

(Ascomycota: Erysiphales) Erysiphaceae

*

(/ / : - / / :)

Erysiphaceae

Quercus sp. *Erysiphe quercicola* *Malva* sp. *E. malvae*
Golovinomyces fischeri *Helianthus* spp. *Golovinomyces ambrosiae*
Senecio glaucus
Golovinomyces cichoracearum s.l.
Golovinomyces *Golovinomyces cichoracearum* s.s.
Sonchus spp. *sonchicola*
Golovinomyces cichoracearum

Symphytum *Golovinomyces cynoglossi*
Leveillula taurica *Photinia serrutata* *Podosphaera leucotricha asperum*
Daphne mucronata

(Ale-Agha *et al.* 2000,

.2004; Kiss 2005)

Erysiphaceae (Ascomycota:

Erysiphales)

.(Kiss, 2005)

.(Kiss, 2005)

(Saenz &

Taylor, 1999; Mori *et al.*, 2000; Takamatsu *et al.*, 1998 & 1999, 2000, 2008; Takamatsu, 2004;

.Matsuda & Takamatsu, 2003)

E. elevata *Erysiphe flexuosa*

(DSH-HX1)

BH2

(Adobe Photoshop CS)

(Braun, 1987, 1995; Braun & Takamatsu,
.2000; Cook & Braun, 2009)

Tajik-Ghanbary

2001a,b 2000) Khodaparast *et al.* (2005) *et al.*

(2005) Tavanaei *et al.* (2007 2005 2003 2002

(2009) Khodaparast & Abbasi

°C

Erysiphaceae

(2009) Cook & Braun

Erysiphaceae

%

BH2

Erysiphe malvae V.P. Heluta

Malva sp. :

//

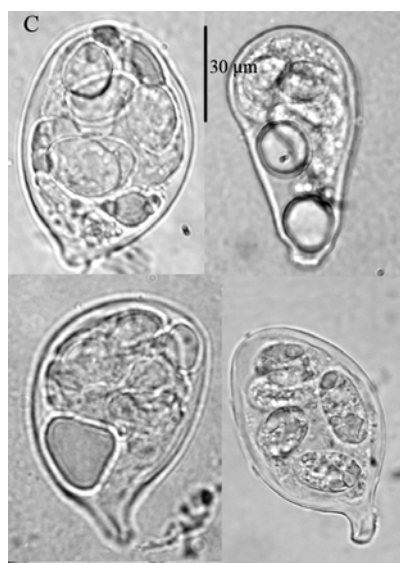
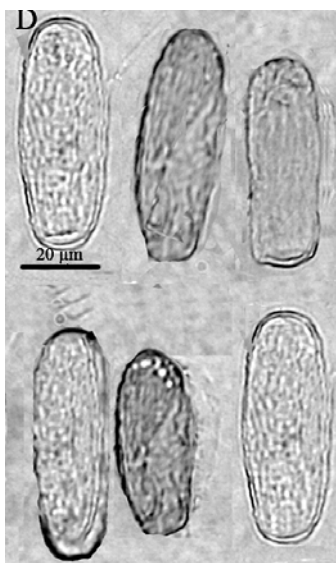
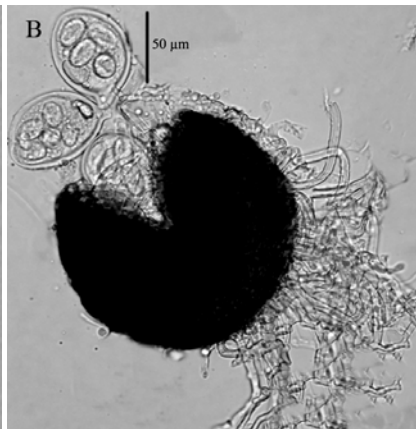
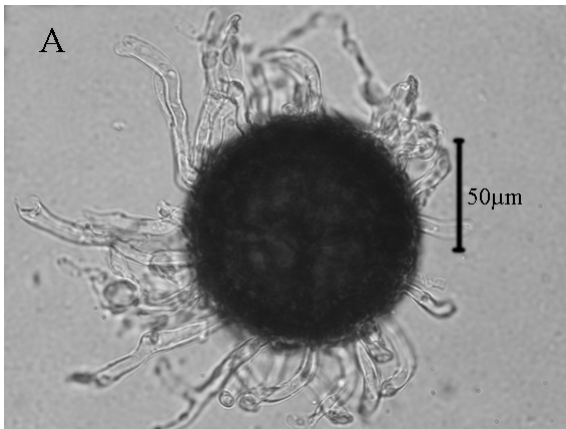
x

(2008) Khodaparast *et al.*

Erysiphe quercicola S. Takam. & U. Braun

Quercus sp.

()



Erysiphe malvae

(D)

(C)

(B)

(A)

|| ||
G. cichoracearum s.l.
 Braun
 Asteraceae (1987)

(2003) Matsuda & Takamatsu
Golovinomyces
 Asteraceae

Asteraceae

. ×
 (.)
E. alphitoides (Griffon &
 Maubl.) U. Braun & S. Takam.

ITS
 AB292693 ITS1+5.8S+ITS2
 (http://www.ncbi.nlm.nih.gov) NCBI

(2007) Takamatsu *et al.*
Oidium mangiferae Berthet

(2009) Cook & Braun

Mangifera indica L.

Scorzonera G. cichoracearum
G. cichoracearum s.s.
Tragopogon Scorzonera

Sonchus spp. *Senecio* spp. *Helianthus* spp.
Scorzonera spp.

Golovinomyces

G. cichoracearum s.s.



Erysiphe quercicola

() (A)
 () (B)

***Golovinomyces cichoracearum* V.P. Heluta**

Scorzonera sp. :

||

Tragopogon sp.

||

()

||

Scorzonera sp.

Tragopogon graminifolius

... :

H. tuberosus ×

() ×

×

Tragopogon bupthalmoides (DC.) Boiss.

ITS

ITS1+5.8S+ITS2

(2003) Khodaparast *et al.*

() × ()

AB077682) *Scorzonera hispanica*

NCBI

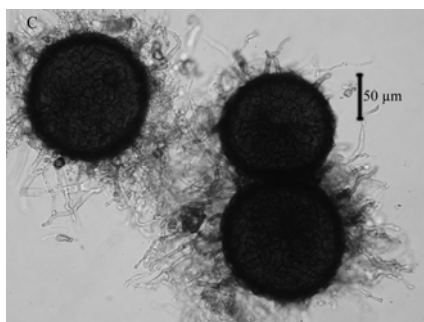
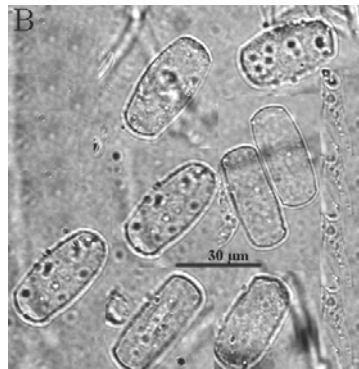
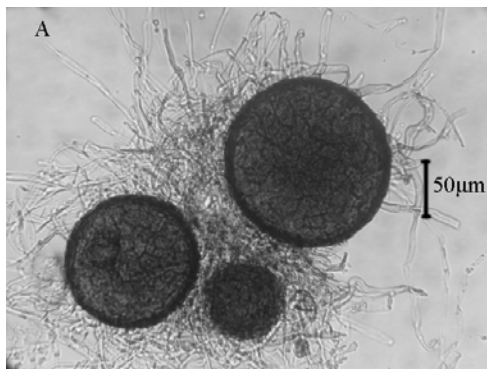
Golovinomyces ambrosiae (Schwein.) U. Braun & R.T.A. Cook

Helianthus annuus :

H. tuberosus / /

reticuloidium / /

(Cook & Braun, 2009) ()



G. cichoracearum (B) *Golovinomyces cichoracearum* (A)

G. fischeri (D) *G. fischeri* (C)

Helianthus

()

(2003) Matsuda & Takamatsu

***Golovinomyces fischeri* (S. Blumer) U. Braun & R.T.A. Cook**

(*Asteraceae*) Heliantheae

Senecio glaucus L. :

/ /

G. cichoracearum var. *latisporus* U. Braun

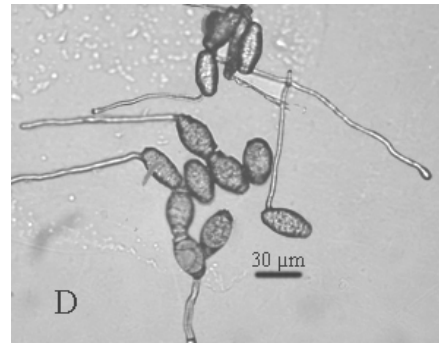
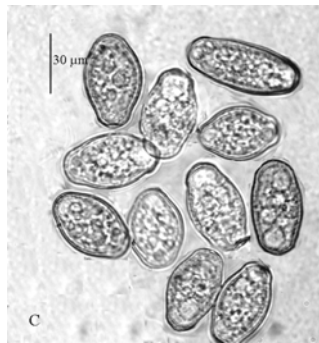
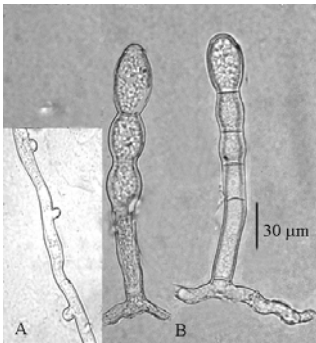
(2009) Cook & Braun

Oidium sp.

(Khodaparast & Abbasi, 2009)

Podosphaera xanthii

×



Helianthus tuberosus

Golovinomyces ambrosiae

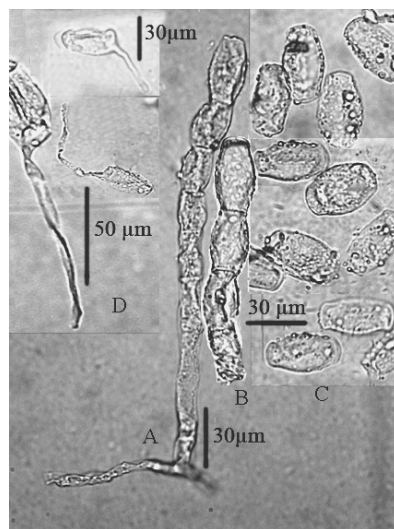
(D)

(C)

(B)

()

(A)



Helianthus annuus

Golovinomyces ambrosiae

(B)

(A)

()

(D)

(C)

... :

G. fischeri
() *G. cichoracearum*
Scorzonera sp.

***Golvinomyces sonchicola* U. Braun & R.T.A. Cook**

() ×

Sonchus oleraceus :

|| L.
||
|| *Sonchus* sp.

() / / (/)
()

()
() ×

() ×
()
/

() () ×
()

×

()

G. cichoracearum s.s.

(1987, 1995) Braun

Erysiphe cichoracearum var. *fischeri*

Cook (S. Blumer) U. Braun
(2009) & Braun

) ×

() × ()
() × ()

Golvinomyces sonchicola

G. fischeri *G. cichoracearum*

G. cichoracearum

Scorzonera sp.

(*G. cichoracearum* s.s.)

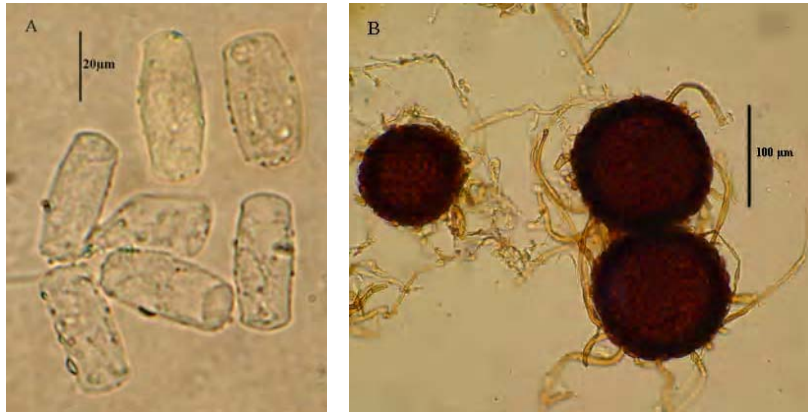
G. cichoracearum

Tragopogon

()

Scorzonera sp.

G. fischeri



Golovinomyces sonchicola

(C) (B) (A)

Podosphaera leucotricha (Ellis and Everh.) E.S. Salmon

Photinia serrutata : // Lindl.

() ×
(1987, 1995) Braun

Podosphaera leucotricha
Oidium photiniae Jacz.
(Amano, 1986)

P. leucotricha

(2009) Cook & Braun

G. cichoracearum

(2003) Matsuda & Takamatsu

G. cichoracearum s.l.

Sonchus

***Golovinomyces cynoglossi* (Wallr.) Heluta**

Symphytum asperum :

// Lepech.

(Khodaparast &

Boraginaceae

.Abbasi, 2009)

×

Leveillula taurica (Lev.) Arn.

Daphne mucronata :

/ /

Leveillula taurica



:Photinia serrutata Podosphaera leucotricha

REFERENCES

1. Ale-Agha, N., Braun, U., Feige, B. & Jage, H. (2000). A new powdery mildew disease on *Aesculus* spp. introduced in Europe. *Cryptogamie Mycologie*, 21, 89–92.
2. Ale-Agha, N., Bolay, A., Braun, U., Feige, B., Jage, H., Kummer, V., Lebeda, A., Piatek, M., Shin, H.-D. & Zimmermannova-Pastircakova, K. (2004). *Erysiphe catalpae* in Europe. *Mycological Progress*, 3, 291–296.
3. Amano, K. (1986). *Host range and geographical distribution of the powdery mildew fungi*. Japan Sci. Soc. Press, Tokyo.
4. Braun, U. (1987). A monograph of the Erysiphaceae (powdery mildews). Beihefte zur *Nowa Hedwigia*, 89, 1-700.
5. Braun, U. (1995). *The Powdery Mildews (Erysiphales) of Europe*. Jena, FisherVerlag, Germany.
6. Braun, U. & Takamatsu, S. (2000). Phylogeny of *Erysiphe*, *Microsphaera*, *Uncinula* (Erysiphaceae) and *Cystotheca*, *Podosphaera*, *Sphaerotheca* (Cystothecaceae) inferred from rDNA ITS sequences – Some taxonomic consequences. *Schlechtendalia*, 4, 1-33.
7. Cook, R. T. A. & Braun, U. (2009). Conidial germination in powdery mildews. *Mycological Research*, 113, 616-639.
8. Khodaparast, S. A. & Abbasi, M. (2009). Species, host range and geographical distribution of powdery mildew fungi (Ascomycota: Erysiphales) in Iran. *Mycotaxon*, 108, 213-216.
9. Khodaparast, S. A., Abbasi, M., Sharifnabi, B. & Zafari, D. (2008). New records of Erysiphaceae (Ascomycota: Erysiphales) for Iran mycoflora. 18th Iranian Plant Protection congress, 24-27 Aug., University of Bu_Ali Siona, Hamedan, Iran, p. 684.
10. Khodaparast, S. A., Hedjaroude, Gh. A., Ershad, Dj., Zad, J. & Termeh, F. (2000). A study on the identification of Erysiphaceae in Guilan province, Iran (I). *Rostaniha*, (1), 53-63. (In Farsi)
11. Khodaparast, S. A., Hedjaroude, Gh. A., Ershad, Dj., Zad, J., Termeh, F. & Moosavi, M. (2001a). A study on the identification of Erysiphaceae in Guilan Province, Iran (II). *Rostaniha*, (2), 75-87. (In Farsi)
12. Khodaparast, S. A., Takamatsu, S. & Hedjaroude, Gh. A. (2001b). Phylogenetic structure of the genus *Leveillula* (Erysiphales: Erysiphaceae) inferred from the sequences of the rDNA internal transcribed

- spacers regions with special references to the *Leveillula taurica* species complex. *Mycological Research*, 105 (8), 909-918.
13. Khodaparast, S. A., Hedjaroude, Gh. A. & Takamatsu, S. (2003). Phylogenetic relationships between Iranian isolates of *Microsphaera* and *Erysiphe* s. lat. based on rDNA internal transcribed spacers sequences. *Rostaniha*, (4), 93-103.
 14. Khodaparast, S. A., Hedjaroude, Gh. A., Takamatsu, S. & Braun, U. (2002). Three new species of the genus *Leveillula* from Iran. *Mycoscience*, 43(6), 459-462.
 15. Khodaparast, S. A., Hedjaroude, Gh. A. & Takamatsu, S. (2005). Phylogenetic analysis of the Iranian powdery mildew fungi using nucleotide sequences of the 28S ribosomal DNA. *Journal of Agricultural science and Technology*, 7, 49-58.
 16. Khodaparast, S. A., Niinomi, S. & Takamatsu, S. (2007). Molecular and morphological characterization of *Leveillula* (Ascomycota: Erysiphales) on monocotyledonous plants, *Mycological research*, 111 (6), 673-679.
 17. Kiss, L. (2005). Powdery mildew as invasive plant pathogens: new epidemics caused by two North American species in Europe. *Mycological research*, 109, (3), 257-260.
 18. Matsuda, S. & Takamatsu, S. (2003). Evolution of host-parasite relationships of Golovinomyces (Ascomycete: Erysiphaceae) inferred from nuclear rDNA sequences. *Molecular Phylogenetics and Evolution*, 27, 314-327.
 19. Mori, Y., Sato, Y. & Takamatsu, S. (2000). Evolutionary analysis of the powdery mildew fungi using nucleotide sequences of the nuclear ribosomal DNA. *Mycologia*, 92, 74-93.
 20. Saenz, G. S. & Taylor, J. W. (1999). Phylogeny of the Erysiphales (powdery mildews) inferred from internal transcribed spacer ribosomal DNA sequences. *Canadian Journal Botany*, 77, 150-169.
 21. Tajik-Ghanbary, M. A., Hedjaroude, Gh. A., Ershad, Dj., Termeh, F. & Mousavi, M. (2005). Identification of fungi belonging to Erysiphaceae in Golestan National park. *Khazar Agricultural and Bioresources Research*, 4, 63-71. (In Farsi).
 22. Takamatsu, S. (2004). Phylogeny and evolution of the powdery mildew fungi (Erysiphales, Ascomycota) inferred from nuclear ribosomal DNA sequences. *Mycoscience*, 45, 147-157.
 23. Takamatsu, S., Braun, U., Limkaisang, S., Kom-Un, S., Sato, Y. & Cunnington, J. H. (2007). Phylogeny and taxonomy of the oak powdery mildew *Erysiphe alphitoides* sensu lato. *Mycological Research*, 111, 809-826.
 24. Takamatsu, S., Hirata, T. & Sato, Y. (1988). Phylogenetic analysis and predicted secondary structures of the rDNA internal transcribed spacers of the powdery mildew fungi (Erysiphales). *Mycoscience*, 39, 441-453.
 25. Takamatsu, S., Hirata, T. & Sato, Y. (2000). A parasitic transition from trees to herbs occurred at least twice in tribe Cytotheceae (Erysiphaceae): evidence from nuclear ribosomal DNA. *Mycological Research*, 104 (11), 1304-1311.
 26. Takamatsu, S., Hirata, T., Sato, Y. & Nomura, Y. (1999). Phylogenetic relationships of *Microsphaera* and *Erysiphe* section *Erysiphe* (powdery mildews) inferred from the rDNA ITS sequences. *Mycoscience*, 40, 259-268.
 27. Takamatsu, S., Inagaki, D., Niinomi, S., Khodaparast, S. A., Shin, H. D., Grigaliunaite, B. & Havrylenko, M. (2008). Comprehensive molecular phylogenetic analysis and evolution of the genus *Phyllactinia* (Ascomycota: Erysiphales) and its allied genera. *Mycological Research*, 112 (3), 299-315.
 28. Tavanaei, Gh., Fazlali, Y. & Khodaparast, S. A. (2005). Introduction of the fungi causing powdery mildews on oak trees in Arasbaran forests. *Iranian Journal of Forest and Range Lands Protection Research*, 3(1), 69-83. (In Farsi).