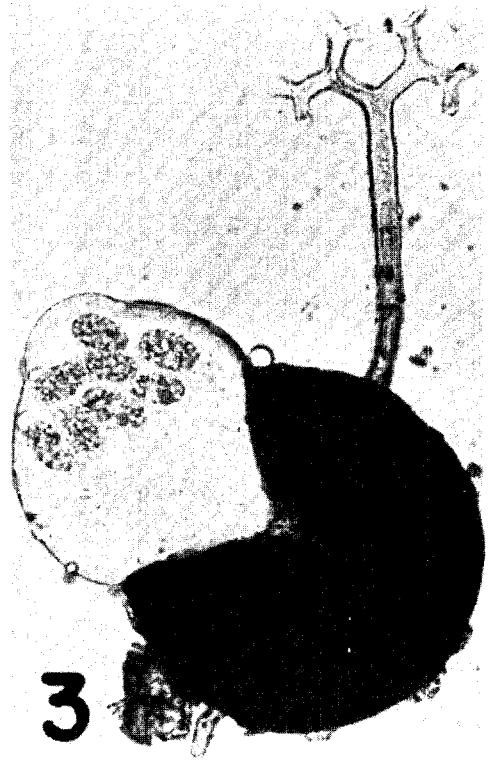
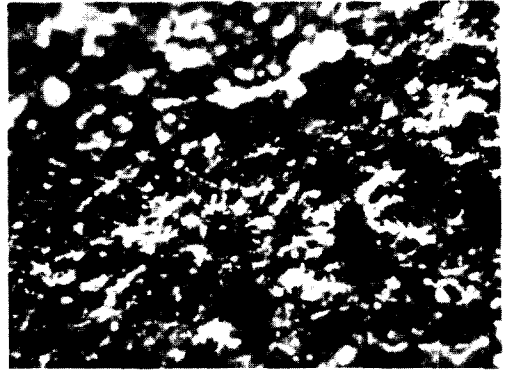
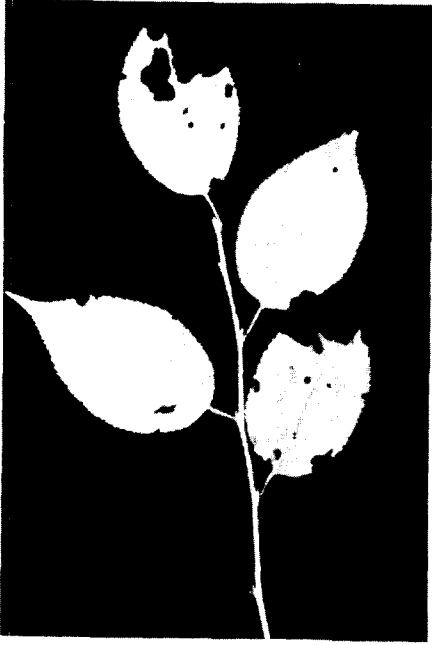


Plate II

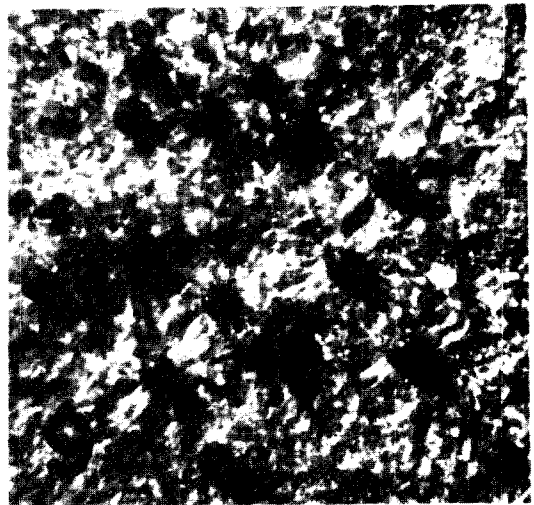
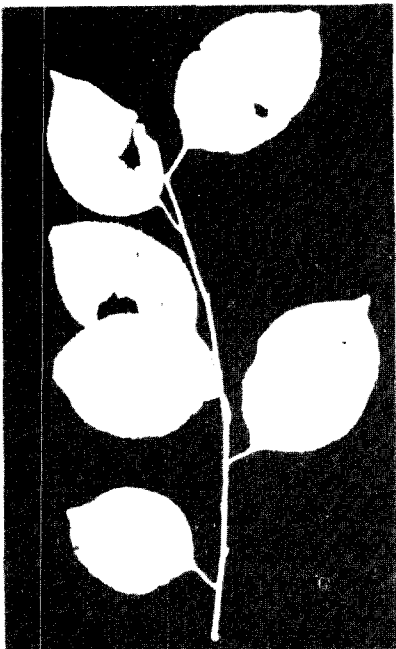
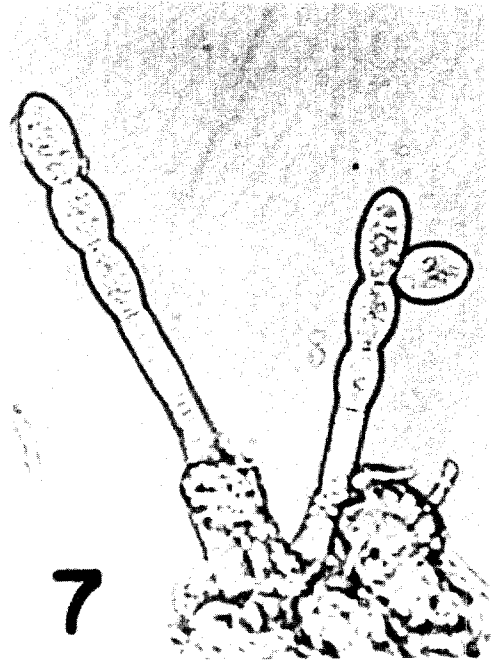




Plate III

