The Powdery Mildews (Erysiphales) of Wales: An Identification Guide and Census Catalogue

Llwydni Blodeuog (Erysiphales) Cymru: Arweiniad a Chatalog Cyfrifiad

Arthur O. Chater & Ray G. Woods

Summary

The powdery mildew fungi form a well circumscribed group of parasitic fungi in the Order Erysiphales within the Phylum Ascomycetes (the “spore shooters”). If the host plant can be accurately identified the task of identifying the powdery mildew is relatively easy. Presented here is a catalogue of host plant species and their powdery mildews which have been reported from Wales or which might occur in Wales, with a synopsis of characters to enable a fungus to be identified where more than one occurs on a particular host.

Over 700 taxa of powdery mildews are known world-wide with over 166 reported from Britain. Catalogued here by the Vice-counties within Wales in which they occur, are over 122 taxa of powdery mildews. Representatives of all five Tribes of the powdery mildews occur in Wales. As many of the wild host plants diminish in extent, the fungi that are dependent on them grow scarcer. This guide, we hope, will stimulate their study and enable conservation priorities to be established.

Crynodeb

Ffurfir y ffwng llwydni blodeuog grwp cyfyngiedig o ffyngau parasitig o fewn yr Urdd Erysiphales sydd o fewn y Ffylwm Ascomycetes (y ‘saethwyr sborau’). Os yw planhigion cynhaliol yn cael eu enwi’n gywir, mae’r dasg o enwi y llwydni blodeuog yn weddol hawdd. Wedi ei gyflwyno yma mae catalog o rywogaethau o blanhigion cynhaliol a’u llwydni blodeuol sydd wedi eu cofnodi yng Nghymru neu efallai yn bodoli yng Nghymru, gyda chrynodeb o nodweddion sy’n galluogi i’r ffwng gael ei enwi’n gywir yn yr achosion ble mae mwy nac un yn bodoli ar blanhigyn cynhaliol arbennig.

Adnabyddir dros 700 tacsa o lwydni blodeuog dros y byd i gyd, gyda dros 166 wedi eu cofnodi ym Mhrydain. Drwy eu catalogio yma ar sail ble maent yn bodoli o fewn Cymru yn yr Is-siroedd (*Vice Counties*), gwelir fod yma 120 tacsa o lwydni blodeuog. Mae cynrychiolwyr o’r pum tylwyth o lwydni blodeuog yn bodoli yng Nghymru. Fel mae nifer o’r planhigion cynhaliol yn lleihau yn eu ehangder, maer ffyngau sy’n ddibynadwy arnynt yn prinhau. Gobeithiwn y gwnaiff yr arweiniad yma ysgogi eu astudiaeth a galluogi blaenoriaethau cadwraeth gael eu sefydlu.

Cover Stories

The front cover is of the powdery mildew of vines (*Erysiphe necator* var. *necator*) (© R.N. Stringer). This mildew first appeared in Europe on vines in Margate in 1845 where it quickly destroyed the fruits and by 1850 had spread through the vineyards of France (Large 1940). About the same time a powdery mildew had become widespread on hops and potato blight first made its appearance in Europe, the latter causing human famine and mass migration.

These epidemics stimulated the detailed study of micro-fungi. The Rev M.J. Berkeley in Britain and Dr. J.H. Léveillé and the Tulasne brothers, Louis and Charles in France began to tease out the life histories of the powdery mildews. One of Charles Tulasne’s never-bettered illustrations from the brothers’ *Selecta Fungorum Carpologia* of 1861 is reproduced on the rear cover.

The images of chasmothecia on the title page and on page 45 are taken from plate 73 of Ernst Haeckel's *Kunstformen der Natur*, Leipzig & Vienna: Bibliographisches Institut, 1904.

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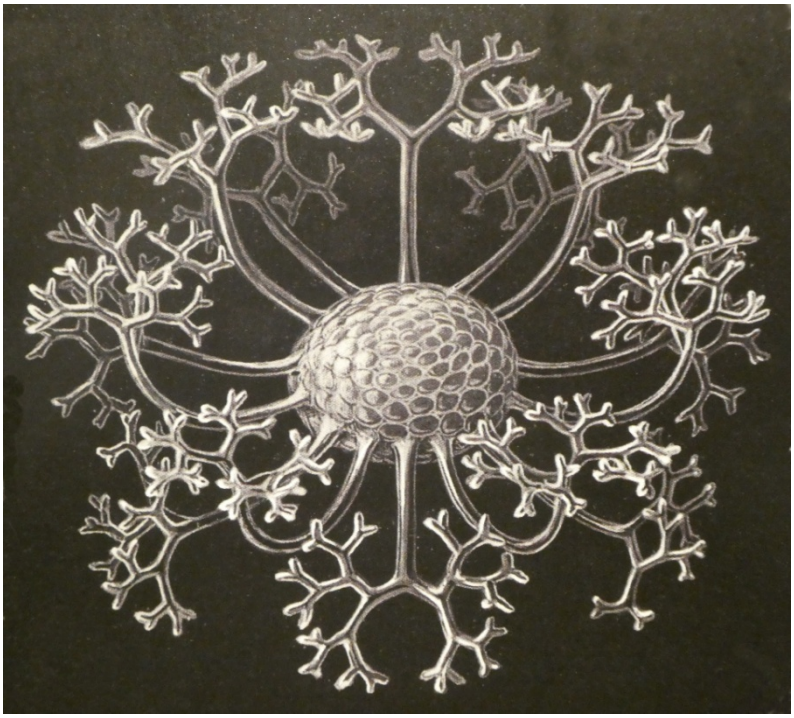

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- Bruce Ing for helpful suggestions and for sharing his knowledge and Welsh records;
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- Eilir Evans for providing the Welsh translations;
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- Paul A. Smith for his records and for invaluable help in preparing the manuscript for the press.

Introduction

There are few gardeners, horticulturalists or farmers who have not rued the existence of powdery mildews. Few crops are immune to their attentions and we ignore them at our peril. Try to grow crops as diverse as cereals, cucurbits, brassicas or soft fruit, or a garden full of roses and, given a spell of dry weather, powdery mildews soon appear. Enjoying a glass of wine or beer is entirely dependent on the growers of grapes, malt and hops understanding the life cycle of powdery mildews and mounting an unrelenting campaign to control their abundance. It seemed sensible to take a "stock check" on the powdery mildews of Wales.

The authors, having spent decades recording the vascular plant flora of parts of Wales (Woods 1993, Chater 2010), have noted the diminution in extent of many species. Threats to this flora have been quantified in a Red Data List for Wales (Dines 2008) and in Vice-county rare plant registers (see BSBI website www.bsbi.org). As plants become more threatened it seemed to the authors that the future of those micro-fungi dependent on them must be equally, if not more, threatened. In an attempt to better understand this threat and stimulate further study a small group of mycologists recently produced Red Data Lists of Welsh rust fungi (Woods *et al.* 2015) and smut fungi and their allies (Woods *et al.* 2018).

A Red List for the powdery mildews (Erysiphales) of Wales also seemed desirable, but a search of the literature and databases yielded so little information for most of Wales that even a draft list could not be confidently constructed. Moreover, recently developed molecular techniques have greatly altered taxonomic concepts in this group (Braun & Cook 2012) and better elucidated the host range of the fungi, so a number of old records had to be discarded. These new concepts also made Bruce Ing's excellent check list and guide, produced in seven parts in the *Mycologist* between 1990 and 1991, now less useful, and the recent changes were also by and large predated by Ellis & Ellis (1997), otherwise an excellent source of information on microfungi. The checklist of British ascomycete fungi (Cannon *et al*. 1985) is equally out of date.

The conscientious student of powdery mildews has therefore to turn to the *Taxonomic Manual of the Erysiphales (Powdery Mildews*) by Uwe Braun and Roger Cook published in 2012, a masterly but somewhat expensive volume covering the entire world, or employ Friedemann Klenke and Markus Scholler's *Pflanzenparasitische Kleinpilze* published in German in 2015. The publication of both of these works does not seem to have greatly stimulated mycologists to record these fungi in Britain. To make use of these volumes with any ease it is necessary to determine the species or at least the genus of the host plant. This seems to be a major stumbling block to many active field mycologists taking up a study of these fungi. The authors have therefore decided to create a guide that might appeal to the vascular plant recorder, as well as the committed mycologist, in the hope of stimulating an interest in powdery mildews and so generating more records and a better understanding of the relationships between these interesting fungi and their hosts.

Given our low knowledge base for Wales, we have expanded the lists and identification guide to include many of the host/fungus combinations recorded from mainland Britain. Also included are those mildews that are most likely to occur here given their known distribution in Western Europe and bearing in mind the possible consequences of a changing climate. The ever expanding horticultural trade between countries and intercontinental travel has also led to the introduction of many new species of both host plant and powdery mildew. For example

the Oak Mildew (*Erysiphe alphitoides*), now one of our commonest powdery mildews, may well have been introduced from the USA, since no record appears to exist of its presence in Britain before 1907 (Ingram & Robertson 1999). At least in south-east England some ecologists consider that by limiting the photosynthetic efficiency of oak seedlings the ability of oak to regenerate inside woodlands has been compromised and other species may now replace oak. Re-growth from coppice stools and pollarded trees may also be checked and occasionally killed.

Oak Mildew (*Erysiphe alphitoides*) abundant on the coppice regrowth shoots of oak.

Over 700 species of powdery mildew have been recorded worldwide (Braun & Cook 2012) divided into 5 tribes, all of which have Welsh representatives. Wales, despite its small size, supports over 122 taxa compared to over 166 in the whole of mainland Britain. By expanding the scope of this publication to include a guide to the identification of taxa that occur beyond the Welsh border, we hope it might find a wider appeal and result in the discovery of taxa previously unreported from Wales. It still, however, remains a “work in progress”, and due to the authors’ rather eccentric bases in Central and West Wales and advancing years, a detailed examination and re-evaluation of existing specimens in the major mycota collections, though highly desirable, has not yet been undertaken. Nor do we claim any special expertise in this group of fungi, so would be very pleased to receive any corrections or additions.

Powdery mildews are ascomycetes (the “spore shooters”) and exist in two states, the asexual anamorph state reproducing by means of conidia, and the sexual teleomorph state reproducing by means of ascospores produced in asci developing in more or less spherical chasmothecia. The usually conspicuous whitish mycelium and conidiophores on leaves, and sometimes on stems or fruits, are what one normally notices (see illustrations below). The chasmothecia of the teleomorph are produced on the mycelium later in the season, though may be absent. If present and when mature they are usually just visible to the naked eye, and are easily seen with a hand lens as minute blackish dots. When mature the chasmothecia may develop hair-like appendages that may branch in characteristic ways.

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Blumeria graminis on Winter Wild-oat *Avena sterilis*

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Erysiphe adunca on Grey Willow *Salix cinerea*

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Phyllactinia orbicularis on Beech *Fagus sylvatica*

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Chasmothecia of *Phyllactinia fraxini* at various stages of maturity

Powdery mildews may be confused by the beginner with species of *Ramularia* and related genera. The latter can be recognised immediately with a hand lens as the mycelium of *Ramularia* spp. is within the plant tissue, often swiftly killing it and the short, usually unevenly branched whitish conidiophores, instead of being generally distributed over the surface of the leaf, arise in clusters through the stomata.

They may also be confused with downy mildews (not fungi, but Oomycetes in the Kingdom Chromista). The mycelium of these members of the Peronosporales is internal in the plant tissue and the sporangiophores (more or less equivalent to conidiophores) emerge through the stomata; in the Peronosporaceae the sporangiophores are elongated and branched above so that the colonies are downy or felt-like and usually greyish in colour. Thick-walled, sexually produced oospores occur in many species, and can often be found in the plant tissue, although they are not always produced and not always in the same parts as the sporangia.

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Ramularia bistortae on *Bistorta officinalis*

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Ramularia urticae on *Urtica dioica*

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Ramularia calthae on *Caltha palustris*

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The downy mildew *Plasmoverna pygmaea* on *Anemone nemorosa* leaves

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Sporangiophores of the downy mildew *Peronospora obovata* as viewed through a hand lens

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Sporangiophore of the downy mildew *Peronospora flava* as viewed through a microscope

In the Albuginaceae (*Albugo* and *Pustula*) the sporangiophores are short, clavate, entire and dense so that the colonies are like a shiny white crust.

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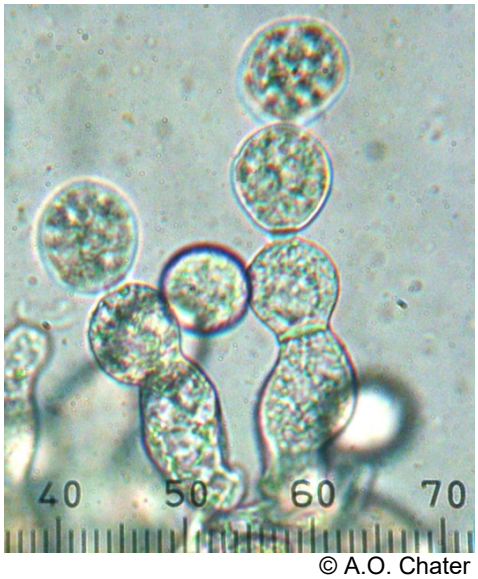
Albugo candida on the leaves of *Cochlearia* sp.



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Sporangiophores of *Albugo candida*

The identification of Powdery Mildews

If the host can be established the task of identification is rendered much more simple, since most powdery mildew taxa are very host specific, so identification of the host, at least to genus, is the first requirement here. Identifying powdery mildews from the fungus alone is a considerable challenge. Braun & Cook (2012) provide a key, though for many genera you will need to examine fungal structures of almost all the life stages of the fungus and even need to understand the times of maturity of some structures. Tabulated alphabetically below by host genus and fungus are the most useful diagnostic characters that distinguish the powdery mildew species reported from Britain or the near continent. Greenhouse and indoor hosts and their fungi are omitted, though Ing (1990-91) devotes a section to this group of species.

The approach adopted here is very inclusive. In addition to all the host/powdery mildew combinations already reported from mainland Britain, we have included those that may already be here but have yet to be detected, or that are likely to occur here in the near future, especially with climate change and the importation of plants from abroad. In general only host taxa in Stace (2019) are included, together with those garden plants from which powdery mildews have been recorded. Distribution information concerning the fungi is based chiefly on data from the Fungal Records Data Base of Britain and Ireland (FRDBI) of the British Mycological Society. As indicated below some of this data has had to be reassessed. The fungal taxonomy, nomenclature and characters chiefly follow Klenke & Scholler (2015) and Braun & Cook (2012). Ing (1990-91) provided much information, though requiring considerable updating and interpretation. Host names mostly follow Stace (2019) though occasionally (eg. in *Polygonum*) we have not taken up the proposed lumping of taxa so as not to lose information should this lumping eventually be reversed. Mildew names in bold have either been reliably reported from Britain, or claimed for Britain, some probably erroneously, but are nevertheless worth checking for. Pending a badly needed thorough revision and publication of a reliable checklist of the British species, this seems to us to be the most helpful approach.

In no way is the catalogue below meant to be an authoritative guide to identification; rather it is an aid and a warning of possibilities and is intended to prevent shortcut identifications that may be wrong. For the powdery mildews, where the taxonomy and nomenclature are currently in a perhaps even greater state of flux than those of the hosts, access to up-to-date identification literature is essential. A good example of one current problem is the recording of *Golovinomyces cichoracearum*. As Braun & Cook (2012) make clear, this mildew is confined to genera of Asteraceae subfamily Cichorioideae, yet it is still being recorded even in the New FRDBI on *Sonchus*, where, assuming it is a *Golovinomyces*, it should be *G. sonchicola*, and it is wrongly recorded on other genera as well. The situation with *Sonchus* is straightforward, but in some other cases, such as *Calendula*, although the mildew will not be *G. cichoracearum*, it is not clear what it should be called, so, as in other similar cases, we have followed Klenke & Scholler (2015) in calling it *G. cichoracearum s.l.* Similarly, in the New FRDBI *Podosphaera fusca* is recorded on *Taraxacum*, *Matricaria* and *Lapsana*, whereas Braun & Cook (2012) make clear that this mildew is confined to *Doronicum* and the records on these other hosts should, assuming they are of a *Podosphaera,* be *P. erigerontis-canadensis*. The situation is even more confusing in the old FRDBI, where, for example, *Plantago lanceolata* has records of *Podosphaera macularis* (actually confined to *Humulus*),

P. fuliginea (actually confined to *Veronica*), *P. plantaginis* and *Golovinomyces sordidus*; one wonders how many of the records of the latter two have been confirmed microscopically, notably by the presence or absence of fibrosin bodies in their conidia.

Mildews on Fabaceae and Asteraceae are often extremely difficult to identify for certain, and this is usually obvious from the characters given in the catalogue below.

For reasons of space, genera of the Poaceae are not included in the catalogue; the only powdery mildew species on its members is *Blumeria graminis.*

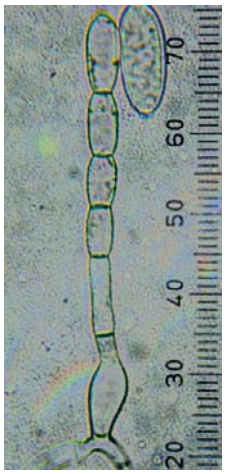
There are rather few reliable records of species of *Leveillula* from Britain, but with climate change they may become more frequent. These potential arrivals have mostly not been included here, but should be looked out for on many genera, and can generally be distinguished from our other genera by the very large conidia (30-150µm) which are dimorphic, the primary, longer ones being usually ovate-lanceolate in outline and often pointed at the apex.

Examining Powdery Mildews

A microscope is essential for identification. Until experience has been gained, it is strongly recommended that only fresh material is used for identification. The mycelium can be scraped or picked off the leaf surface with a needle, but the easiest method is to use a piece of transparent sticky tape such as Sellotape: a small piece is pressed onto the leaf, peeled off, and inverted into a drop of water on a slide; it is then turned over so that the sticky side with the mycelium is uppermost, replaced in the drop and a coverslip added.

Conidia and Conidiophores

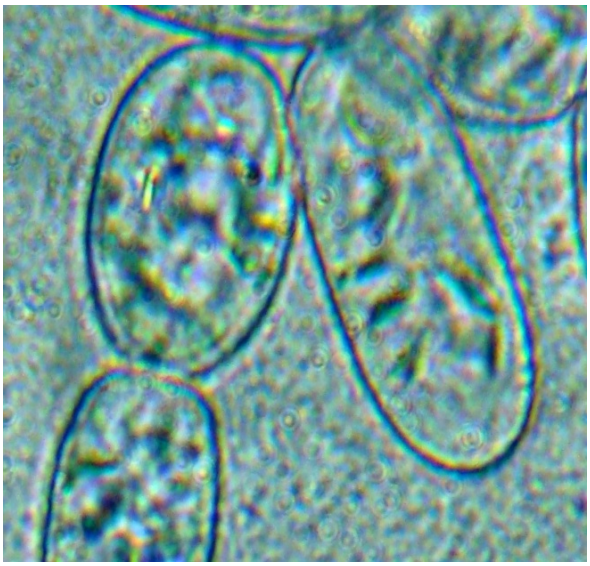
Conidiophores that bud off conidia should be readily apparent. Distinguishing between conidia formed singly from those formed in chains can be difficult: when conidiospores are formed singly, after a ripe conidium has detached, at most only one swollen cell is left at the apex of the conidiophores but when they are formed in chains several decreasingly swollen cells can be seen down the conidiophore (near right image of *Blumeria graminis*). The image of *B. graminis* also shows the characteristic swollen foot-cell of the conidiophore in this species.



Both © A.O. Chater

Fresh material is always preferable to work with, and fibrosin bodies, reflective shard-like bodies in the conidia (see images overleaf), can *only* be seen on fresh material. To see the germ tubes conidia have to be germinated: the leaf surface is tapped over the inside of the lid of a Petri dish so that conidia are deposited on its surface; a dampened piece of tissue is put in the dish, the lid closed and the whole kept in the dark at room temperature for 12-24 hours, or if need be for even longer, when the germ tubes will have emerged. They can be examined by removing and inverting the lid and observing the

conidia on it under the microscope without the use of a cover slip. In some species germ tubes may be long, in others short, whilst some show a distinctive pattern of branching. Examples are shown below.



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Fibrosin bodies in conidia

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Germ tubes short and lobed

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Germ tubes short and unlobed

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Germ tube long and unlobed

Appressoria

Hyphal appressoria are swellings developed at intervals along the hyphae allowing the fungus to gain access to the host's cells. They can be obscure and difficult to find in some powdery mildew species, whilst in others they may be nipple-shaped or slightly to strongly lobed.

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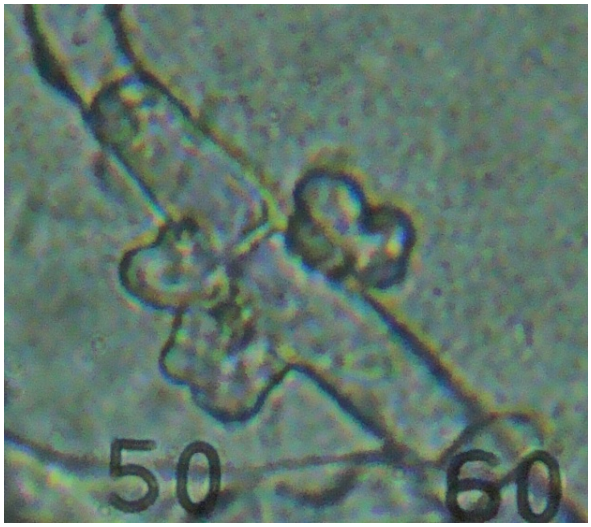
Nipple-shaped appressoria of *Golovinomyces orontii.*



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Lobed appressoria of *Neoerysiphe galeopsidis*

Chasmothecia

The fruiting bodies of powdery mildews are spherical to somewhat flattened and, lacking any obvious opening, are called chasmothecia. Many sprout hair-like appendages, the varied shapes of which when mature aid identification. They can be examined on Sellotape preparations, but are often more easily studied if picked off the leaf with a fine needle; the appendages can be difficult to see intact if they are entangled in the mycelium, and their full length and the apical forking or branching (in the relevant species) are often not properly developed until after the chasmothecium is fully grown and darkened. In a few species a search of leaves shed from the host plant may alone reveal mature chasmothecia. “Branched” means that the appendages are repeatedly, tightly and symmetrically dichotomously branched at the apex; “forked” means forked once, or irregularly forked only a few times. Asci also need to be fairly ripe before the number of ascospores in them can be counted. A gentle tap on the cover slip may be required to break open a mature chasmothecium to reveal the asci.

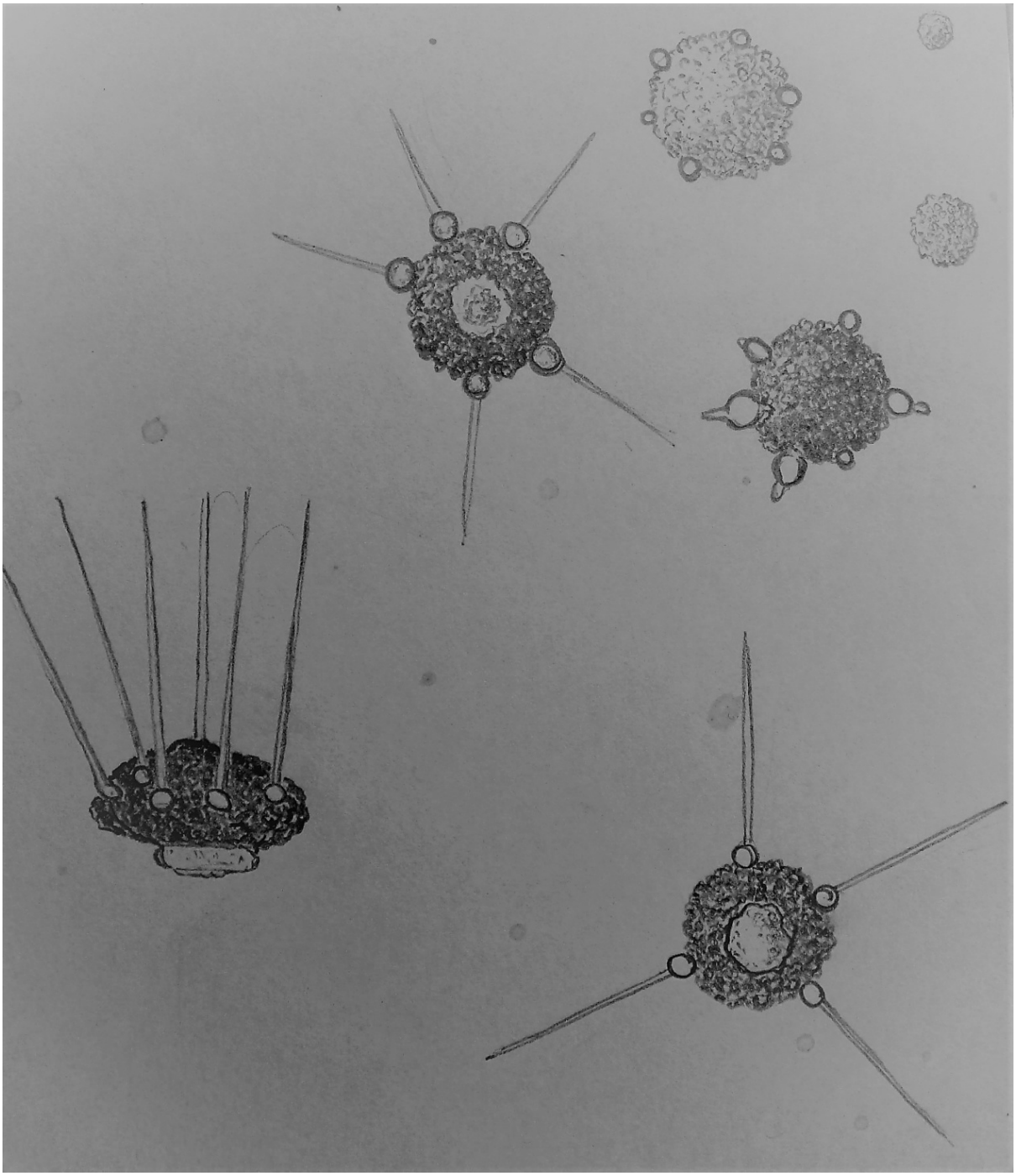
The illustration on the next page of the chasmothecia of the Hazel powdery mildew *Phyllactinia guttata* shows the various stages of development from immature (top right) to mature (bottom and bottom left). This extraordinary species, fruiting on the underside of the leaves, secretes a blob of glue on the chasmothecium side facing the ground. The appendages as they mature then bend back to prise the chasmothecium off the leaf surface and then function as the feathers in a shuttlecock to ensure the blob of glue comes into contact with a twig or the soil below the tree. There it sits all winter until the new leaves form next spring before splitting apart to fire off its ascospores to reinfect the tree.

An occasional hazard is the presence of ripe chasmothecia of another species fallen or blown from a different host; normally if chasmothecia that belong to the mycelium are present they occur in different stages of development and coloration, or are reasonably numerous, and isolated mature ones should be viewed with suspicion. Hyperparasites can

also cause confusion, the commonest being *Ampelomyces quisqualis* whose dark, ovoid pycnidia are formed on the mildew's mycelium and conidiophores (see p10).

The introductory chapters of Braun & Cook (2012) provide the best account of the mildews and their characteristics.

Specimens should be preserved by pressing and drying as for plants, and kept insect-free in small paper packets (like moss-packets). They can be collected into the same packets in the field.



Chasmothecia of the Hazel powdery mildew *Phyllactinia guttata*

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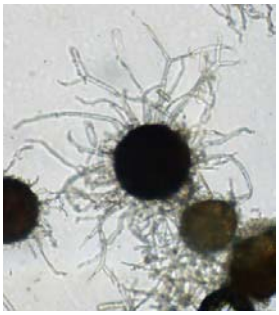
Straight appendages with swollen bases. *Phyllactinia betulae*



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Forked appendages. *Podosphaera convolvuli* var. *calystegiae*

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Branched appendages. *Erysiphe hypophylla*

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Branched appendages *Podosphaera myrtilli*

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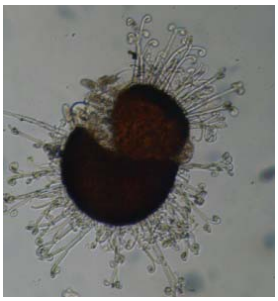
Flexuous appendages. *Erysiphe flexuosa*



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Forked and coiled appendages. *Sawadaea bicornis*

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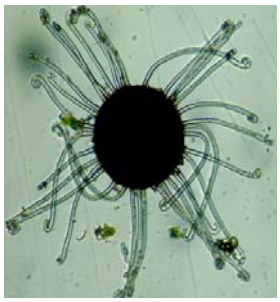
Unbranched, not swollen appendages with emergent asci. *Erysiphe aquilegiae* var. *ranunculi*



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Hooked appendages. *Erysiphe prunastri*

Powdery Mildews Identification Catalogue

Tabulated on the following page, on the left is the host genus followed to the right by the powdery mildew species reported from this host. Those in bold have been recorded from Britain (but see above for qualifications). Where only a single species is currently known from a host genus, no descriptive characteristics of the fungus are given. Where more than one fungus species is reported from a host genus the most useful characteristics to separate the fungi are tabulated.

Ampelomyces quisqualis, from Tulasne & Tulasne (1861)

The following abbreviations are used:

A	ascospores. The number(s) following are the number of ascospores per ascus
C	conidia
CH	chasmothecia
CHA	chasmothecia appendages
CP	conidiophores
FB	fibrosin bodies in conidia
GT	germ tube of conidium
HA	hyphal appressoria

Measurements are generally given as a range and are in microns (µm).

Acaena	**Podosphaera aphanis var. aphanis**
Acanthus	Golovinomyces orontii HA nipple-shaped **Neoerysiphe galeopsidis** HA lobed
Acer campestre	**Phyllactinia marissalii** FB absent**;** C formed singly; CHA entire, straight, swollen at base **Sawadaea bicornis** FB present; C formed in chains; CHA mostly forked at apex, not swollen Sawadaea tulasnei FB present; C formed in chains; CHA mostly entire, not swollen
Acer macrophyllum, *negundo*, *saccharinum*, *tataricum*	**Sawadaea bicornis** C formed in chains; CHA mostly forked at apex **Sawadaea tulasnei** C formed in chains; CHA mostly entire, not swollen
Acer platanoides	**Phyllactinia marissalii** FB absent; C formed singly; CHA entire, straight, swollen at base **Sawadaea bicornis** FB present; C formed in chains; CHA mostly forked at apex, not swollen **Sawadaea tulasnei** FB present; C formed in chains; CHA mostly entire, not swollen
Acer pseudoplatanus	**Phyllactinia marissalii** FB absent; C formed singly; CHA entire, straight, swollen at base **Sawadaea bicornis** FB present; C formed in chains; CHA mostly forked at apex, not swollen
Achillea	Golovinomyces artemisiae C *c*.1.5 as long as wide; CHA colourless **Golovinomyces macrocarpus** C *c*.twice as long as wide; CHA brown
Aconitum	**Erysiphe aquilegiae var. ranunculi**
Actaea	Erysiphe aquilegiae var. aquilegiae
Adonis	Erysiphe aquilegiae var. ranunculi FB absent; HA lobed; A (2-)3-5(6) Podosphaera delphinii FB present; HA indistinct or nipple-shaped; A 6-8
Aegopodium	**Erysiphe heraclei**

Aesculus	Erysiphe alphitoides FB absent; CHA straight, branched at apex **Erysiphe flexuosa** FB absent; CHA flexuous, hooked at apex **Sawadaea bicornis** FB present; CHA straight, forked at apex
Aethusa	**Erysiphe heraclei**
Agrimonia	**Podosphaera aphanis var. aphanis**
Ajuga	**Golovinomyces biocellatus** HA nipple-shaped; A 2 **Neoerysiphe galeopsidis** HA strongly lobed; A (2-)3-6(-8)
Akebia	**Erysiphe akebiae**
Alcea	**Leveillula contractirostris** C 40-70µm, the primary ones pointed at apex **Neoerysiphe galeopsidis** C 25-40(-45)µm, not pointed
Alchemilla	**Podosphaera aphanis var. aphanis**
Alkekengi (*Physalis s.l.*)	Golovinomyces orontii FB absent; A 2-3(-4) **Podosphaera xanthii** FB present; A (6-)8
Alliaria	**Erysiphe cruciferarum**
Alnus	**Erysiphe penicillata** C 28-42µm; CHA branched at apex, not swollen **Phyllactinia alnicola** C 50-70µm; CHA entire, straight, swollen at base
Alyssum	**Erysiphe cruciferarum**
Amelanchier	Phyllactinia mali FB absent; C 50-80µm; CHA entire, straight, swollen at base **Podosphaera amelanchieris** FB present; C 20-35 µm; CHA branched at apex, not swollen
Ammi	Erysiphe heraclei
Ampelopsis	**Erysiphe necator var. necator**
Anchusa	**Erysiphe lycopsidis** HA lobed; C formed singly; A (2-)3-4(-5) Golovinomyces cynoglossi HA nipple-shaped or obscure; C formed in chains; A mostly 2
Anemone	**Erysiphe aquilegiae var. ranunculi**
Anethum	Erysiphe heraclei
Angelica	**Erysiphe heraclei**
Anthemis	**Golovinomyces macrocarpus**
Anthriscus	**Erysiphe heraclei**
Anthyllis	**Erysiphe trifoliorum**
Antirrhinum	**Golovinomyces orontii**
Aphanes	**Podosphaera aphanis var. aphanis**
Apium	**Erysiphe heraclei**
Aquilegia	**Erysiphe aquilegiae var. aquilegiae**
Arabidopsis	Erysiphe cruciferarum

Arabis	Erysiphe cruciferarum FB absent; C length/width mostly >2, formed singly Podosphaera drabae FB present; C length/width <2, formed in chains
Arctium	**Golovinomyces depressus** FB absent; HA nipple-shaped Leveillula lappae FB absent; HA lobed or coralloid Podosphaera xanthii FB present; HA indistinct or nipple-shaped
Aremonia	Podosphaera aphanis var. aphanis
Arenaria	Erysiphe buhrii
Argemone	Erysiphe cruciferarum
Armoracia	**Erysiphe cruciferarum**
Arnica	Podosphaera erigerontis-canadensis CH 60-85µm diameter; CHA 0.5-3 × diameter of CH Podosphaera xanthii CH (70-)80-110µm diameter; CHA 0.25-4 × diameter of CH
Artemisia	**Golovinomyces artemisiae**
Aruncus	Podosphaera spiraeae
Asclepias	Erysiphe asclepiadis HA mostly lobed; C formed singly; CHA not swollen at base Golovinomyces orontii HA nipple-shaped or obscure; C formed in chains; CHA not swollen at base. Phyllactinia fraxini CHA swollen at base
Asperugo	**Golovinomyces cynoglossi**
Asperula	**Golovinomyces riedlianus**
Astragalus	**Erysiphe astragali** FB absent; A (2-)3-5(-6) Podosphaera astragali FB present; A 8
Aubrieta	Podosphaera drabae
Aurinia	**Erysiphe cruciferarum**
Ballota	**Neoerysiphe galeopsidis**
Baptisia	**Erysiphe baptisiae**
Barbarea	**Erysiphe cruciferarum**
Bartsia	**Podosphaera phtheirospermi**
Begonia	**Erysiphe begoniicola** HA lobed or coralloid; C formed singly **Golovinomyces orontii** HA nipple-shaped; C formed in chains
Bellis	**Golovinomyces asterum var. asterum**
Berberis	**Erysiphe berberidis** C *c*.20-50µm; CHA branched at apex, not swollen **Phyllactinia berberidis** C (40-)50-80(-90)µm; CHA entire, straight, swollen at base.
Berteroa	Erysiphe cruciferarum C formed singly Golovinomyces orontii C formed in short chains
Berula	Erysiphe heraclei
Beta	**Erysiphe betae**

Betonica	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A(2-)3-6(-8)
Betula	**Erysiphe ornata var. europaea** C 30-40µm; CHA branched at apex, not swollen at base **Phyllactinia betulae** C 60-90µm; CHA entire, straight, swollen at base
Bidens	**Podosphaera xanthii**
Biscutella	Erysiphe cruciferarum
Bistorta	Erysiphe polygoni
Bixa	**Erysiphe quercicola**
Blackstonia	**Oidium sp.**
Borago	**Golovinomyces cynoglossi**
Brassica	**Erysiphe cruciferarum** HA mostly lobed; C formed singly Golovinomyces orontii HA unlobed or obscurely lobed; C formed in chains
Brunnera	**Golovinomyces cynoglossi**
Bryonia	**Golovinomyces orontii**
Buglossoides	Erysiphe lycopsidis C formed singly; A 3-4 Golovinomyces cynoglossi C formed in chains; A mostly 2
Bunias	**Erysiphe cruciferarum**
Bunium	Erysiphe heraclei
Bupleurum	Erysiphe heraclei
Calendula	**Golovinomyces cichoracearum *s.l.*** FB absent; A 2 **Podosphaera xanthii** FB present; A (6-)8
Callistemum	**Oidium sp.**
Callistephus	**Golovinomyces cichoracearum *s.l.***
Calluna	**Pseudoidium sp.**
Caltha	**Erysiphe aquilegiae var. aquilegiae**
Calycanthus	**Phyllactinia calycanthi**
Calystegia soldanella	Erysiphe convolvuli var. convolvuli A 3-4
Calystegia other spp	**Erysiphe convolvuli var. calystegiae** A 5-6
Camelina	Erysiphe cruciferarum C formed singly Golovinomyces orontii C formed in chains
Campanula	**Golovinomyces orontii**
Capsella	**Erysiphe cruciferarum** FB absent; C formed singly **Golovinomyces orontii** FB absent; C formed in chains Podosphaera drabae FB present
Caragana	**Erysiphe palczewskii**
Cardamine	**Erysiphe cruciferarum** C formed singly Golovinomyces orontii C formed in chains

Carduus	**Golovinomyces montagnei**
Carica	**Erysiphe caricae**
Carpinus	**Erysiphe arcuata** C 25-45µm; CHA entire, coiled at apex, not swollen; A (2-)5(-6) **Erysiphe carpinicola** C 20-30µm; CHA entire, coiled at apex, not swollen; A (4-)7-8 **Phyllactinia carpini** C 60-75µm; CHA entire, straight, swollen at base
Carthamus	**Golovinomyces montagnei**
Carum	Erysiphe heraclei
Castanea	**Erysiphe alphitoides** C 25-40(-45)µm **Phyllactinia roboris** C 50-65µm
Catalpa	**Erysiphe catalpae** FB absent; C formed singly; CHA <20, entire or forked, 0.5-2 × diameter of CH **Erysiphe elevata** FB absent: C formed singly; CHA <20, some branched, 1-6 × diameter of CH **Fibroidium hiratae** FB present **Neoerysiphe galeopsidis** C formed in chains: CHA >20, entire or forked, 0.5-2 × diameter of CH
Catananche	**Golovinomyces cichoracearum**
Caucalis	Erysiphe heraclei
Celosia	Erysiphe celosiae
Centaurea montana	**Golovinomyces depressus** CP foot cells 80-190µm Golovinomyces montagnei CP foot cells (25-)30-60(-80)µm
Centaurea other spp	**Golovinomyces montagnei** FB absent; A (2-)4 Podosphaera xanthii FB present; A (6-)8
Centranthus	**Golovinomyces valerianae**
Cephalaria	Erysiphe knautiae FB absent; A (2-)3-5 **Podosphaera dipsacacearum** FB present; A (6-)8
Cephalotus	**Oidium sp.**
Cerastium	Erysiphe buhrii
Cerinthe	**Golovinomyces cynoglossi**
Chaerophyllum	**Erysiphe heraclei**
Chamaemelum	Golovinomyces cf. macrocarpus FB absent; A (1-)2(-4) **Podosphaera erigerontis-canadensis** FB present; A 8
Chamaenerion	**Podosphaera epilobii**
Chionanthus	**Phyllactinia fraxini *s.l.***
Chitalpa	**Erysiphe elevata** C formed singly; CHA branched at apex **Neoerysiphe galeopsidis** C formed in chains; CHA entire
Chrysanthemum	**Golovinomyces orontii** CP foot cells often curved at base; C 25-40µm **Euoidium chrysanthemi** CP foot cells straight; C 35-50(-80)µm
Cicerbita	**Golovinomyces cichoracearum**

Cichorium	**Golovinomyces cichoracearum**
Cicuta	**Erysiphe heraclei**
Circaea	**Erysiphe circaeae**
Cirsium	**Erysiphe mayori** FB absent; HA lobed; A 5-8 **Golovinomyces montagnei** FB absent; HA nipple-shaped; A 2 **Podosphaera xanthii** FB present; HA indistinct or nipple-shaped; A (6-)8
Citrullus	Golovinomyces cucurbitacearum FB absent; C formed in long chains **Golovinomyces orontii** FB absent; C formed in short chains Podosphaera xanthii FB present
Clematis	**Erysiphe aquilegiae var. aquilegiae** CHA (1-)3-12 × diameter of CH **Erysiphe aquilegiae var. ranunculi** CHA 5-4 × diameter of CH
Cleome	**Erysiphe cruciferarum**
Clinopodium	**Golovinomyces biocellatus** HA indistinct or nipple-shaped: A 2 **Neoerysiphe galeopsidis** HA lobed; A (2-)3-6(-8)
Cnicus	**Golovinomyces montagnei**
Cochlearia	Eysiphe cruciferarum
Colutea	**Erysiphe ?coluteae** CHA (2-)3-6(-8) × diameter of CH **Erysiphe palczewskii** CHA 1-2.5 × diameter of CH
Comarum	**Podosphaera aphanis var. aphanis**
Conium	**Erysiphe heraclei**
Consolida	**Erysiphe aquilegiae var. ranunculi** FB absent; A 3-5 **Podosphaera delphinii** FB present; A 6-8
Convolvulus	**Erysiphe convolvuli var. convolvuli**
Coreopsis	Golovinomyces spadiceus FB absent; A 2 Podosphaera xanthii FB present; A (6-)8
Coriandrum	Erysiphe heraclei
Cornus	**Erysiphe pulchra** C 20-45µm; CHA 1-2 × diameter of CH, branched at apex, not swollen; A 4-8 **Erysiphe tortilis** C 25-40µm; CHA 2-15 × diameter of CH, entire or forked, not swollen; A 3-5 **Phyllactinia corni** C 50-90µm; CHA entire, straight, swollen at base; A 2
Coronilla	**Erysiphe trifoliorum**
Corylus	**Phyllactinia guttata**
Cosmos	Golovinomyces cichoracearum *s.l.* FB absent; A 2 **Podosphaera xanthii** FB present; A (6-)8
Cota	**Golovinomyces macrocarpus**
Cotinus	**Erysiphe cotini**
Cotyledon	**Pseudoidium kalanchoes**
Crambe	**Erysiphe cruciferarum**

Crassula	**Pseudoidium kalanchoes**
Crataegus	**Phyllactinia mali** FB absent; C 50-80µm; CHA entire, straight, swollen at base **Podosphaera clandestina var. clandestina** FB present; C 15-35µm; CHA branched at apex, not swollen
Crepis	**Golovinomyces cichoracearum** FB absent; A 2 **Podosphaera erigerontis-canadensis** FB present; A 8
Cruciata	**Neoerysiphe galii**
Cucumis	**Golovinomyces cucurbitacearum** FB absent; HA strongly nipple-shaped or lobed; C formed in long chains; A 2 **Golovinomyces orontii** FB absent HA nipple-shaped, often weakly; C formed in short chains; A 2-4 **Podosphaera xanthii** FB present; HA indistinct or nipple-shaped; C formed in long chains; A (6-)8
Cucurbita	**Golovinomyces cucurbitacearum** FB absent; HA strongly nipple-shaped or lobed; C formed in long chains; A 2 **Golovinomyces orontii** FB absent; HA nipple-shaped, often weakly; C formed in short chains; A 2-4 **Podosphaera xanthii** FB present; HA nipple-shaped, often weakly; C formed in long chains; A (6-)8
Cuminum	Erysiphe heraclei
Cuphea	**Fibroidium sp.**
Cyclamen	**Golovinomyces orontii** mycelium on leaves; CP up to 180µm, of 2-4 cells **Pseudoidium cyclaminis** mycelium on petals; CP <100µm, of (1-)2-3 cells
Cydonia	**Phyllactinia mali** FB absent; C 50-80µm; CHA swollen at base **Podosphaera clandestina var. clandestina** FB present**;** C <50µm; CHA not swollen at base, branched at apex; A not curved Podosphaera clandestina var. cydoniae FB absent; C <50µm; CHA not swollen at base, branched at apex; A curved, bean-shaped **Podosphaera leucotricha** FB absent**;** C <50µm; CHA not swollen at base, entire or sometimes forked; A not curved
Cymbalaria	**Golovinomyces orontii**
Cynara	**Golovinomyces montagnei** HA nipple-shaped or crenulate; C 25-45µm, formed in chains **Leveillula lappae** HA lobed to coralloid; C 35-65µm, formed singly
Cynoglossum	**Golovinomyces cynoglossi**
Cytisus	**Erysiphe trifoliorum**
Dahlia	**Golovinomyces orontii** FB absent; CP foot cells often curved; CH seldom formed **Golovinomyces spadiceus** FB absent; CP foot cells straight; CH mostly well formed **Podosphaera erigerontis-canadensis** FB present
Dasiphora	**Podosphaera aphanis var. aphanis**

Daucus	**Erysiphe heraclei**
Descurainia	Erysiphe cruciferarum
Deutzia	**Erysiphe deutziae**
Dianthus	**Erysiphe buhrii**
Digitalis	Golovinomyces orontii
Diplotaxis	**Erysiphe cruciferarum**
Dipsacus	Erysiphe knautiae FB absent; A 3-5 **Podosphaera dipsacacearum** FB present; A (6-)8
Doronicum	**Podosphaera fusca**
Draba	Erysiphe cruciferarum FB absent; C length/width mostly >2, formed singly Podosphaera drabae FB present; C length/width <2, formed in chains
Dryas	**Podosphaera volkartii**
Dudleya	**Pseudoidium kalanchoes**
Dysphania	Erysiphe betae
Echeveria	**Pseudoidium sp.**
Echinops	**Golovinomyces echinopis**
Echium	**Golovinomyces cynoglossi** HA nipple-shaped; C 20-40µm, not pointed **Leveillula taurica *s.l.*** HA lobed or coralloid; C 50-80µm, the primary ones pointed at apex
Epilobium	**Podosphaera epilobii**
Erica	**Erysiphe azaleae** C formed singly; A 4-6(-7) **Golovinomyces orontii** C formed in chains; A 2-3(-4)
Erigeron	Golovinomyces cichoracearum *s.l.* FB absent; A 2 **Podosphaera erigerontis-canadensis** FB present; A (6-)8
Erodium	Erysiphe geraniacearum FB absent; HA lobed **Podosphaera erodii** FB present; HA nipple-shaped, often weakly
Eruca	Erysiphe cruciferarum HA mostly lobed; C formed singly Golovinomyces orontii HA nipple-shaped, often weakly; C formed in chains
Erucastrum	Erysiphe cruciferarum
Ervilia	**Erysiphe baeumleri** CHA often forked, 3-6 × diameter of CH **Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH
Ervum	Erysiphe baeumleri CHA often forked, 3-6 × diameter of CH **Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH
Eryngium	Erysiphe heraclei
Erysimum	**Erysiphe cruciferarum** C formed singly Golovinomyces orontii C formed in short chains

Erythranthe	**Golovinomyces brunneopunctatus**
Eschscholzia	**Erysiphe cruciferarum**
Eucalyptus	**Golovinomyces orontii** FB absent; A 2-3(-4) Podosphaera aphanis FB present; A (6-)8
Euonymus japonicus, *E. fortunei*	**Erysiphe euonymicola**
Euonymus other species	**Erysiphe euonymi**
Eupatorium	**Golovinomyces circumfusus**
Euphorbia	**Leveillula clavata** FB absent; C 45-65µm **Podosphaera euphorbiae** FB present; C 25-35µm Pseudoidium poinsettiae FB absent; C 25-35µm
Euphrasia	**Podosphaera phtheirospermi**
Fagopyrum	**Erysiphe polygoni**
Fagus	**Erysiphe alphitoides** C 25-45µm; CHA branched at apex, not swollen **Phyllactinia orbicularis** C 60-80µm; CHA entire, swollen at base
Falcaria	Erysiphe heraclei
Fallopia	**Erysiphe polygoni**
Felicia	**Golovinomyces asterum var. asterum**
Filipendula	**Erysiphe ulmariae** FB absent; shoots and leaves not distorted **Podosphaera filipendulae** FB present; shoots and leaves usually distorted
Foeniculum	Erysiphe heraclei
Forsythia	**Podosphaera pannosa**
Fragaria	**Podosphaera aphanis var. aphanis**
Frangula	**Erysiphe divaricata**
Fraxinus	**Phyllactinia fraxini**
Fuchsia	**Erysiphe howeana**
Fumaria	**Erysiphe cruciferarum**
Gaillardia	**Leveillula lappae**
Galatella (Aster s.l.)	Golovinomyces asterum var. moroczkovskii
Galega	**Erysiphe galegae**
Galeopsis	**Neoerysiphe galeopsidis**
Galium	**Golovinomyces riedlianus** HA nipple-shaped; A 2 **Neoerysiphe galii** HA mostly lobed; A 2-4
Gazania	**Leveillula lappae**
Genista	**Erysiphe trifoliorum** CHA entire and some 1-2(-3) × forked **Erysiphe thermopsidis** CHA entire and some 1-5 × forked or branched
Geranium	**Neoerysiphe geranii** FB absent; HA usually lobed **Podosphaera fugax** FB present; HA indistinct

Gerbera	**Golovinomyces cichoracearum *s.l.***
Geum	**Podosphaera aphanis var. aphanis**
Glaucium	**Erysiphe cruciferarum**
Glebionis	**Golovinomyces macrocarpus**
Glechoma	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Greyia	**Leveillula taurica *s.l.***
Grindelia	**Golovinomyces pseudosepultus**
Gypsophila	Erysiphe buhrii
Hedera	Golovinomyces orontii
Helianthemum	Golovinomyces orontii FB absent; C not pointed; HA nipple-shaped; A 2-4 **Oidiopsis cisti** FB absent; primary C pointed at apex; HA lobed or coralloid; CH not formed **Podosphaera helianthemi** FB present; C not pointed; A (6-)8
Helianthus	**Golovinomyces ambrosiae** C length/width 1.3-1.6(-1.9); length of some GT up to 10 × width of C; CH usually formed **Golovinomyces orontii** C length/width c.2; length of GT less than 3 × width of C; CH seldom formed
Helichrysum	Euoidium helichrysi
Heliopsis	**Golovinomyces ambrosiae**
Helminthotheca	**Golovinomyces cichoracearum** C 25-42µm, formed in chains **Leveillula picridis** C 40-60µm, formed singly
Heracleum	**Erysiphe heraclei**
Hesperis	**Erysiphe cruciferarum**
Heuchera	**Podosphaera macrospora**
Hieracium	**Golovinomyces cichoracearum** FB absent; A 2-4 Podosphaera erigerontis-canadensis FB present; A (6-)8
Hippocrepis	**Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense **Erysiphe trifoliorum** CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Hippophae	Phyllactinia hippophaes
Hippuris	Golovinomyces orontii
Hirschfeldia	**Erysiphe cruciferarum**
Homogyne	Golovinomyces cichoracearum *s.l.*
Humulus	Golovinomyces orontii FB absent; A 2-3(-4) **Podosphaera macularis** FB present; A (2-)4-8
Hydrangea	**Golovinomyces orontii** HA nipple-shaped **Pseudoidium hortensiae** HA mostly lobed
Hylotelephium (*Sedum s.l.*)	**Erysiphe sedi** HA lobed; C formed singly **Golovinomyces orontii** HA nipple-shaped or obscure; C formed in chains

Hyoscyamus	**Golovinomyces hyoscyami**
Hypericum	**Erysiphe hyperici**
Hypochaeris	**Golovinomyces cichoracearum** FB absent; A 2-4 Podosphaera erigerontis-canadensis FB present; A (6-)8
Hyssopus	**Golovinomyces biocellatus**
Iberis	**Erysiphe cruciferarum**
Impatiens	**Fibroidium balsaminae** C 25-45 × 12-22µm; GT entire **Podosphaera balsaminae** C 23-38 × 11-13(-19)µm; GT sometimes lobed **Podosphaera xanthii *s.l.*** C 25-45 × 12-22µm; GT sometimes lobed
Inula	Golovinomyces inulae
Ipomoea	Erysiphe convolvuli
Isatis	Erysiphe cruciferarum
Ismelia	**Golovinomyces macrocarpus**
Isopyrum	Erysiphe aquilegiae var. ranunculi
Jacobaea	**Podosphaera senecionis**
Juglans	**Erysiphe juglandis** C <35µm; CHA laxly and widely branched at apex, not swollen at base Erysiphe juglandis-nigrae C <35µm; CHA tightly branched at apex, not swollen at base Phyllactinia juglandis C >35µm; CHA entire, swollen at base
Knautia	**Erysiphe knautiae** FB absent; A 3-5
Knautia	**Podosphaera dipsacacearum** FB present; A (6-)8
Laburnum	**Erysiphe guarinonii**
Lactuca	**Golovinomyces cichoracearum** FB absent; A 2 Podosphaera xanthii FB present; A (6-)8
Lagerstroemia	**Erysiphe australiana**
Lamiastrum	Golovinomyces orontii HA nipple-shaped; A 2-3(-4) **Neoerysiphe galeopsidis** HA lobed; A ((2-)3-6(-8)
Lamium	Golovinomyces orontii HA nipple-shaped; A 2-3(-4) **Neoerysiphe galeopsidis** HA lobed; A ((2-)3-6(-8)
Lappula	Golovinomyces cynoglossi
Lapsana	**Golovinomyces cichoracearum** FB absent; GT entire **Neoerysiphe nevoi** FB absent; GT very short, lobed **Podosphaera erigerontis-canadensis** FB present
Lathyrus	**Erysiphe pisi var. cruchetiana** CHA often forked; C 0.5-3 × diameter of CH **Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense **Erysiphe trifoliorum** CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Laurus	**Pseudoidium lauracearum**
Legousia	Golovinomyces orontii

Lens	Erysiphe pisi var. pisi CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense Erysiphe trifoliorum CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Leontodon	Golovinomyces cichoracearum FB absent; A 2-4 **Podosphaera erigerontis-canadensis** FB present; A (6-)8
Leonurus	Neoerysiphe galeopsidis
Lepidium	**Erysiphe cruciferarum**
Levisticum	Erysiphe heraclei
Ligusticum	Erysiphe heraclei
Ligustrum	**Erysiphe syringae** C 24-38µm; CHA branched at apex, colourless or brownish at base; A (3-)4-7(-8) **Erysiphe syringae-japonicae** C 20-40µm; CHA branched at apex, brownish at least to middle; A 5-8. Phyllactinia fraxini C 45-100µm; CHA entire, straight, swollen at base; A 2-3(-4)
Limnanthes	Golovinomyces orontii HA nipple-shaped or obscure; C formed in chains Pseudoidium limnanthis HA lobed; C formed singly
Limonium	**Erysiphe limonii**
Linaria	**Golovinomyces orontii**
Linum	**Golovinomyces orontii** FB absent; A 2-3(-4) **Podosphaera lini** FB present; A 6-8
Lithospermum	**Golovinomyces cynoglossi**
Lobularia	Erysiphe cruciferarum
Lonicera	**Erysiphe lonicerae var. lonicerae** CHA 2-10 × diameterof CH, brownish at base Erysiphe magnusii CHA 1-3 × diameter of CH, colourless
Lotus	Erysiphe pisi var. pisi CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense **Erysiphe trifoliorum** CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Lunaria	**Erysiphe cruciferarum**
Lupinus	**Erysiphe intermedia** CHA 2-6 × diameter of CH, equatorial Erysiphe pisi var. pisi CHA (0.25-)0.5-5(-7) × diameter of CH, equatorial and in lower half
Lycium	**Arthrocladiella mougeotii**
Lycopsis (*Anchusa s.l.*)	**Erysiphe lycopsidis** HA lobed; C formed singly; A (2-)3-4(-5) **Golovinomyces cynoglossi** HA nipple-shaped or obscure; C formed in chains; A mostly 2
Lycopus	**Erysiphe lycopsidis** HA lobed; C formed singly; GT lobed or unlobed **Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; C formed in chains; GT unlobed **Neoerysiphe galeopsidis** HA lobed; C formed in chains; GT lobed

Lythrum	**Erysiphe lythri**
Macleaya	**Erysiphe macleayae**
Magnolia	**Erysiphe magnifica**
Mahoberberis neubertii	**Erysiphe berberidis var. berberidis**
Mahonia	**Erysiphe berberidis var. berberidis**
Malcolmia	**Erysiphe cruciferarum**
Malus	Phyllactinia mali FB absent; C 50-80µm; CHA entire, straight, swollen at base **Podosphaera leucotricha** FB present; C 20-30µm; CHA entire or forked at apex, not swollen
Malva	**Golovinomyces orontii** C 25-40µm, not pointed **Leveillula contractirostris** C 40-70µm, the primary ones pointed at apex
Marrubium	**Neoerysiphe galeopsidis**
Matricaria	**Golovinomyces macrocarpus** FB absent; CH usually formed; CHA 0.25-1(-2) × diameter of CH Golovinomyces orontii FB absent; CH rarely formed; CHA 0.5-2 × diameter of CH **Podosphaera erigerontis-canadensis** FB present; CH 60-85µm diameter; CHA 0.5-3 × diameter of CH Podosphaera xanthii FB present; CH (70-)80-110µm diameter; CHA 0.25-4 × diameter of CH
Matthiola	Erysiphe cruciferarum
Meconopsis	**Eryisiphe macleayae**
Medicago	**Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense Erysiphe trifoliorum CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Medusagyne	**Podosphaera xanthii**
Melampyrum	Golovinomyces orontii FB absent; A 2-3(-4) **Podosphaera phtheirospermi** FB present; A (6-)8
Melilotus	Erysiphe pisi var. pisi CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense **Erysiphe trifoliorum** CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Melissa	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Melittis	Neoerysiphe galeopsidis
Mentha	**Golovinomyces biocellatus**
Mertensia	Golovinomyces cynoglossi
Mespilus	**Phyllactinia mali** FB absent; C 50-80µm; HA oblong to coralloid; CHA entire, straight, swollen at base **Podosphaera clandestina var. clandestina** FB present; C <50µm; HA obscure or nipple-shaped; CHA branched at apex, not swollen

Minuartia s.l.	Erysiphe buhrii
Misopates	**Golovinomyces orontii** FB absent; A 2-3(-4) Podosphaera phtheirospermi FB present; A (6-)8
Monarda	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Mycelis	**Golovinomyces cichoracearum**
Myosotis	**Golovinomyces cynoglossi**
Myrrhis	**Erysiphe heraclei**
Nepeta	Golovinomyces biocellatus HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Neslia	Erysiphe cruciferarum C formed singly; CH usually formed Golovinomyces orontii C formed in short chains; CH rarely formed
Nicotiana	**Golovinomyces orontii**
Nigella	Erysiphe aquilegiae var. ranunculi
Nonea	Golovinomyces cynoglossi
Odontites	**Podosphaera phtheirospermi**
Oemleria	Phyllactinia mali
Oenanthe	Erysiphe heraclei
Oenothera	**Erysiphe howeana** FB absent; C formed singly Oidium sp. FB present; C formed in chains
Omphalodes	**Golovinomyces cynoglossi**
Onobrychis	Erysiphe pisi var. pisi CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense **Erysiphe trifoliorum** CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Ononis	**Erysiphe pisi var. cruchetiana** CHA mostly forked, 0.5-3 × diameter of CH Erysiphe trifoliorum CHA sometimes forked, 2-6 × diameter of CH
Onopordum	**Golovinomyces depressus** FB absent; HA nipple-shaped; A 2(-4) Podosphaera xanthii FB present; HA indistinct or nipple-shaped; A (6-)8
Orbea	**Oidium stapeliae**
Origanum	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Ostrya	*Phyllactinia sp.*

Oxalis	**Erysiphe russellii** C 25-45µm, formed singly, not pointed Golovinomyces orontii C 25-40µm, formed in short chains, not pointed **Leveillula oxalidicola** C 35-70µm, formed singly, the primary ones pointed at apex
Pachysymbium	**Leveillula taurica *s.l.***.
Paeonia	Erysiphe hypophylla C length/width 2.3-3.3; CHA branched at apex Erysiphe paeoniae C length/width 1.7-2.5; CHA often forked
Papaver cambricum	**Erysiphe macleayae**
Papaver other species	**Erysiphe cruciferarum** C formed singly **Golovinomyces orontii** C formed in short chains
Parietaria	**Oidiopsis parietariae** FB absent; primary C pointed at apex **Podosphaera parietariae** FB present; C not pointed
Parthenocissus	**Erysiphe necator var. necator** C 25-50µm; CHA entire, hooked at apex Phyllactinia ampelopsidis C 60-110µm; CHA entire, straight, swollen at base
Passiflora	**Pseudoidium passiflorae**
Pastinaca	**Erysiphe heraclei**
Pedicularis	**Podosphaera phtheirospermi**
Pedilanthus	**Podosphaera euphorbiae-hirtae**
Pelargonium	**Fibroidium pelargonii**
Penstemon	**Golovinomyces orontii**
Pentaglottis	**Erysiphe lycopsidis** C formed singly; A 3-4 **Golovinomyces cynoglossi** C formed in chains; A mostly 2
Pericallis	**Podosphaera pericallidis**
Persicaria	**Erysiphe polygoni**
Petrosedum	Erysiphe sedi
Petunia	**Euoidium longipes** CP 50-150(-180) µm, with 1-2 cells present above foot cells each 60-300µm; CH absent **Golovinomyces orontii** CP 165-300µm, with1-2 cells present above foot cells each usually 10-25µm; CH sometimes present
Peucedanum	Erysiphe heraclei
Phaseolus	Erysiphe pisi var. pisi
Phedimus (Sedum s.l.)	**Erysiphe sedi** HA lobed; C formed singly; CH usually formed **Golovinomyces orontii** HA nipple-shaped or obscure; C formed in chains; CH seldom formed
Philadelphus	Erysiphe deutziae HA lobed; CHA branched **Golovinomyces orontii** HA nipple-shaped or obscure; CHA entire
Phlox	**Golovinomyces magnicellulatus** FB absent; A 2(-4) **Podosphaera xanthii** FB present; A (6-)8
Photinia	**Podosphaera leucotricha**

Physocarpus	**Podosphaera physocarpi**
Physospermum	Erysiphe heraclei
Picris	**Golovinomyces cichoracearum** HA nipple-shaped to slightly lobed; C 25-40µm **Leveillula picridis** HA lobed to coralloid; C (25-)40-60µm
Pilosella	**Golovinomyces cichoracearum** FB absent; A 2(-4) Podosphaera erigerontis-canadensis FB present; A (6-)8
Pimpinella	**Erysiphe heraclei**
Plantago	**Golovinomyces sordidus** FB absent; A 2(-4) **Podosphaera plantaginis** FB present; A (6-)8
Platanus	**Erysiphe platani**
Polemonium	**Golovinomyces magnicellulatus** FB absent; A 2(-4) **Podosphaera polemonii** FB present; CHA (0.5-)3-6 × diameter of CH; A 6-8 **Podosphaera xanthii** FB present; CHA 0.25-4 × diameter of CH; A (6-)8
Polygonum	**Erysiphe polygoni**
Populus	**Erysiphe adunca** C25-40µm; CHA entire, hooked at apex Phyllactinia populi C (40-)50-105µm; CHA entire, straight, swollen at base
Potentilla	**Podosphaera aphanis var. aphanis**
Poterium	**Podosphaera ferruginea var. ferruginea**
Primula obconica	**Fibroidium primulae-obconicae**
Prunella	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) Neoerysiphe galeopsidis HA lobed; GT lobed; A (2-)3-6(-8)
Prunus	**Erysiphe prunastri** FB absent; C <50µm; CHA entire, coiled at apex, not swollen Golovinomyces orontii FB absent; C <50µm; CHA usually entire, sinuous, not coiled at apex, not swollen **Phyllactinia mali** FB absent; C 50-80µm; CHA entire, straight, swollen at base **Podosphaera pannosa** FB present; C <50µm; CHA usually entire, sinuous, not swollen **Podosphaera tridactyla** FB present; C <50µm; CHA branched at apex, not swollen
Pseudofumaria	**Erysiphe cruciferarum**
Pseudoturritis	Erysiphe cruciferarum FB absent; C length/width mostly >2; A >10 Podosphaera drabae FB present; C length/width <2; A <10
Pulicaria	**Golovinomyces inulae** FB absent; CHA 0.25-2 × diameter of CH; A 2 **Podosphaera erigerontis-canadensis** FB present; CH 60-85µm diameter; CHA 0.5-3 × diameter of CH; A (6-)8 **Podosphaera xanthii** FB present; CH 80-110µm diameter; CHA 0.25-4 × diameter of CH; A (6-)8

Pulmonaria	**Golovinomyces cynoglossi**
Pulsatilla	Erysiphe aquilegiae var. ranunculi
Pyracantha	**Phyllactinia mali** FB absent; C 50-80 µm; CHA entire, straight, swollen at base **Podosphaera clandestina** FB present; C<50µm CHA entire or forked at apex, not swollen
Pyrus	Phyllactinia mali FB absent; C 50-80 µm; CHA entire, straight, swollen at base **Podosphaera clandestina** FB present; C<50µm; CHA branched at apex, not swollen **Podosphaera leucotricha** FB present; C<50µm CHA entire, occasionally forked
Quercus	**Erysiphe alphitoides** C 25-40(-45)µm, length/width 1.4-2.3; mycelium amphiphyllous, dense, conspicuous; leaves often deformed Erysiphe hypophylla C 30-45(-65)µm, length/width 2.3-3.3; mycelium hypophyllous, sparse, inconspicuous; leaves not deformed **Phyllactinia roboris** C 50-65µm; mycelium hypophyllous, sparse, inconspicuous; leaves not deformed
Ranunculus	**Erysiphe aquilegiae var. aquilegiae** CHA (1-)3-12 × diameter of CH **Erysiphe aquilegiae var. ranunculi** CHA 0.5-4 × diameter of CH
Raphanus	**Erysiphe cruciferarum** C formed singly Golovinomyces orontii C formed in chains
Rapistrum	Erysiphe cruciferarum
Reseda	Erysiphe cruciferarum
Reynoutria	**Erysiphe polygoni**
Rhamnus	**Erysiphe friesii var. friesii**
Rhaponticum	Golovinomyces montagnei
Rheum	Erysiphe polygoni
Rhinanthus	**Podosphaera phtheirospermi**
Rhododendron	**Erysiphe azaleae** C (25-)30-45(-55)µm; CHA branched at apex, not swollen; A 4-7(-7) Phyllactinia enkianthi C 65-90µm ; CHA entire, straight, swollen at base; A (1-)2(-3)
Rhus	**Podosphaera cf. pruinosa**
Ribes	**Erysiphe grossulariae** FB absent; C (20-)23-35µm; A 3-5(-6) **Phyllactinia ribes** C (4-)60-100µm; FB absent; A 2 **Podosphaera mors-uvae** FB present; A (6-)8
Ricinus	**Golovinomyces orontii** HA nipple-shaped or obscure; C 25-40µm, not pointed **Leveillula ricini** HA lobed to coralloid; C 40-70µm, the primary ones pointed at apex
Rivea	**Oidium riveae**

Robinia	**Erysiphe robiniae**
Roemeria	Erysiphe cruciferarum C formed singly Golovinomyces orontii C formed in short chains
Rorippa	Erysiphe cruciferarum
Rosa	**Podosphaera pannosa**
Rosmarinus	Golovinomyces biocellatus HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Rubus	**Podosphaera aphanis var. aphanis**
Rudbeckia	**Golovinomyces ambrosiae**
Rumex	**Erysiphe polygoni**
Salix	**Erysiphe adunca var. adunca** C 25-40µm; CHA (0.75-)1-2 × diameter of CH, coiled at apex, not swollen at base **Erysiphe capreae** C 25-35µm; CHA 0.3-1 × diameter of CH, coiled at apex, not swollen at base Phyllactinia populi C (40-)50-100µm; CHA entire, straight, swollen at base
Salvia	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Sambucus	**Erysiphe vanbruntiana var. sambuci-racemosae**
Sanguisorba	**Podosphaera ferruginea var. ferruginea**
Sanvitalia	Golovinomyces cichoracearum *s.l.* FB absent; A 2(-4) Podosphaera xanthii FB present; A (6-)8
Saponaria	Erysiphe buhrii
Saussurea	Golovinomyces montagnei FB absent; A 2(-4) Podosphaera erigerontis-canadensis FB present; A (6-)8
Scabiosa	**Erysiphe knautiae** FB absent; HA indistinct or nipple-shaped **Podosphaera dipsacacearum** FB present; HA lobed
Scandix	Erysiphe heraclei
Scopolia	Golovinomyces orontii
Scorzonera	**Golovinomyces cichoracearum**
Scorzoneroides	**Golovinomyces cichoracearum** FB absent; A 2(-4) **Podosphaera erigerontis-canadensis** FB present; A (6-)8
Scrophularia	Podosphaera phtheirospermi
Scutellaria	Golovinomyces biocellatus
Securigera	**Erysiphe trifoliorum**
Sedum	Erysiphe sedi
Selinum	Erysiphe heraclei
Senecio	**Golovinomyces fischeri** FB absent; A 2 **Podosphaera senecionis** FB present; A (6-)8
Senna	**Erysiphe pisi var. pisi**

Serratula	Golovinomyces montagnei
Seseli	Erysiphe heraclei
Sherardia	Golovinomyces riedlianus
Sibbaldia	Podosphaera aphanis var. aphanis
Silaum	Erysiphe heraclei
Silene	**Erysiphe buhrii**
Silybum	**Golovinomyces montagnei**
Sinapis	**Erysiphe cruciferarum**
Sisymbrium	**Erysiphe cruciferarum**
Sium	Erysiphe heraclei
Smyrnium	**Erysiphe heraclei**
Solanum lycopersicum	**Pseudoidium neolycopersici**
Solanum other species	**Golovinomyces orontii**
Solenostemon	**Golovinomyces cf. biocellatus**
Solidago	**Golovinomyces asterum var. solidaginis** FB absent; A 2(-3) Podosphaera erigerontis-canadensis FB present; A (6-)8
Sonchus	**Golovinomyces sonchicola** FB absent; A 2 Podosphaera xanthii FB present; A (6-)8
Sorbaria	**Erysiphe alphitoides *s.l.***
Sorbus	Phyllactinia mali FB absent; C 50-80µm; CHA entire, straight, swollen at base **Podosphaera aucupariae** FB present; C <50µm; CHA branched at apex Podosphaera niesslii FB present; C <50µm; CHA entire, flexuous
Spartium	**Erysiphe rayssii**
Spinacia	**Erysiphe betae**
Spiraea	Podosphaera clandestina CHA branched at apex; mycelium sparse **Podosphaera spiraeae** CHA simple; mycelium dense
Stachys	Golovinomyces biocellatus HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) **Neoerysiphe galeopsidis** HA lobed; GT lobed; A (2-)3-6(-8)
Stellaria	Erysiphe buhrii
Streptocarpus	**Golovinomyces orontii**
Succisa	**Erysiphe knautiae**
Symphoricarpos	**Erysiphe symphoricarpae**
Symphyotrichum (Aster s.l.)	**Golovinomyces asterum var. moroczkovskii** FB absent; A (2-)3 Podosphaera xanthii FB present; A (6-)8
Symphytum	**Golovinomyces cynoglossi**

Syringa	**Erysiphe syringae** C 24-38µm; CH formed in late autumn, sparse; CHA branched at apex, not swollen; A (3-)4-7(-8) **Erysiphe syringae-japonicae** C (20-)25-35(-40)µm; CH formed mostly in summer, dense; CHA branched at apex, not swollen; A 5-8 **Phyllactinia fraxini** C 45-100µm; CHA entire, straight, swollen at base
Tagetes	**Neoerysiphe cumminsiana**
Tanacetum	**Euoidium chrysanthemi** FB absent; CP (60-)105-190(-230)µm; A (1-)2-3(-4) **Golovinomyces macrocarpus** FB absent; CP up to c.120µm; A (6-)8 Podosphaera xanthii FB present; A (6-)8
Taraxacum	**Golovinomyces cichoracearum** FB absent; A 2 **Podosphaera erigerontis-canadensis** FB present; A (6-)8
Tellima	**Podosphaera macrospora**
Tephroseris	Golovinomyces fischeri FB absent; A 2 Podosphaera senecionis FB present; A (6-)8
Teucrium	Golovinomyces biocellatus HA nipple-shaped, rarely slightly lobed; GT unlobed; A (2-)4 Neoerysiphe galeopsidis HA lobed; GT lobed; A (2-)3-6(-8)
Thalictrum	**Erysiphe aquilegiae var. ranunculi** FB absent; A (2-)3-5(-6) **Podosphaera thalictri** FB present; A 8
Thermopsis	**Erysiphe thermopsidis**
Thesium	**Erysiphe thesii**
Thlaspi	**Erysiphe cruciferarum**
Thymus	**Golovinomyces biocellatus** HA nipple-shaped, rarely slightly lobed; GT unlobed; A 2(-4) Neoerysiphe galeopsidis HA lobed; GT lobed; A (2-)3-6(-8)
Tiarella	Golovinomyces orontii FB absent; A 2-3(-4) Podosphaera macrospora FB present; A (6-)8
Tolmiea	**Podosphaera macrospora**
Tordylium	Erysiphe heraclei
Torilis	**Erysiphe heraclei**
Tragopogon	**Golovinomyces cichoracearum** FB absent; A 2 Podosphaera xanthii FB present; A (6-)8
Tremastelma	**Erysiphe knautiae**
Trifolium	**Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH; mycelium usually dense **Erysiphe trifoliorum** CHA sometimes forked, 2-6 × diameter of CH; mycelium sparse, easily detachable
Trigonella	**Erysiphe trifoliorum**
Trinia	Erysiphe heraclei
Tripleurospermum	Golovinomyces macrocarpus

Tripolium	**Golovinomyces asterum var. asterum**
Trollius	Erysiphe aquilegiae var. ranunculi FB absent; CHA <10 **Podosphaera delphinii** FB present; CHA (4-)10-50
Tuberaria	**Podosphaera helianthemi**
Turgenia	Erysiphe heraclei
Turritis	Erysiphe cruciferarum
Tussilago	**Golovinomyces senecionis**
Ulex	**Oidium sp.**
Ulmus	**Erysiphe ulmi**
Urtica	**Erysiphe urticae** HA lobed Golovinomyces orontii HA nipple-shaped
Vaccinium	**Podosphaera myrtillina var. myrtillina**
Valeriana	**Golovinomyces valerianae**
Valerianella	**Golovinomyces orontii**
Verbascum	**Golovinomyces verbasci** HA nipple-shaped; C formed in chains **Leveillula verbasci** HA lobed or coralloid; C formed singly
Verbena	**Golovinomyces orontii** FB absent; CP not constricted and often curved at base; CH rarely formed; A 2-3(-4) **Golovinomyces verbenae** FB absent; CP slightly constricted and not curved at base; CH usually formed; A 2 **Podosphaera xanthii** FB present; A (6-)8
Veronica	**Golovinomyces orontii** FB absent; A 2-3(-4) **Podosphaera fuliginea** FB present; A 6-8
Viburnum	**Erysiphe hedwigii** CH average <90µm diameter **Erysiphe viburni** CH average >90µm diameter
Vicia	**Erysiphe pisi var. pisi** CHA rarely forked, 0.5-3 × diameter of CH **Erysiphe baeumleri** CHA often forked, 3-6 × diameter of CH
Vinca	**Golovinomyces vincae** HA nipple-shaped or obscure **Pseudoidium vincae** HA lobed
Viola	**Golovinomyces orontii**
Visnaga	Erysiphe heraclei
Vitis	**Erysiphe necator var. necator**
Wisteria	**Erysiphe trifoliorum**
Xanthium	Golovinomyces spadiceus FB absent; A 2(-3) Podosphaera xanthii FB present; A (6-)8
Xerochrysum	Euoidium helichrysi
Zinnia	**Golovinomyces spadiceus**

Census Catalogue of Welsh Powdery Mildews

The list is arranged alphabetically by host name, the following column displaying the name of the fungus recorded from that host plant. The taxonomy of the host species mostly follows Stace (2019) whilst that of the fungi follows Braun & Cook (2012). The third column records the known distribution within Wales using the Watsonian Vice-county system (Watson 1883). The Vice-counties are numbered as follows:

35	Monmouthshire	45	Pembrokeshire	50	Denbighshire
41	Glamorgan	46	Cardiganshire	51	Flintshire
42	Breconshire	47	Montgomeryshire	52	Anglesey
43	Radnorshire	48	Merionethshire		
44	Carmarthenshire	49	Caernarvonshire		

Almost all the records reported here were made post 1960. To stimulate recording, however, where there is only a pre-1960 Vice-county record from Wales, the Vice-county number is displayed in square brackets. Otherwise all records have been extracted from the British Mycological Society's FRDBI, web pages entitled "New Disease Reports" of the British Society of Plant Pathology (www.ndrs.org.uk/search.php) or have been supplied by trusted recorders. We regret not having the time or resources to record the presence of these fungi in the Vice-counties of England and Scotland.

Abbreviations Agg. = aggregate; cv. = cultivar (plural cvs.); f. = forma; in hort. = the powdery mildew has only been recorded on a normally wild plant whilst it was in cultivation in the listed VC; *s.l.* =*sensu lato* (in the broad sense); *s.s.* = *sensu stricto* (in the strict or narrow sense); sp. = species (plural spp.); ssp. = subspecies; var. = variety.

Host	Fungus	Distribution
Acanthus mollis	Neoerysiphe galeopsidis	46
Acanthus spinosus	Neoerysiphe galeopsidis	46
Acer campestre	Phyllactinia marissalii	46, 47, 50
	Sawadaea bicornis	35, 41, 44, 46, 47
Acer campestre var. leiocarpum	Sawadaea bicornis	46
Acer campestre var. oxytonum	Sawadaea bicornis	46
Acer negundo	Sawadaea bicornis	46
Acer platanoides	Phyllactinia marissalii	46, 47
	Sawadaea bicornis	46
	Sawadaea tulasnei	46, 47
Acer platanoides 'Goldsworth Purple'	Sawadaea tulasnei	46
Acer pseudoplatanus	Phyllactinia marissalii	46
	Sawadaea bicornis	35, 41, 42, 44, 46, 47, 49-52
Aconitum napellus	Erysiphe aquilegiae var. ranunculi	46

Host	Fungus	Distribution
Aesculus carnea	Erysiphe flexuosa	46
Aesculus carnea 'Briotii'	Erysiphe flexuosa	46
Aesculus hippocastanum	Erysiphe flexuosa	42, 43, 46
Aesculus × plantierensis	Erysiphe flexuosa	46
Aesculus spp.	Erysiphe flexuosa	35, 41-52
Agrostis capillaris	Blumeria graminis	41, 44
Agrostis spp.	Blumeria graminis	42
Alchemilla glabra	Podosphaera aphanis var. aphanis	46, 48, 49
Alliaria petiolata	Erysiphe cruciferarum	44, 46, 47
Alnus glutinosa	Erysiphe penicillata	42, 44, 45, 46
	Phyllactinia alnicola	41, 44
Alnus incana	Erysiphe penicillata	44, 46, 47
Amelanchier lamarckii	Podosphaera amelanchieris	41, 46, 49-51
Angelica sylvestris	Erysiphe heraclei	41, 44, 46, 47, 49
Anisantha sterilis	Blumeria graminis	44, 46, 47
Anthoxanthum odoratum	Blumeria graminis	35, 44, 46
Anthriscus sylvestris	Erysiphe heraclei	35, 44, 46, 50
Anthyllis vulneraria	Erysiphe trifoliorum	41
Antirrhinum majus	Golovinomyces orontii	46, 49
Aphanes australis	Podosphaera aphanis var. aphanis	46
Aquilegia vulgaris	Erysiphe aquilegiae var. aquilegiae	35, 44, 46, 47, 49, 52
Arctium lappa	Golovinomyces depressus	35, 44, 49
Arctium minus	Golovinomyces depressus	41, 42, 46
Arctium minus ssp. pubens	Golovinomyces depressus	46
Arctium sp.	Golovinomyces depressus	35, 50, 52
Arrhenatherum elatius	Blumeria graminis	41
Arrhenatherum elatius var. bulbosum	Blumeria graminis	44, 46
Arrhenatherum elatius var. elatius	Blumeria graminis	46
Artemisia sp.	Golovinomyces artemisiae	48, 49, 52
Artemisia vulgaris	Golovinomyces artemisiae	44-46, 49, 50
Avena sativa	Blumeria graminis	46, 49
Avena sterilis ssp. ludoviciana	Blumeria graminis	46
Ballota nigra	Neoerysiphe galeopsidis	41
Begonia 'Semperflorens'	Erysiphe begoniicola	46
Begonia spp.	Erysiphe begoniicola	41, 51
Bellis perennis	Golovinomyces asterum var. asterum	44, 46
Berberis thunbergii f. atropurpurea	Erysiphe berberidis var. berberidis	41, 42, 44, 46, 47

Host	Fungus	Distribution
Berberis vulgaris	Erysiphe berberidis var. berberidis	42, 46
Berberis × ottawensis	Erysiphe berberidis var. berberidis	46
Beta sp.	Erysiphe betae	41, 49, 50, 51
Beta vulgaris ssp. maritima	Erysiphe betae	44-46
Betonica officinalis	Neoerysiphe galeopsidis	46
Betula kamtschatica	Phyllactinia betulae	46
Betula pendula	Erysiphe ornata var. europaea	46
	Phyllactinia betulae	46
Betula pubescens ssp.celtiberica	Phyllactinia betulae	46
Betula pubescens ssp. pubescens	Erysiphe ornata var. europaea	43, 46
	Phyllactinia betulae	46
Betula utilis var. jacquemontii	Phyllactinia betulae	46, 47
Borago officinalis	Golovinomyces cynoglossi	45, 47
Brachypodium sylvaticum	Blumeria graminis	44
Brassica nigra	Erysiphe cruciferarum	46
Brassica oleracea cv.	Erysiphe cruciferarum	46
Bromus hordeaceus	Blumeria graminis	35, 44, 46, 51
Bromus racemosus	Blumeria graminis	35
Bromus sp.	Blumeria graminis	45, 49
Buglossoides arvensis	Golovinomyces cynoglossi	[52]
Calendula officinalis	Podosphaera xanthii	45, 46, 47
Caltha palustris	Erysiphe aquilegiae var. aquilegiae	44, 46
Calystegia spp.	Erysiphe convolvuli var. calystegiae	35, 41, 49-51
Calystegia silvatica	Erysiphe convolvuli var. calystegiae	46
Capsella bursa-pastoris	Erysiphe cruciferarum	46
Carduus crispus	Golovinomyces montagnei	46
Carpinus betulus	Erysiphe arcuata	41, 50, 51
	Phyllactinia carpini	51
Castanea sativa	Phyllactinia roboris	44
Catalpa bignonioides	Erysiphe elevata	46
Catapodium marinum	Blumeria graminis	46
Centaurea nigra	Golovinomyces montagnei	46, 47
Centranthus ruber	Golovinomyces valerianae	44, 46, 49
Chrysanthemum × grandiflorum	Euoidium chrysanthemi	51
Circaea lutetiana	Erysiphe circaeae	35, 41-46, 48-52
Cirsium arvense	Golovinomyces montagnei	46
	Podosphaera xanthii	46
Cirsium palustre	Golovinomyces montagnei	46
Cirsium vulgare	Golovinomyces montagnei	46, 49, 52

Host	Fungus	Distribution
Clematis × jackmanii	Erysiphe aquilegiae var. ranunculi	46
Comarum palustre	Podosphaera aphanis var. aphanis	46
Consolida sp.	Erysiphe aquilegiae var. ranunculi	48, 52
Convolvulus arvensis	Erysiphe convolvuli var. convolvuli	46, 49-52
Cornus alba cv.	Erysiphe tortilis	44
Cornus alba var. sibirica	Erysiphe tortilis	46
Cornus koenigii	Erysiphe tortilis	47
Cornus sanguinea	Erysiphe tortilis	35, 41, 42, 44, 46
Cornus sanguinea ssp. australis	Erysiphe tortilis	44, 46
Cornus sanguinea ssp. australis × sanguinea	Erysiphe tortilis	46
Cornus spp.	Erysiphe tortilis	35, 41, 42, 44, 46, 47, 49-52
Corylus avellana	Phyllactinia guttata	35, 41-52
Corylus avellana ‘Contorta’	Phyllactinia guttata	46
Corylus avellana f. schizochlamys	Phyllactinia guttata	46
Cotinus coggygria	Erysiphe cotini	49-51
Crataegus laevigata	Podosphaera clandestina var. clandestina	51
Crataegus laevigata ‘Paul’s Scarlet’	Podosphaera clandestina var. clandestina	46
Crataegus monogyna	Phyllactinia mali	46, 47
	Podosphaera clandestina var. clandestina	35, 41, 42-44, 46, 50
Crataegus monogyna ‘Biflora’	Podosphaera clandestina var. clandestina	46
	Phyllactinia mali	46
Crataegus sp.	Podosphaera clandestina var. clandestina	35, 48, 49, 52
Crataegus × subsphaerica	Podosphaera clandestina var. clandestina	46
Crepis biennis	Golovinomyces cichoracearum	46
Crepis capillaris	Golovinomyces cichoracearum	44, 46
Crepis vesicaria ssp. taraxacifolia	Golovinomyces cichoracearum	46
Cucurbita maxima	Golovinomyces cucurbitacearum	42, 46
Cucurbita pepo	Golovinomyces cucurbitacearum	42, 43, 46
	Golovinomyces orontii	42, 46
Cydonia oblonga	Podosphaera leucotricha	46
Cymbalaria muralis	Golovinomyces orontii	46, 48, 49
Cynoglossum officinale	Golovinomyces cynoglossi	35, 44

Host	Fungus	Distribution
Dactylis glomerata	Blumeria graminis	35, 44, 46
Deschampsia cespitosa ssp. cespitosa	Blumeria graminis	46
Deutzia scabra	Erysiphe deutziae	41, 49, 51
Dipsacus fullonum	Podosphaera dipsacacearum	44, 46, 48
Echium vulgare	Golovinomyces cynoglossi	51
Elymus athericus	Blumeria graminis	44
Elymus repens	Blumeria graminis	35, 43, 44, 46
Epilobium brunnescens	Podosphaera epilobii	44, 46
Epilobium ciliatum	Podosphaera epilobii	41, 44, 46
Epilobium hirsutum	Podosphaera epilobii	41, 44, 46
Epilobium montanum	Podosphaera epilobii	44, 46
Epilobium obscurum	Podosphaera epilobii	46, 48
Epilobium palustre	Podosphaera epilobii	44, 46
Epilobium parviflorum	Podosphaera epilobii	44, 46
Epilobium tetragonum	Podosphaera epilobii	46
Epilobium × interjectum	Podosphaera epilobii	46
Epilobium × vicinum	Podosphaera epilobii	46
Erodium maritimum	Podosphaera erodii	45
Euonymus europaeus	Erysiphe euonymi	35, 41, 42, 44, 46, 48-51
Euonymus europaeus f. intermedius	Erysiphe euonymi	46
Euonymus japonicus	Erysiphe euonymicola	35, 41, 44-46, 48-52
Eupatorium cannabinum	Golovinomyces circumfusus	35, 41, 44, 46, 48-52
Euphorbia amygdaloides ssp. amygdaloides	Podosphaera euphorbiae	[35]
Euphorbia amygdaloides ssp. amygdaloides ‘Purpurea’	Podosphaera euphorbiae	46
Euphorbia characias	Podosphaera euphorbiae	46
Euphorbia dulcis	Podosphaera euphorbiae	44
Euphorbia helioscopia	Podosphaera euphorbiae	44, 46
Euphorbia peplus	Podosphaera euphorbiae	35, 41, 46, 47
Euphrasia confusa	Podosphaera phtheirospermi	52
Euphrasia confusa × nemorosa	Podosphaera phtheirospermi	46
Euphrasia nemorosa	Podosphaera phtheirospermi	46
Euphrasia officinalis ssp. anglica	Podosphaera phtheirospermi	46
Euphrasia officinalis ssp. pratensis	Podosphaera phtheirospermi	46
Fagus sylvatica	Phyllactinia orbicularis	41, 45-47, 50, 51
Fagus sylvatica ‘Purpurea’	Phyllactinia orbicularis	46
Festuca rubra ssp. rubra	Blumeria graminis	35, 44, 46

Host	Fungus	Distribution
Filipendula ulmaria	Erysiphe ulmariae	35, 42-46, 48-52
	Podosphaera filipendulae	35, 41, 42, 44-46, 48-52
Fragaria vesca	Podosphaera aphanis var. aphanis	44, 46
Frangula alnus var. alnus	Erysiphe divaricata	46
Frangula alnus var. latifolia	Erysiphe divaricata	46
Fraxinus excelsior	Phyllactinia fraxini	35, 41-52
Fraxinus excelsior 'Pendula'	Phyllactinia fraxini	46
Fumaria bastardii in hort.	Erysiphe cruciferarum	42
Fumaria bastardii var. bastardii	Erysiphe cruciferarum	46
Fumaria densiflora in hort.	Erysiphe cruciferarum	42
Fumaria muralis ssp. boraei var. gracilis	Erysiphe cruciferarum	46
Fumaria muralis ssp. boraei var. major	Erysiphe cruciferarum	46
Fumaria occidentalis in hort.	Erysiphe cruciferarum	42
Fumaria parviflora in hort.	Erysiphe cruciferarum	42
Fumaria purpurea in hort.	Erysiphe cruciferarum	42
Fumaria reuteri in hort.	Erysiphe cruciferarum	42
Galeopsis bifida	Neoerysiphe galeopsidis	46, 47
Galeopsis sp.	Neoerysiphe galeopsidis	35, 43, 47
Galeopsis tetrahit	Neoerysiphe galeopsidis	42-44, 46, 47
Galium aparine	Neoerysiphe galii	44, 46, 47, 49, 52
Galium odoratum	Neoerysiphe galii	46, 47, 49
Geranium dissectum	Podosphaera fugax	43, 44, 46
Geranium molle	Podosphaera fugax	44, 46, 47
Geranium pratense	Neoerysiphe geranii	44, 46
Geranium pyrenaicum	Podosphaera fugax	35, 44
Geranium rotundifolium	Podosphaera fugax	46
Geranium sanguineum	Podosphaera fugax	44
Geranium × magnificum	Neoerysiphe geranii	46
Geum macrophyllum	Podosphaera aphanis var. aphanis	46, 47, 48
Geum urbanum	Podosphaera aphanis var. aphanis	35, 41-44, 46, 47
Glechoma hederacea	Golovinomyces biocellatus	44, 46, 48
	Neoerysiphe galeopsidis	44, 46
Helianthemum sp.	Oidiopsis cisti	51
Helminthotheca echioides	Golovinomyces cichoracearum	46
Heracleum mantegazzianum	Erysiphe heraclei	44
Heracleum sphondylium	Erysiphe heraclei	35, 41-47, 49, 50, 52
Hesperis matronalis	Erysiphe cruciferarum	46
Hieracium daedalolepioides	Golovinomyces cichoracearum	46

Host	Fungus	Distribution
Hieracium grandidens	Golovinomyces cichoracearum	46
Hieracium sabaudum	Golovinomyces cichoracearum	46
Hieracium sp.	Golovinomyces cichoracearum	44
Hieracium subcrocatum	Golovinomyces cichoracearum	46
Hieracium umbellatum ssp. bichlorophyllum	Golovinomyces cichoracearum	46
Hieracium vagum	Golovinomyces cichoracearum	46
Hirschfeldia incana	Erysiphe cruciferarum	44, 46
Holcus lanatus	Blumeria graminis	44
Hordeum distichon	Blumeria graminis	46
Hordeum murinum	Blumeria graminis	35
Humulus lupulus	Podosphaera macularis	35, 41, 47, 51
Hydrangea macrophylla cv.	Pseudoidium hortensiae	41, 45, 46, 49, 51, 52
Hypericum androsaemum	Erysiphe hyperici	44
Hypericum hirsutum	Erysiphe hyperici	46
Hypericum maculatum	Erysiphe hyperici	44, 49, 50
Hypericum maculatum ssp. obtusiusculum	Erysiphe hyperici	42, 46, 47
Hypericum perforatum	Erysiphe hyperici	41, 44, 46
Hypericum perforatum × undulatum	Erysiphe hyperici	46
Hypericum tetrapterum	Erysiphe hyperici	46
Hypericum undulatum	Erysiphe hyperici	45
Hypericum × desetangsii	Erysiphe hyperici	46, 48
Hypochaeris radicata	Golovinomyces cichoracearum	46
Impatiens sp.	Fibroidium balsaminae	51
Jacobaea aquatica	Podosphaera senecionis	44, 46
Jacobaea erucifolia	Podosphaera senecionis	46
Jacobaea vulgaris	Podosphaera senecionis	44, 46
Knautia macedonica	Erysiphe knautiae	46, 48
	Podosphaera dipsacacearum	48
Laburnum anagyroides	Erysiphe guarinonii	44, 46
Laburnum sp.	Erysiphe guarinonii	51
Lactuca serriola	Golovinomyces cichoracearum	46
Lamiastrum galeobdolon ssp. argentatum	Neoerysiphe galeopsidis	46
Lamiastrum galeobdolon ssp. montanum	Neoerysiphe galeopsidis	46
Lamium album	Neoerysiphe galeopsidis	44, 46, 47, 50
Lamium amplexicaule	Neoerysiphe galeopsidis	46
Lamium purpureum	Neoerysiphe galeopsidis	35, 45, 47
Lapsana communis ssp. communis	Neoerysiphe nevoi	44, 46, 47, 51
	Podosphaera erigerontis-canadensis	35, 44, 50
Lathyrus odoratus	Erysiphe pisi var. pisi	42, 44, 46

Host	Fungus	Distribution
Lathyrus odoratus cv.	Erysiphe trifoliorum	47
Lathyrus pratensis	Erysiphe pisi var. cruchetiana	46
	Erysiphe pisi var. pisi	46
	Erysiphe trifoliorum	35, 41-46, 49, 51, 52
Lathyrus sativus	Erysiphe pisi var. pisi	35, 46
Laurus nobilis	Pseudoidium lauracearum	[35]
Ligustrum vulgare	Erysiphae syringae	44
Linaria purpurea	Golovinomyces orontii	46
Linaria repens	Golovinomyces orontii	46
Lolium perenne	Blumeria graminis	44, 46, 52
Lonicera caprifolium	Erysiphe lonicerae var. lonicerae	44
Lonicera japonica	Erysiphe lonicerae var. lonicerae	46
Lonicera periclymenum	Erysiphe lonicerae var. lonicerae	46, 48
Lonicera periclymenum 'Serotina'	Erysiphe lonicerae var. lonicerae	44
Lotus corniculatus	Erysiphe trifoliorum	44
Lotus pedunculatus	Erysiphe trifoliorum	46
Lunaria annua	Erysiphe cruciferarum	49
Lupinus albus	Erysiphe intermedia	47
Lupinus spp.	Erysiphe intermedia	35, 41, 49-52
Lupinus × regalis	Erysiphe intermedia	46
Lycium barbarum	Arthrocladiella mougeotii	46
Lycopsis arvensis	Erysiphe lycopsidis	44, 46
Lycopus europaeus	Golovinomyces biocellatus	46
Lythrum salicaria	Erysiphe lythri	47
Magnolia spp. & cvs.	Erysiphe magnifica	41, 50, 51
Mahonia aquifolium	Erysiphe berberidis var. berberidis	44, 46
Malus cv.	Podosphaera leucotricha	35, 52
Malus domestica	Podosphaera leucotricha	46
Malus sylvestris	Podosphaera leucotricha	35
Matricaria discoidea	Podosphaera erigerontis-canadensis	46, 47
Medicago lupulina	Erysiphe pisi var. pisi	43, 46
Medicago sativa var. sativa	Erysiphe pisi var. pisi	41, 44
Melilotus altissimus	Erysiphe trifoliorum	35, 41, 44, 46
Melilotus sp.	Erysiphe trifoliorum	44
Melissa officinalis	Golovinomyces biocellatus	46
	Neoerysiphe galeopsidis	46
Mentha aquatica	Golovinomyces biocellatus	44, 46
Mentha suaveolens	Golovinomyces biocellatus	49
Mentha × villosa	Golovinomyces biocellatus	44, 46
Milium effusum	Blumeria graminis	35, 44
Milium effusum 'Aureum'	Blumeria graminis	46
Misopates orontium	Neoerysiphae galeopsidis	44

Host	Fungus	Distribution
Monarda ‘Vintage Wine’	Golovinomyces orontii	44
Mycelis muralis	Golovinomyces cichoracearum	44, 46, 47
Myosotis arvensis	Golovinomyces cynoglossi	42-44, 46
Myosotis sylvatica	Golovinomyces cynoglossi	46, 47
Nepeta cataria	Neoerysiphe galeopsidis	44
Nepeta sp.	Neoerysiphe galeopsidis	44
Nicotiana alata	Golovinomyces orontii	41
Odontites vernus	Podosphaera phtheirospermi	44
Oenothera biennis	Erysiphe howeana	41
Oenothera cambrica	Erysiphe howeana	46
Oenothera glazioviana	Erysiphe howeana	41, 44, 46
Oenothera sp.	Erysiphe howeana	45, 51
Oenothera stricta	Erysiphe howeana	46
Oenothera × fallax	Erysiphe howeana	46
Onobrychis viciifolia	Erysiphae trifoliorum	44
Ononis repens	Erysiphe pisi var. cruchetiana	41, 44, 46
Oxalis spp.	Erysiphe russellii	48, 51
Papaver cambricum in hort.	Erysiphe macleayae	46
Papaver dubium	Golovinomyces orontii	46
Papaver rhoeas	Golovinomyces orontii	46
Papaver somniferum	Golovinomyces orontii	46
Parietaria judaica	Podosphaera parietariae	46
Parthenocissus spp.	Erysiphe necator	51
Passiflora caerulea	Pseudoidium passiflorae	46
Pastinaca sativa	Erysiphe heraclei	44
Pentaglottis sempervirens	Erysiphe lycopsidis	46
Persicaria lapathifolia	Erysiphe polygoni	46
Petunia cv.	Euoidium longipes	46
Petunia × hybrida	Euoidium longipes	35, 41, 46, 50-52
	Golovinomyces orontii	44, 46, 49
Phlox paniculata	Golovinomyces magnicellulatus var. magnicellulatus	44, 46
Phlox spp.	Golovinomyces magnicellulatus var. magnicellulatus	35, 41, 44, 46, 47, 50, 51
Pilosella aurantiaca ssp. carpathicola	Golovinomyces cichoracearum	46
Pimpinella saxifraga	Erysiphe heraclei	46
Plantago coronopus	Golovinomyces sordidus	44, 46
Plantago lanceolata	Golovinomyces sordidus	41, 46, 48
	Podosphaera plantaginis	35, 41, 43-47, 50-52
Plantago major	Golovinomyces sordidus	35, 41-46, 49, 51
Plantago major ssp. intermedia var. salina	Golovinomyces sordidus	46
Plantago major ssp. major	Golovinomyces sordidus	35, 41, 44-47
Plantago maritima	Golovinomyces sordidus	41, 44, 45, 46, 51

Host	Fungus	Distribution
Plantago sp.	Golovinomyces sordidus	48, 49, 52
Platanus sp.	Erysiphe platani	35, 41, 49-51
Poa humilis	Blumeria graminis	46
Poa nemoralis	Blumeria graminis	35
Poa pratensis *s.l.*	Blumeria graminis	35
Poa pratensis *s.s.*	Blumeria graminis	46
Poa trivialis	Blumeria graminis	35, 44, 46
Polygonum agrestinum	Erysiphe polygoni	46, 47
Polygonum arenastrum	Erysiphe polygoni	49
Polygonum aviculare agg.	Erysiphe polygoni	44, 46
Polygonum aviculare *s.s.*	Erysiphe polygoni	35, 44, 46
Polygonum chamaechyton	Erysiphe polygoni	46
Polygonum polycnemiforme	Erysiphe polygoni	46, 48
Populus nigra	Erysiphe adunca var. adunca	51
Populus nigra ssp. betulifolia	Erysiphe adunca var. adunca	46
Potentilla anglica	Podosphaera aphanis var. aphanis	46
Potentilla erecta ssp. erecta	Podosphaera aphanis var. aphanis	46
Potentilla reptans	Podosphaera aphanis var. aphanis	44, 46
Potentilla sterilis	Podosphaera aphanis var. aphanis	44, 46
Potentilla × suberecta	Podosphaera aphanis var. aphanis	46
Primula obconica	Fibroidium primulae-obconicae	51
Prunus domestica	Podosphaera tridactyla	49
Prunus domestica ssp. insititia	Podosphaera tridactyla	46
Prunus domestica ssp. insititia var. nigra	Erysiphe prunastri	46
	Podosphaera tridactyla	46
Prunus domestica var. damascena	Erysiphe prunastri	46
Prunus laurocerasus	Podosphaera pannosa	46
	Podosphaera tridactyla	49
Prunus lusitanica	Podosphaera pannosa	46
Prunus padus	Podosphaera tridactyla	43
Prunus spinosa	Erysiphe prunastri	42, 44, 46, 47, 49
	Podosphaera tridactyla	35, 42, 44, 46, 52
Pulmonaria longifolia	Golovinomyces cynoglossi	46
Pulmonaria officinalis	Golovinomyces cynoglossi	35, 46
Pyrus sp.	Podosphaera clandestina var. clandestina	46
Quercus petraea	Erysiphe alphitoides	44, 46-50
Quercus robur	Erysiphe alphitoides	35, 41, 44, 46-51
Quercus sp.	Erysiphe alphitoides	35, 42, 43

Host	Fungus	Distribution
Quercus × rosacea	Erysiphe alphitoides	46, 47
Ranunculus acris	Erysiphe aquilegiae var. ranunculi	35, 44, 46, 47, 50, 52
Ranunculus bulbosus	Erysiphe aquilegiae var. ranunculi	35, 46
Ranunculus flammula	Erysiphe aquilegiae var. ranunculi	46
Ranunculus repens	Erysiphe aquilegiae var. ranunculi	35, 42-44, 46, 47, 49-51
Ranunculus sp.	Erysiphe aquilegiae var. ranunculi	48
Raphanus raphanistrum ssp. maritimus	Erysiphe cruciferarum	44
Rhamnus cathartica	Erysiphe friesii var. friesii	51
Rhododendron luteum	Erysiphe azaleae	47
Rhododendron sp. 'Azalea Group'	Erysiphe azaleae	46
Rhododendron spp.	Erysiphe azaleae	35, 41, 45, 47-52
Rhododendron × superponticum	Erysiphe azaleae	46
Ribes nigrum	Podosphaera mors-uvae	46
Ribes rubrum	Podosphaera mors-uvae	50
Ribes sanguineum	Podosphaera mors-uvae	44
Ribes uva-crispa	Erysiphe grossulariae	35, 44, 46
	Podosphaera mors-uvae	46
Robinia sp.	Erysiphe robiniae	41
Rosa arvensis	Podosphaera pannosa	44, 46, 48
Rosa canina agg.	Podosphaera pannosa	35, 42, 43, 46
Rosa canina	Podosphaera pannosa	41, 46
Rosa cf. 'American Pillar'	Podosphaera pannosa	46
Rosa cv.	Podosphaera pannosa	41
Rosa mollis	Podosphaera pannosa	50
Rosa mulliganii	Podosphaera pannosa	46
Rosa multiflora	Podosphaera pannosa	46
Rosa rugosa	Podosphaera pannosa	46
Rosa setigera hybrid	Podosphaera pannosa	46
Rosa sherardii	Podosphaera pannosa	46
Rosa sp.	Podosphaera pannosa	35, 46
Rubus idaeus in hort.	Podosphaera aphanis var. aphanis	46
Rumex acetosella	Erysiphe polygoni	46, 47
Rumex crispus ssp. crispus	Erysiphe polygoni	46
Salix aurita	Erysiphe adunca var. adunca	44
Salix caprea	Erysiphe adunca var. adunca	35, 41-46
	Erysiphe capreae	35, 41, 42, 44, 46, 47, 50-52
Salix cinerea ssp. oleifolia	Erysiphe adunca var. adunca	41, 42, 44, 45, 46
Salix repens	Erysiphe adunca var. adunca	44, 52
Salix repens var. argentea	Erysiphe adunca var. adunca	41

Host	Fungus	Distribution
Salix sp.	Erysiphe adunca var. adunca	47
Salix × holosericea	Erysiphe adunca var. adunca	46
Salvia sp.	Golovinomyces biocellatus	46, 50
Sambucus racemosus	Erysiphe vanbruntiana var. sambuci-racemosae	44, 51
Sanguisorba officinalis	Podosphaera ferruginea var. ferruginea	41, 42, 44, 46, 47, 50, 52
Scabiosa atropurpurea	Erysiphe knautiae	42
Scabiosa columbaria	Erysiphe knautiae	44
Schedonorus arundinaceus	Blumeria graminis	44
Schedonorus pratensis	Blumeria graminis	44
Senecio sylvaticus	Golovinomyces fischeri	46
Senecio vulgaris	Golovinomyces fischeri	35, 44, 46, 47, 52
	Podosphaera senecionis	46
Silene dioica	Erysiphe buhrii	46
Silene latifolia ssp. alba	Erysiphe buhrii	46
Silene sp.	Erysiphe buhrii	49, 52
Sisymbrium officinale	Erysiphe cruciferarum	44, 46, 49, 50
Smyrnium olusatrum	Erysiphe heraclei	46
Solidago ‘Goldenmosa’	Golovinomyces asterum var. solidaginis	46
Solidago gigantea ssp. serotina	Golovinomyces asterum var. solidaginis	46
Solidago virgaurea	Golovinomyces asterum var. solidaginis	46
Sonchus arvensis	Golovinomyces sonchicola	44, 46
Sonchus asper	Golovinomyces sonchicola	44, 46, 47
Sonchus asper ssp. glaucescens	Golovinomyces sonchicola	46
Sonchus oleraceus	Golovinomyces sonchicola	41, 44, 46, 47, 49
Sorbus aucuparia	Podosphaera aucupariae	41-44, 46, 48
Spiraea japonica cv.	Podosphaera spiraeae	46
Spiraea sp.	Podosphaera spiraeae	35, 41, 46, 49-52
Spiraea × bumalda	Podosphaera spiraeae	35
Stachys arvensis	Neoerysiphe galeopsidis	46
Stachys byzantina ‘Big Ears’	Neoerysiphe galeopsidis	46
Stachys palustris	Neoerysiphe galeopsidis	46
Stachys sylvatica	Neoerysiphe galeopsidis	35, 41-44, 46, 47, 49, 50, 52
Succisa pratensis	Erysiphe knautiae	44, 46
Symphoricarpos sp.	Erysiphe symphoricarpae	41, 44, 50, 51
Symphyotrichum sp.	Golovinomyces asterum var. moroczkovskii	46
Symphyotrichum × salignum	Golovinomyces asterum var. moroczkovskii	44, 46
Symphytum caucasicum	Golovinomyces cynoglossi	46

Host	Fungus	Distribution
Symphytum officinale ssp. officinale	Golovinomyces cynoglossi	44, 46, 50, 52
Symphytum sp.	Golovinomyces cynoglossi	35, 42
Symphytum × uplandicum	Golovinomyces cynoglossi	44, 46, 47
Syringa vulgaris	Erysiphe syringae	44, 46, 47
Tagetes sp.	Neoerysiphe cumminsiana	41
Tanacetum vulgare in hort.	Euoidium chrysanthemi	42
Taraxacum officinale agg.	Podosphaera erigerontis-canadensis	35, 41, 45, 46, 47, 49-51
Taraxacum oxoniense	Podosphaera erigerontis-canadensis	46
Tellima grandiflora	Podosphaera macrospora	43
Thymus drucei	Golovinomyces biocellatus	42
Tolmiea menziesii	Podosphaera macrospora	46
Torilis japonica	Erysiphe heraclei	42, 46, 50
Trifolium arvense	Erysiphe trifoliorum	44
Trifolium campestre	Erysiphe trifoliorum	44, 46
Trifolium dubium	Erysiphe trifoliorum	41, 42, 44, 46
Trifolium hybridum	Erysiphe trifoliorum	44
Trifolium pratense	Erysiphe pisi var. pisi	46
	Erysiphe trifoliorum	35, 46
Trifolium repens	Erysiphe trifoliorum	44, 46
Trifolium strictum in hort.	Erysiphe trifoliorum	42
Tripolium pannonicum	Golovinomyces cichoracerum	44
Triticum aestivum	Blumeria graminis	46
Urtica dioica	Erysiphe urticae	35, 41-44, 46, 47, 49-51
Vaccinium myrtillus	Podosphaera myrtillina var. myrtillina	35, 42, 43, 46, 48-51
Valeriana officinalis	Golovinomyces valerianae	44, 46
Valeriana phu	Golovinomyces valerianae	46
Valerianella carinata	Golovinomyces orontii	46, 49
Valerianella locusta var. locusta	Golovinomyces orontii	46
Valerianella locusta var. oleracea	Golovinomyces orontii	46
Verbascum cf. chaixii	Golovinomyces verbasci	46
Verbascum cv.	Golovinomyces verbasci	46
Verbascum nigrum	Golovinomyces verbasci	43, 44
Verbascum nigrum in hort.	Golovinomyces verbasci	46
Verbascum sp.	Golovinomyces verbasci	35, 41, 44-52
Verbascum thapsus	Golovinomyces verbasci	35, 44, 46, 49, 51
Verbena bonariensis	Golovinomyces orontii	46
Veronica chamaedrys	Golovinomyces orontii	44, 46
	Podosphaera fuliginea	44, 46
Veronica longifolia	Podosphaera fuliginea	46

Host	Fungus	Distribution
Veronica spicata in hort.	Podosphaera fuliginea	44
Viburnum opulus	Erysiphe viburni	44, 46, 47
Viburnum tinus	Erysiphe viburni	46
Vicia cracca	Erysiphe baeumleri	46
Vicia sativa ssp. nigra	Erysiphe pisi var. pisi	46
Vicia sepium	Erysiphe pisi var. pisi	44, 45
Vicia sylvatica	Erysiphe baeumleri	46
Vinca major	Pseudoidium vincae	41
	Golovinomyces vincae	35, 49
Viola sp.	Golovinomyces orontii	49
Viola × wittrockiana	Golovinomyces orontii	46
Vitis sp.	Erysiphe necator var. necator	41, 44, 50, 51
Vitis vinifera	Erysiphe necator var. necator	42, 46

Powdery mildew taxa with their host genera in Wales

Arthrocladiella mougeotii	Lycium
Blumeria graminis	Agrostis, Anisantha, Anthoxanthum, Arrhenatherum, Avena, Brachypodium, Bromus, Catapodium, Dactylis, Deschampsia, Elymus, Festuca, Holcus, Hordeum, Lolium, Milium, Poa, Schedonorus, Triticum
Erysiphe adunca var. *adunca*	Populus, Salix
Erysiphe alphitoides	Quercus
Erysiphe aquilegiae var. *aquilegiae*	Aquilegia, Caltha
Erysiphe aquilegiae var. *ranunculi*	Aconitum, Clematis, Consolida, Ranunculus
Erysiphe arcuata	Carpinus
Erysiphe azaleae	Rhododendron
Erysiphe baeumleri	Vicia
Erysiphe begoniicola	Begonia
Erysiphe berberidis var. *berberidis*	Berberis, Mahonia
Erysiphe betae	Beta
Erysiphe buhrii	Silene
Erysiphe capreae	Salix
Erysiphe circaeae	Circaea
Erysiphe convolvuli var. *calystegiae*	Calystegia
Erysiphe convolvuli var. *convolvuli*	Convolvulus
Erysiphe cotini	Cotinus
Erysiphe cruciferarum	Alliaria, Brassica, Capsella, Fumaria, Hesperis, Hirschfeldia, Lunaria, Raphanus, Sisymbrium
Erysiphe deutziae	Deutzia
Erysiphe divaricata	Frangula
Erysiphe elevata	Catalpa
Erysiphe euonymi	Euonymus
Erysiphe euonymicola	Euonymus
Erysiphe flexuosa	Aesculus
Erysiphe friesii var. *friesii*	Rhamnus
Erysiphe grossulariae	Ribes
Erysiphe guarinonii	Laburnum
Erysiphe heraclei	Angelica, Anthriscus, Heracleum, Pastinaca, Pimpinella, Smyrnium, Torilis
Erysiphe howeana	Oenothera
Erysiphe hyperici	Hypericum
Erysiphe intermedia	Lupinus
Erysiphe knautiae	Knautia, Scabiosa, Succisa
Erysiphe lonicerae var. *lonicerae*	Lonicera
Erysiphe lycopsidis	Lycopsis, Pentaglottis
Erysiphe lythri	Lythrum
Erysiphe macleayae	Papaver
Erysiphe magnifica	Magnolia
Erysiphe necator var. *necator*	Vitis
Erysiphe necator	Parthenocissus
Erysiphe ornata var. *europaea*	Betula

Erysiphe penicillata	Alnus
Erysiphe pisi var. *cruchetiana*	Lathyrus, Ononis
Erysiphe pisi var. *pisi*	Lathyrus, Medicago, Trifolium, Vicia
Erysiphe platani	Platanus
Erysiphe polygoni	Persicaria, Polygonum, Rumex
Erysiphe prunastri	Prunus
Erysiphe robiniae	Robinia
Erysiphe russellii	Oxalis
Erysiphe symphoricarpae	Symphoricarpos
Erysiphe syringae	Ligustrum, Syringa
Erysiphe tortilis	Cornus
Erysiphe trifoliorum	Anthyllis, Lathyrus, Lotus, Melilotus, Onobrychis, Trifolium
Erysiphe ulmariae	Filipendula
Erysiphe urticae	Urtica
Erysiphe vanbruntiana var. *sambuci-racemosae*	Sambucus
Erysiphe viburni	Viburnum
Euoidium chrysanthemi	Chrysanthemum, Tanacetum
Euoidium longipes	Petunia
Fibroidium balsaminae	Impatiens
Fibroidium primulae-obconicae	Primula
Golovinomyces artemisiae	Artemisia
Golovinomyces asterum var. *asterum*	Bellis
Golovinomyces asterum var. *moroczkovskii*	Symphyotrichum
Golovinomyces asterum var. *solidaginis*	Solidago
Golovinomyces biocellatus	Glechoma, Lycopus, Melissa, Mentha, Salvia, Thymus
Golovinomyces cichoracearum	Crepis, Helminthotheca, Hieracium, Hypochaeris, Lactuca, Mycelis, Pilosella, Tripolium
Golovinomyces circumfusus	Eupatorium
Golovinomyces cucurbitacearum	Cucurbita
Golovinomyces cynoglossi	Borago, Buglossoides, Cynoglossum, Myosotis, Pulmonaria, Symphytum, Echium
Golovinomyces depressus	Arctium
Golovinomyces fischeri	Senecio
Golovinomyces magnicellulatus var. *magnicellulatus*	Phlox
Golovinomyces montagnei	Carduus, Centaurea, Cirsium
Golovinomyces orontii	Antirrhinum, Cucurbita, Cymbalaria, Linaria, Misopates, Nicotiana, Papaver, Petunia, Valerianella, Verbena, Veronica, Viola
Golovinomyces sonchicola	Sonchus
Golovinomyces sordidus	Plantago
Golovinomyces valerianae	Centranthus, Valeriana
Golovinomyces verbasci	Verbascum
Golovinomyces vincae	Vinca
Neoerysiphe cumminsiana	Tagetes
Neoerysiphe galeopsidis	Acanthus, Ballota, Betonica, Galeopsis, Glechoma, Lamiastrum, Lamium, Melissa, Monarda, Nepeta, Stachys
Neoerysiphe galii	Galium
Neoerysiphe geranii	Geranium
Neoerysiphe nevoi	Lapsana
Oidiopsis cisti	Helianthemum

Phyllactinia alnicola	Alnus
Phyllactinia betulae	Betula
Phyllactinia carpini	Carpinus
Phyllactinia fraxini	Fraxinus
Phyllactinia guttata	Corylus
Phyllactinia mali	Crataegus
Phyllactinia marissalii	Acer
Phyllactinia orbicularis	Fagus
Phyllactinia roboris	Castanea
Podosphaera amelanchieris	Amelanchier
Podosphaera aphanis var. *aphanis*	Alchemilla, Aphanes, Comarum, Fragaria, Geum, Potentilla, Rubus
Podosphaera aucupariae	Sorbus
Podosphaera clandestina var. *clandestina*	Crataegus, Pyrus
Podosphaera dipsacacearum	Dipsacus, Knautia
Podosphaera epilobii	Epilobium
Podosphaera erigerontis-canadensis	Lapsana, Matricaria, Taraxacum
Podosphaera erodii	Erodium
Podosphaera euphorbiae	Euphorbia
Podosphaera ferruginea var. *ferruginea*	Sanguisorba
Podosphaera filipendulae	Filipendula
Podosphaera fugax	Geranium
Podosphaera fuliginea	Veronica
Podosphaera leucotricha	Cydonia, Malus
Podosphaera macrospora	Tellima, Tolmiea
Podosphaera macularis	Humulus
Podosphaera mors-uvae	Ribes
Podosphaera myrtillina var. *myrtillina*	Vaccinium
Podosphaera pannosa	Prunus, Rosa
Podosphaera parietariae	Parietaria
Podosphaera phtheirospermi	Euphrasia, Odontites
Podosphaera plantaginis	Plantago
Podosphaera senecionis	Jacobaea, Senecio
Podosphaera spiraeae	Spiraea
Podosphaera tridactyla	Prunus
Podosphaera xanthii	Calendula, Cirsium
Pseudoidium hortensiae	Hydrangea
Pseudoidium lauracearum	Laurus
Pseudoidium passiflorae	Passiflora
Pseudoidium vincae	Vinca
Sawadaea bicornis	Acer
Sawadaea tulasnei	Acer

Glossary

Amphiphyllous Occuring on both top and bottom leaf surfaces.

Anamorph The asexual stage, reproducing by means of conidia.

Asci Sac-like bodies (one to many) formed within the chasmothecia, in which the ascospores develop.

Ascospores Spores (2-8 in number) formed within the ascus after meiosis.

Branched Referring to chasmothecial appendages that are repeatedly, tightly and more or less symmetrically branched at the apex.

Chasmothecia Closed, usually spherical or somewhat flattened bodies, in which the asci develop.

Chasmothecial appendages Entire or variously forked or branched outgrowths from the chasmothecia.

Conidia Asexual spores formed singly or in chains at the apex of conidiophores.

Conidial germ tubes The primary tubes grown out from the conidia that ultimately form hyphae.

Conidiophores Specialised, unbranched hyphae bearing conidia.

Fibrosin bodies Minute shard-like reflective bodies within the conidia of *Podosphaera* and *Sawadaea.*

Flexuous Referring to chasmothecial appendages that are generally straight but regularly wavy in the upper part.

Forked Referring to chasmothecial appendages that are once or a few times irregularly forked.

Hyphal appressoria Outgrowths from the hyphae for attachment to or penetration of the host epidermis.

Hypophyllous Occurring only on the underside of leaves.

Teleomorph The sexual stage reproducing by means of ascospores produced in asci in the chasmothecia.

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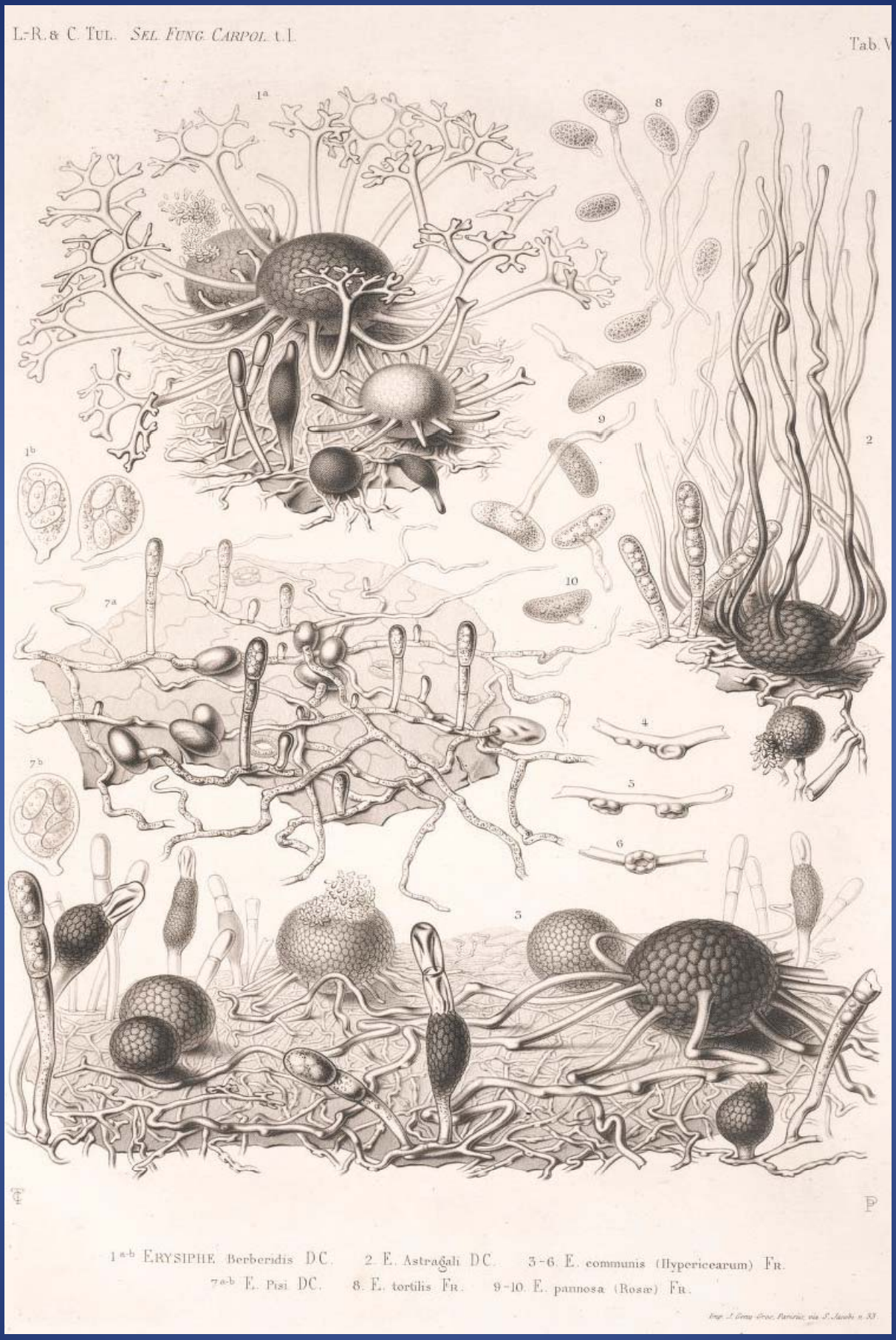
Erysiphe howeana on *Oenothera stricta* (Fragrant Evening-primrose),
Gwbert, Ceredigion, 28 September 2015.



1a-b Erysiphe Berberidis DC. 2. E. Astragali DC. 3-6. E. communis (Hypericearum) Fr.
7a-b E. Pisi DC. 8. E. tortilis Fr. 9-10. E. pannosa (Rosæ) Fr.

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