White Moulds, *Ramularia* and *Phacellium* Anamorphs, in Wales and Britain: A Guide and Welsh Census Catalogue

Llwydni Gwyn, Anamorffau *Ramularia* a *Phacellium*, yng Nghymru a Phrydain: Cyfeirydd a Chatalog Cyfrifiad Cymreig

Arthur O. Chater, Ray G. Woods, R. Nigel Stringer, Debbie A. Evans & Paul A. Smith

Summary

Ramularia species, often referred to as White Moulds, are a large and interesting but little-studied group of parasitic Hyphomycete fungi. Eighty-one species are reported here from Wales in 180 unique combinations with their host organisms. This compares with a total for Britain and Ireland of 108 species reported in 307 combinations with host species. Most are parasitic on vascular plants causing, in a few cases, economically significant damage to crops. Many, however, appear to co-habit successfully with their host plants. Indeed, despite almost half of the Welsh species being reported from gardens, few gardeners will be aware of their existence.

This guide has been created to assist in White Mould identification and to stimulate further recording to better understand their ecology and distribution.

Crynodeb

Mae rhywogaethau *Ramularia*, sy'n aml yn cael eu cyfeirio atynt fel Llwydni Gwyn, yn grŵp mawr a diddorol o ffwng Hyphomycete parasitig ond heb eu astudio llawer. Adroddir fod 81 o rywogaethau yma yng Nghymru mewn 180 o gyfuniadau unigryw gyda eu organebau lletyol. Cymharir hyn gyda cyfanswm ar gyfer Prydain ac Iwerdddon o 108 rhywogaeth wedi eu cofnodi mewn 307 o gyfuniadau gyda eu rhywogaethau lletyol. Mae'r rhan fwyaf yn barasitig ar blanhigion fasgwlar sy'n achosi, mewn rhai achosion, difrod economaidd sylweddol i gropiau. Beth bynnag, mae llawer yn cyd-fyw yn llwyddianus gyda'i planhigion lletyol. Yn wir, er fod bron hanner cofnodion rhywogaethau Cymru wedi eu cofnodi mewn gerddi, ychydig iawn o arddwyr sy'n ymwybodol o'u bodolaeth.

Creuwyd y cyfeirydd yma i gynorthwyo adnabyddiaeth o Lwydni Gwyn ac i sbarduno cofnodi pellach er mwyn dealltwriaeth gwell o'u ecoleg a'u dosbarthiad.

Cover Stories

The front cover displays images at top left of *Ramularia pratensis* on *Rumex obtusifolius* Broad-leaved Dock, at top centre *Ramularia digitalis* on *Verbascum thapsus* Great Mullein, at bottom left *Ramularia pratensis* on *Rheum* × *rhabarbarum* Rhubarb, bottom centre *Ramularia purpurascens* on *Petasites pyrenaicus* Winter Helliotrope and on the right *Ramularia rufibasis* on *Myrica gale* Bog Myrtle.

The rear cover displays an image of *Galanthus nivalis* Snowdrop overlooking the Wye Valley above Hay on Wye with below, images of its white mould *Ramularia septata* at differing magnifications. This mould widely affects cultivated populations late in the season and is found on naturalised populations of *G. nivalis*, *G. plicatus* Pleated Snowdrop and *G. elwesii* Greater Snowdrop in the Wye catchment.

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"Spots that could spell trouble" (Pasture 2018)

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Preface

In this book, the fifth of our series of accounts of the phytoparasitic microfungi of Wales, we cover the group of Hyphomycetes in the genera *Ramularia* and *Phacellium*, commonly known as White Moulds. They are not as popular as the Rusts, Smuts, Powdery Mildews and Downy Mildews of our other volumes, and records of them are generally sparser, but they are equally worthy of attention and our aim is to encourage interest in them, to indicate what is known of their occurrence in Wales, and to stimulate further recording and study.

Acknowledgements

We are grateful to Fay Newbery, Peter Roberts and Brian Spooner for helpful comments and advice; to Chris Preston for extensive comments on the manuscript; to Sam Bosanquet, Theresa Greenaway, Andy Jones, David Mitchel, Fay Newbery, Julie Rose, Sheila Spence, Shelly Stroud, Jo Weightman and Julian Woodman for collections and records, and especially to Peter Roberts for the remarkable records from his Glasbury garden; to Bruce Ing for details of his North East Wales records; to Chris Yeates for his Yorkshire records; to Chris Preston and John Poland for help in the field and to Eilir Evans for providing the Welsh translations.

Whilst most of the images used to illustrate the book are those of the authors, we are grateful to Peter Roberts for providing images of species confined to his and Shelly Evans' wonderful garden and to Mike Stroud for the excellent image of *Ramularia septata* caespituli on the rear cover.

We would like to thank the British Society for Plant Pathology (and Richard Shattock for facilitating this connection) and the British Mycological Society for their support towards publishing this latest book in the series.

Ramularia calthae on *Caltha palustris*

Introduction

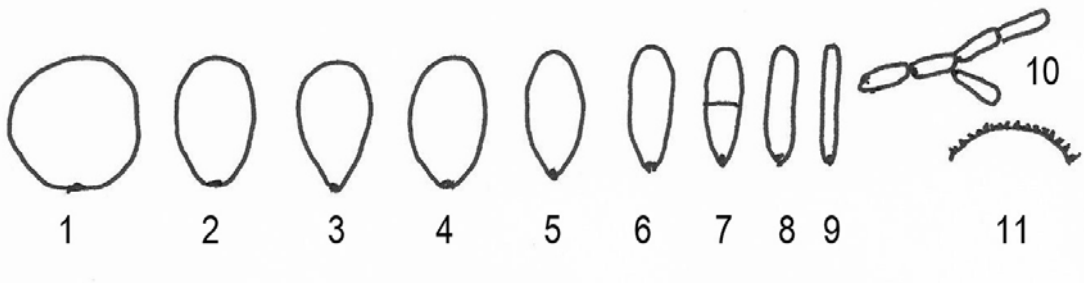
This very preliminary account of *Ramularia* and *Phacellium* is based on the excellent monograph by Braun (1998), the essential manual for identification which made our work possible, with a few taxonomic modifications from Videira *et al*. (2016) and other recent sources. Unlike the terms Rusts, Smuts, Powdery Mildews and Downy Mildews, the terms White Moulds and *Ramularia* usually do not mean anything much to most naturalists, or even to many mycologists, let alone to the general public. Yet many are widespread and often conspicuous endophytes and/or parasites of vascular plants, and several species cause significant diseases of agricultural crops and horticultural plants, notably *R. collo-cygni* on Barley, *R. beticola* on Fodder Beet, *R. deusta* var. *alba* on Sweet Peas, *R. grevilleana* on Garden Strawberry, *R. onobrychidis* on Sainfoin, *R. pratensis* on Rhubarb and *R. vallisumbrosae* on Daffodils. Kernaghan *et al*. (2017) provide a more positive picture of *Ramularia* spp. in contrast to their role as parasites. Their study of endophytic fungi in wild and cultivated *Vitis* Grape species in North America demonstrated a significant role for *Ramularia* spp. as symptomless endophytes in wild vines, providing protection against damaging pathogens and a potential role as biocontrol agents in cultivated vines. Saikkonen *et al*. (1998) review the role of endophytic fungi in general and demonstrate the seamless transition in many species to that of pathogen brought on by aging plant tissue or external stressors of the host plant. We clearly have much to learn about the wider role of these fungi.

White, tufted caespituli of *Ramularia lamii* on *Lamiastrum galeobdolon* Yellow Archangel. It is almost certainly from such white tufts that the common name of this group “White Moulds” is derived.

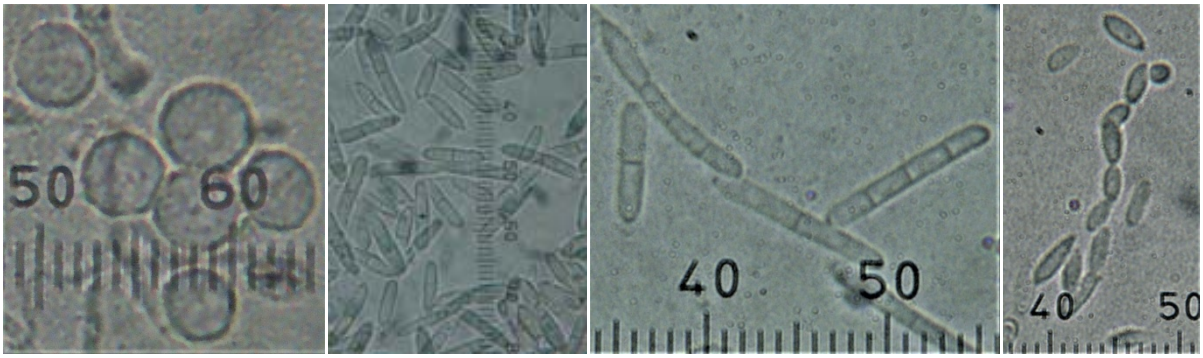
The White Moulds considered here encompass the Hyphomycete genera *Ramularia* and *Phacellium* all members of which are obligate parasites of plants or fungi. The significance of the generic epithet *Ramularia* coined by Unger (1833) can be guessed from a word he uses in his rather minimal generic description. "Ramulus" in Latin means a branchlet or twig, and

Unger describes the conidiophores as "mehr oder weniger büschelförmig aus den Athemhöhlen hervorwächst [emerging more or less tufted from the stomata]", i.e. that the caespituli are like a tuft of branchlets. There are around 350 species worldwide, including about 108 recorded for Britain and Ireland, of which 81 have so far been found in Wales. *Ramularia* and *Phacellium* species as interpreted here are anamorphs, reproducing asexually by means of conidia. Their teleomorph stages, reproducing sexually by means of ascospores produced in asci in pseudothecia, are species of *Mycosphaerella*, and these are not treated in this account. In most cases the relevant *Mycosphaerella* counterpart is unknown for certain, and the only British species whose counterparts have been experimentally proven are *Ramularia grevilleana* and *Mycosphaerella fragariae*, *R. inaequalis* and *M. hieracii*, and *R. digitalis* and *M. mariae* (Videira *et al*. 2015). (*Ramularia endophylla* in particular is not considered here, as it applies to the teleomorph formerly generally known as *Mycosphaerella punctiformis*, its anamorph being insufficiently known and formed only in culture, Verkley *et al*. (2004)). The generic name *Ramularia* is conserved. Extensive comment on relationships with associated genera can be found in Videira *et al*. (2017).

The hyphae of these genera are septate and immersed in the host tissue. Conidiophores are developed mostly in dense groups (caespituli) in *Ramularia*, or compacted into columns (synnema, pl. synnemata) in the species formerly included in *Phacellium*. (Most species of *Phacellium* have now been, or are soon likely to be, moved into *Ramularia*.) Synnemata emerge usually through the stomata. They may be unbranched or branched, aseptate or septate. Conidia are produced at the apex or also on the sides of conidiophores and are globose to narrowly cylindrical, aseptate or septate and may be either solitary or developed in chains (catenate), which can sometimes be branched. There is often great variation in size, shape and septation of the conidia even within one caespitulum. Chains of conidia are easily broken up under the microscope so this can be a difficult character to check.



The various main shapes of conidia: 1 globose 2 obovoid 3 narrowly obovoid 4 ellipsoid 5 narrowly ellipsoid 6 fusiform, aseptate 7 fusiform, 1-septate 8 narrowly fusiform 9 cylindrical 10 conidia in branched chain 11 conidium wall echinulate (detail)



Aseptate and spherical in *R. sphaeroidea*

Fusiform, aseptate and septate in *R. adoxae*

Narrowly cylindrical, variously sized and 1-3-septate in *R. inaequalis*

Ellipsoid to fusiform and formed in chains in *R. digitalis*

Throughout the book, where a scale is given, as in the images above, each division is 2.5µm. On release of the conidia the conidiophores retain at the point of former attachment a minute and thickened scar just visible under the light microscope. This feature typifies *Ramularia*, *Ramulariopsis* and *Phacellium* and differentiates these genera from otherwise similar looking fungi such a *Cercosporella* (see image below right). *Ramulariopsis* is a small, mostly tropical genus with no British species whilst most species of *Phacellium* have been, or are soon likely to be, moved into *Ramularia*.

Above left: unbranched conidiophores of a *Ramularia urticae* caespitulum Centre: synnema of *Phacellium trifolii*. Right: scars left on a conidiophore of *R. rufibasis* after the conidia have been shed.

Ramularia and *Phacellium* infections are fairly readily detectable by leaf spots visible on the upper as well as the lower surface of the leaves of the host plants, with the very characteristic caespituli usually arising through the stomata on the lower surface, but sometimes breaking through the epidermis on either surface. These caespituli are usually whitish or greyish, creating neat tufts and are normally distinctly separated from each other and so look quite different, even with just a hand lens, from the more even, extensive and usually sparser weft of sporangiophores of Downy Mildews.

In many cases where Braun (1998) describes the caespituli as being on both surfaces of the leaf (amphiphyllous) they are in our material confined to the lower surface (hypophyllous); where they are amphiphyllous the caespituli are usually much more abundant on the lower surface. Species that are normally hypophyllous in the field if kept in a damp chamber can become amphiphyllous and may do so in humid weather in the field. In the great majority of

species the mycelium is internal in the leaf tissue so only the caespituli are visible on the leaf surface.

Most species are host-specific, but microscopic confirmation is of course essential in all cases where more than one species may have been recorded anywhere on that host, and advisable always. *Ramularia rosea* on *Salix cinerea* Grey Willow, *R. rufibasis* on *Myrica gale* Bog-myrtle and *R. sambucina* on *Sambucus nigra* Elder are the only species on woody hosts in Wales, and the only other species on woody hosts in Britain seem to be *R. berberidis* on *Berberis asiatica* Asian Barberry, *R. alnicola* on *Alnus glutinosa* Alder, *R. fatsiae* on *Fatsia japonica* and *Phacellium sorbi* on *Sorbus aucuparia* Rowan. In Wales 57 species of herbaceous perennial and biennial host plants support 67 out of a total of 81 White Mould species reported from Wales, indicating the importance of these host life cycles to these fungi.

The only species on pteridophytes in Wales are *R. asplenii* on *Asplenium ruta-muraria* and *R. scolopendrii* on *A. scolopendrium*, the former apparently varying greatly in abundance from year to year. Given the abundance of *Pteridium aquilinum* Bracken, *Dryopteris dilatata* Broad Buckler-fern and *D. filix-mas* Male-fern in Western Europe, it seems strange that there appears to be no more than a handful of records of *Ramularia* spp. on the dead fronds of these hosts, with all of the records being from mainland Europe. The only species on the Poaceae Grass family in Wales are *R. collo-cygni* on Barley and *R. holci-lanati* on *Holcus lanatus* Yorkshire-fog; elsewhere in Britain *R. pusilla* occurs on *Alopecurus pratensis* Meadow Foxtail, *Cynosurus cristatus* Crested Dog's-tail, *Phalaris arundinacea* Reed Canary-grass and *Poa humilis* Spreading Meadow-grass.

Apart from some 370 records in the Fungal Records Database of Britain and Ireland (FRDBI), 35 records of 19 species in Aron (2005) and 36 species in Ing (2020), there are no substantial groups of records published or available for Wales. The majority of the records made by the present authors have either not yet been uploaded into or submitted to the FRDBI. There are some 1700 such records from Wales which form the main basis of this account.

Fifteen genera host two or more species of *Ramularia* in Britain so special care should always be taken in identifying them on these hosts; those recorded in Wales are shown in bold type, and the main differences are given under the species marked with an asterisk below. Such pairs of species that are not in Wales can be found in the species descriptions in square brackets.

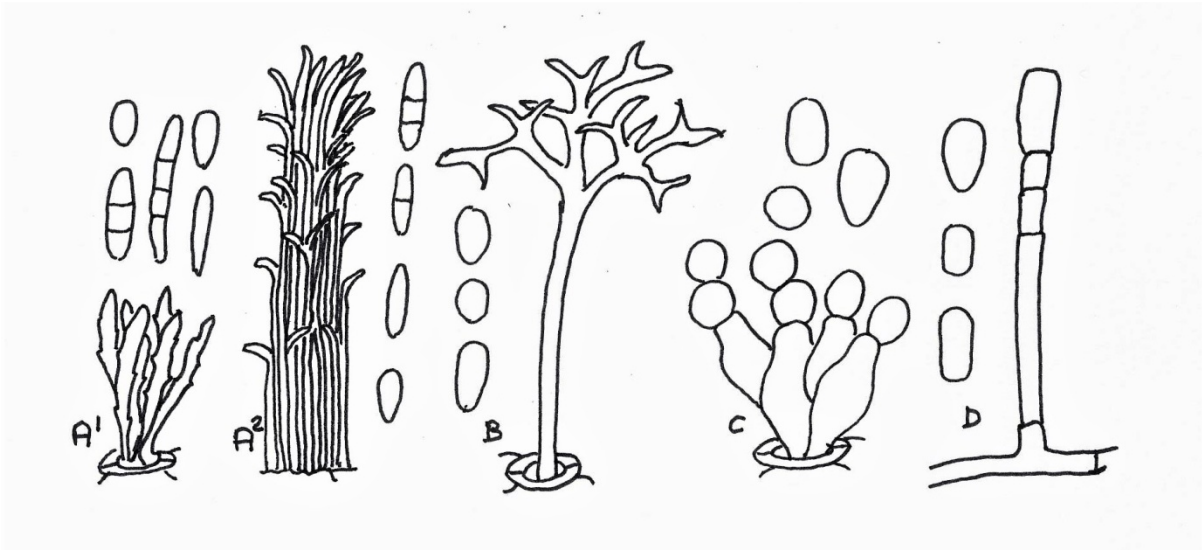
Alchemilla Lady's-mantles – *R. alpina,* ***R. aplospora****
Asplenium Spleenworts – ***R. aspleniae****, ***R. scolopendrii***
Campanula Bellflowers – *R. campanulae-latifoliae*, R. macrospora*
Lathyrus Peas – ***R. deusta*** *var.* ***alba****, var.* ***deusta****, Phacellium carneum*
Leucanthemum Oxeye Daisies - *R. bellunensis*, ***R. tanaceti****
Lotus Bird's-foot-trefoils – *R. schulzeri,* ***R. sphaeroidea****
Petasites Butterburs – ***R. major***, ***R. purpurascens****
Plantago Plantains – ***R. kriegeriana****, **R. rhabdospora***
Primula Primroses – ***R. interstitialis****, **R. primulae***
Ranunculus Buttercups – ***R. acris****,* ***R. didyma*** var*.* ***didyma****,* ***R. simplex*** var*.* ***simplex***
Rumex Docks – ***R. pratensis*** *var.* ***pratensis****,* ***R. rubella***
Silene Campions – ***R.*** **didymarioides***, **R. lychnicola**

Stachys Woundworts – ***R. bresadolae***, ***R. lamii*** var. ***lamii****
Tanacetum Tansies – *R. bellunensis*, *R. tanaceti**
Veronica Speedwells – *R. beccabungae,* ***R. chamaedryos****, **R. coccinea, R. veronicae***
Viola Violets – ***R. agrestis*** var. ***agrestis,*** var. ***deflectens****, ***R. lactea****

In these cases, where the host species has more than one White Mould and the naked eye does not distinguish which is involved, there is a tendency for a recorder (or at least the present authors!) to collect only one example from each locality. It would seem likely therefore that one or other of the species has been missed, especially if they are of more or less equal abundance.

Finding White Moulds

The drawings below show typical White Moulds, Powdery and Downy Mildews and White Blister-rusts that can look rather similar to the naked eye. White Moulds have clustered, mostly unbranched conidiophores, and the conidia are often septate (A1 below) and sometimes compacted into synnemata (A2); Downy Mildews have sporangiophores branched at the apex and aseptate sporangia (B); White Blister-rusts have very short, clavate and entire sporangiophores budding off the sporangia at the apex, all under a white crust (C); and Powdery Mildews almost always display an extensive superficial mycelium on the leaf surface, absent in White Moulds, and their conidiophores are unbranched and septate, with aseptate conidia (D). Techniques for finding the White Moulds are much the same as those for finding the other groups of plant-parasitic microfungi. Leaf spots, other discolorations or distortions of leaves or other parts of the plant should be investigated.

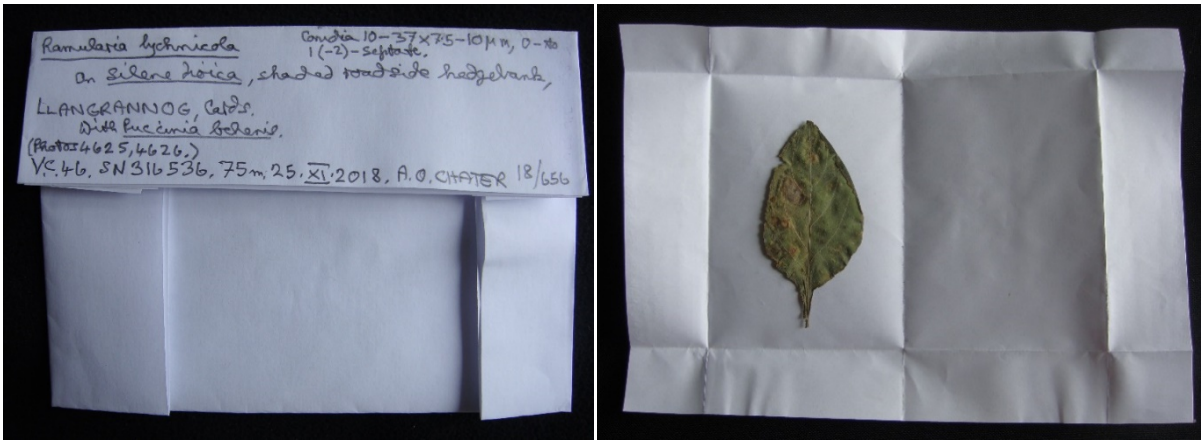


Almost always the White Moulds cause discoloration visible on the upper leaf surface, making infected plants fairly easily noticeable. Usually this starts pale or yellowish, then darkens and becomes brownish as necrosis sets in. It should be noted though that host discolouration is more related to physiological condition of the host and may often not be due to the mould; damage to the tissue of any particular host by White Moulds or other fungi, Downy Mildews, invertebrates or physical accidents tends to result in the affected parts of the leaf colouring up in the same way. Spots, discolouration and deformation must always be

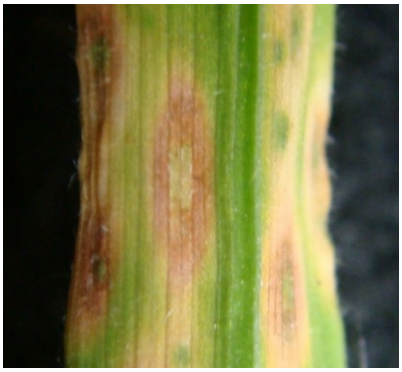
carefully examined to establish the presence of the mould. It can also be worth looking for the whitish or otherwise pale caespituli on dead leaves. Following prolonged dry weather, the caespituli tend to disappear, or one may see the spots before the caespituli have emerged, and the hunter of White Moulds is left with a frustrating range of leaf spots with no visible fungi. In desperation, following one of the driest springs on record one of the authors took to placing leaves with promising spots in sealed boxes in the dark. A damp tissue was placed in the box, or the leaf stalks were placed in shallow water in the box base whilst the blades were kept above water. Remarkably, in as little as 24 hours almost all the selected leaf spots produced well-grown caespituli making identification possible. This technique has revolutionised White Mould hunting from a sport typified by wet knees, mackintoshes and uncertain weather to the pleasure of operating in warm, dry and settled conditions. As an added bonus this culture technique has also helped to overcome the additional frustration of being beaten to the fungus by some small fungivore that has selectively eaten out the centre of a promising leaf spot; following a few days in a damp chamber the surviving collar of tissue around the browsed hole can frequently be induced to produce conidia that are seldom seen in the field, so permitting a confident determination. Hughes (1949) however points out that sizes of conidia may vary somewhat when grown under very damp conditions, with some species developing larger conidia and some slightly smaller and speculates that such variability may occur in the field under differing weather conditions.

Collection and Preservation

Maintaining a collection of material is essential. It enables revisions of one's determinations, especially if the taxonomy changes, it enables comparisons to be made and it can be a valuable source of material for DNA studies. A characteristic sample of the infected part of the host, such as a whole leaf or leaves, should be packeted and dried in a press as one does with plants in general, either changing the drying paper or using gentle heat. Packets should be of a standard size for ease of filing, and labelled with the name of the White Mould, name of host, habitat, location, vice-county, grid reference, altitude, date and collector. Any observations on abundance, measurements and other details observed under the microscope and anything else of interest should be added. Pencil is better than most inks, many of which fade even in the dark. A6 is a convenient size for the packets, and they can be folded from an A4 sheet so as to enclose the specimen safely protected from spillage or the attentions of mites or other pests (see illustration below). The folds should be tightened



Ramularia glechomatis



Ramularia holci-lanati

Ramularia purpurascens

Ramularia pratensis

Ramularia digitalis

Ramularia tricheri

Ramularia cynarae

Ramularia rhabdospora

Ramularia sambucina

Ramularia scolopendri

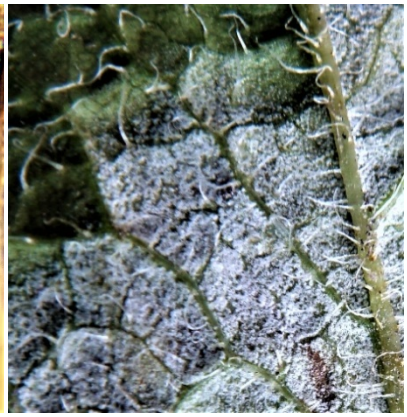
Ramularia abscondita

Ramularia lamii

Examples of leaf discoloration associated with the presence of *Ramularia* species

Ramularia alborosella synnemata

Ramularia collo-cygni caespituli



Ramularia lampsanae caespituli

Ramularia septata caespituli

Ramularia scolopendrii caespituli

Ramularia urticae caespituli

Ramularia asplenii caespituli

Ramularia lactea caespituli

Ramularia carneola caespituli

Ramularia veronicae caespituli

Ramularia ajugae caespituli

Ramularia bistorti caespituli

Examples of synnemata and caespituli as typically visible through a ×10 lens

by running them between the finger nails. Ideally archive quality paper should be used. Avoid collecting too much material and to ensure that the specimens are ‘bug’ free they can be placed in a plastic container and put in the freezer for 48 hours.

Identification

Although we do not pretend to obviate the desirability of using the monograph by Braun (1998), we hope that our book may enable the user to make reasonably accurate identifications of Welsh material, and to some extent of material of species that are only recorded from the rest of Britain and Ireland. Having assured yourself that your specimen is a *Ramularia* (see above) and having identified the host, turn to the table of hosts and their fungi in Appendix 2 at the end of the book. This will lead you to the species occurring on that host, which you then will find in alphabetical order in the body of the book, and you should check that it fits the brief description we give; if more than one *Ramularia* occurs on a host, an asterisk after the host name indicates under which species we give the diagnostic characters. Ellis & Ellis (1997) is very incomplete and now out-of-date. For many species see Kruse (2019) and the website https://bladmineerders.nl/parasites/fungi/ascomycota/pezizomycotina/dothideomycetes/capnodiales/ramularia/. For those recorders who want to research more into the recent advances in taxonomy of these species, it is recommended that they trawl the internet and visit Google Scholar and Researchgate websites. Poland & Clement (2020) is helpful for identifying the hosts where the infection predates or has inhibited flowering.

Identification for the ordinary recorder not using molecular techniques requires only straightforward microscope work. Fresh material is better to work on but properly preserved specimens (see above for details) are usually adequate. Caespituli and conidia can easily be moved onto a slide with a needle, or transferred on transparent sticky tape such as Scotch Tape or Sellotape: a small piece of tape is pressed onto the leaf, peeled off and wetted in a drop of water on a slide; it is then turned over so that the sticky side with the White Mould is uppermost, replaced submerged in the drop and a coverslip added. Should the tape curl up on being wetted, change to a different brand. Slight variations in method are described in Evans (2013) and Leech (2017). Unstained conidia of White Moulds, and thus the probable presence of *Ramularia*, usually show up much less clearly under the binocular microscope than the conidia and sporangia of Powdery and Downy Mildews and White Blister-rusts. Caespituli show up much better under the binocular microscope when the illumination is from the side rather than from above, as is the case with ring lights. In the absence of such illumination, elevating and viewing the specimen at an angle of 45 degrees can often reveal caespituli previously invisible when viewed directly from above.

Conservation and Habitat Preferences of White Moulds

We have argued elsewhere, for example in Woods *et al*. (2018) about the desirability of actively conserving plant pathogenic fungi. Two of the authors of this account spent much of their careers conserving wildlife, noting the slow progress in developing any specific actions to conserve fungi, one of the most species-diverse kingdoms of the living world. Traditionally

fungi have had to manage on the unproven assumption that if you conserve a good range of habitats you will conserve the fungi. Such wishful assumptions would, if applied to other better-known groups of organisms such as butterflies or birds, produce a scornful response. One of the main drivers behind the production of this account was therefore to try and take the first steps towards a better understanding of the distribution, ecology and conservation requirements of this little-observed group.

So far 81 species of White Moulds have been recorded from Wales. Seven species, plus two varieties, (*R. aplospora*, *R. armoraciae*, *R. collo-cygni*, *R. doronici*, *R. galegae*, *R. major*, *R. purpurascens*, *R. deusta* var. *alba*, *R. valerianae* var. *centranthi*) occur only on non-native hosts. It is by no means clear whether these species should be afforded the same degree of concern as those only or also on native hosts. Even if these fungi colonised their hosts with no obvious assistance from man, the priority to be afforded their conservation remains debatable and efforts might perhaps be better directed to sites within the native range of their hosts. Of the 73 remaining species 20 occur in more than half (i.e. seven or more) vice-counties in Wales and can be considered to be widespread and of no immediate conservation concern. Of the remaining 53 species much uncertainty remains regarding their abundance.

The discovery of a number of new hosts for species both for Wales and Britain in the garden of one of the authors, and of several elsewhere in Wales, strongly hints at significant under-recording in the wider countryside! So far no *Ramularia* species have been found that are confined to any Red Data Book vascular plant in Wales. The following species have, however, only recently been found to be present in the British Isles at a single site in Wales: *Phacellium trifolii* on *Trifolium medium* Zigzag Clover, *R. bresadolae* on *Stachys palustris* Marsh Woundwort and *R. holci-lanati* on *Holcus lanatus* Yorkshire Fog. This latter species was found in two sites in the 1950's but has only been seen recently in one site. All these hosts are considered to be of widespread occurrence in Wales. The *Phacellium* occurred on a roadside bank with no form of statutory protection. *R. bresadolae* is located close to a river that is both an SSSI and European Habitats Directive site. Whilst this might confer some protection, habitat management to favour otters, crayfish and migratory fish, the main reason for the designation, might not protect it. *Impatiens balsamifera* Himalayan Balsam is spreading rapidly in its vicinity, a species known to reduce seed set in Marsh Woundwort, the host of *R. bresadolae*, due to competition for pollinators. *R. holci-lanati* occurs in a damp riverside meadow with no protection. This latter record is of particular interest since the fungus was first reported in or close to this site over 60 years ago. Despite extensive searches it has not been found elsewhere. It provides the most compelling evidence that at least some microfungi can persist in some sites for extended periods and therefore might benefit from site protection measures. Other species of note include *R. rufomaculans* on *Persicaria hydropiper* Water-pepper with two Welsh records but no other British records, *R. chaerophylli* with one Welsh record on *Anthriscus sylvestris* and three English records on this and two other members of the Apiaceae, *R. cynoglossae* with but two British records on *Cynoglossum officinale* Hound's-tongue, one in Wales and one in England, and *R. linariae* on *Linaria vulgaris* Common Toadflax found once in Wales and twice in England. In Wales, of these notable species only *R. rufomaculans* and *R. cynoglossae* occur on statutorily protected sites.

Further thought is also required in establishing priorities for the conservation of unique host/fungus partnerships. Two examples suffice: *Ramularia lamii* occurs as var. *minor* on *Prunella vulgaris* Selfheal and *Stachys arvensis* Field Woundwort in Britain. This variety differs from the more widespread var. *lamii* in small differences in spore size and the species

of host. Whilst there are records from England on *P. vulgaris*, on *S. arvensis* there appear to be records only from Portugal and a single garden in Wales. Moreover *S. arvensis* is considered by Dines in *A Vascular Plant Red Data List for Wales* (2008) to be a “Vulnerable” species in Wales and in the UK it is considered to be “Near Threatened”.

Slightly different issues are raised by *R. cynarae*. The fungus forms conspicuous grey-brown patches on leaves and so is readily identifiable and not easily missed. It occurs in Britain on at least four genera and ten different species in the Tribe Cynareae, the thistles, but is far from common. The only world record so far made on *Cirsium dissectum* Meadow Thistle is from a grassland SSSI in Radnorshire. Given that Wales is probably the world headquarters of *C. dissectum* we might consider this occurrence to be of more than average significance and perhaps weigh management of the site in favour of *C. dissectum* and its fungus.

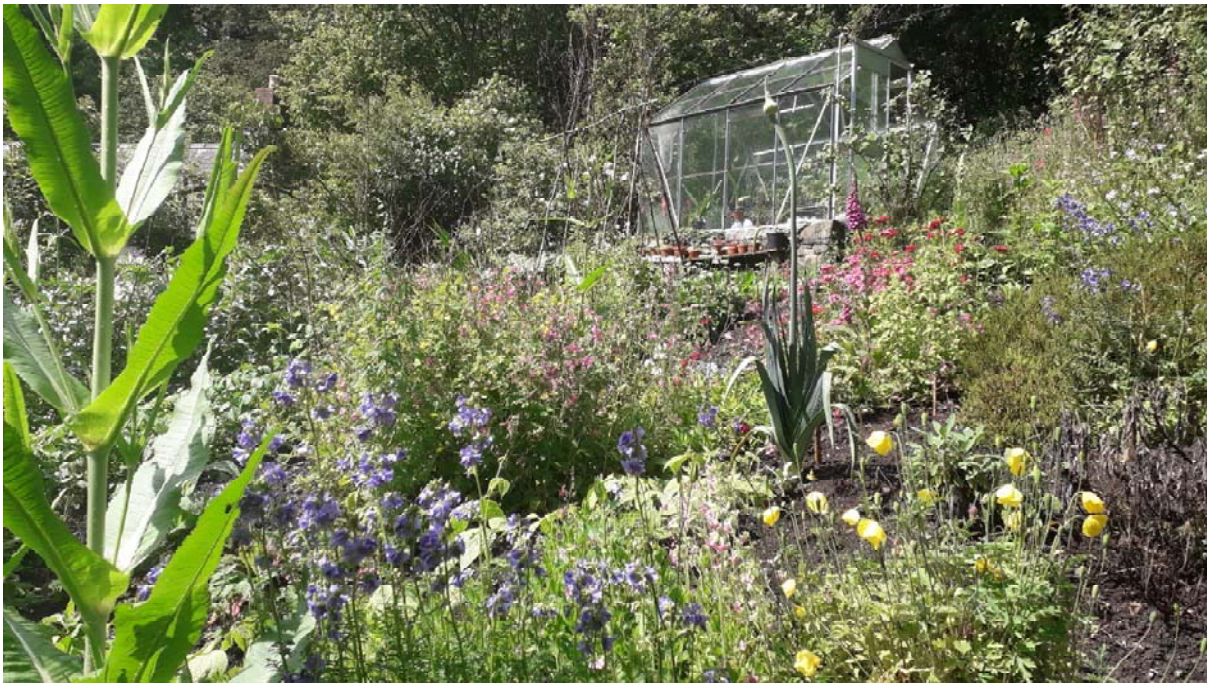
Having established the priorities for conservation action, the actual actions required, beyond the obvious conservation of the host, are much less clear. There is very little information on the life cycles of White Moulds. Most species have an apparently simple life cycle with but one spore stage, the conidium. Without any obvious resting spore stage continuity of green leaves throughout the year may be important. All but two of the twenty commonest *Ramularia* species in Wales live on hosts that retain green leaves throughout the year. A study of *R. collo-cygni* referred to in the species account below noted the ability of the fungus to grow throughout the host plant and to be transmissible from generation to generation of its annual host via seeds. Knots of hyphae form resting structures called sclerotia on the outside of the seed. Studies of the *Ramularia* diseases of Daffodils, Sainfoin and Artichokes in particular have all noted the existence of sclerotia as potential overwintering structures. They may prove to be important in other species. Site management might therefore be geared to ensure a continuity of green foliage for those White Moulds dependant on conidiophore production whilst ensuring the persistence of dead remains of host plants for those species dependant on sclerotia.

Few *Ramularia* species occur on woody hosts. Only three such hosts have been noted from Wales; *Myrica gale* Bog Myrtle, *Sambucus nigra* Elder and *Salix cinerea* Grey Willow. We have noted above the report of *Ramularia* spp. occurring as endophytes in wild *Vitis* species in North America. From observations in Wales the White Mould on *Myrica* seems to behave as if it might be an endophyte. Those on Elder and Grey Willow are so rare even on infected trees, with seldom more than a couple of leaves per tree infected, that it is difficult to believe they arose endophytically unless perhaps they occur more widely as unobserved endophytes that rarely establish leaf lesions and caespituli. If they are not endophytic the conidia must somehow manage to overwinter on the fallen leaves or stick to shoots and buds and then find their way on to fresh leaves in the following spring – in all a tall order but one that, if true, would have to be taken into account in determining site management options. There is clearly much left to be elucidated.

There seems little doubt that the most productive habitats for a diversity of *Ramularia* species are roadside and pathside hedgebanks and verges with over 44 species noted in this habitat in Wales, gardens, churchyards, sand dunes, weedy arable and fallow fields, waste ground and to a lesser extent unimproved pastures and fens. Woodlands, mires and improved pastures are less productive. We do not have enough information about White Moulds in semi-natural or unmodified upland habitats in Wales to comment on the significance of such areas.

Habitats in Wales where good numbers of *Ramularia* species have been recorded:

Churchyards as above left at Gartheli in Cardiganshire and fen meadows as above right near Llanstephan Radnorshire are often rich in *Ramularia* species.



This garden belonging to one of the authors in Llysdinam, North Breconshire had in 2020 twenty-one species of *Ramularia*. The record for a Welsh garden in 2020 appears to be 27 species from one in South Radnorshire.

A species-rich roadside bank near Brynhoffnant in Cardiganshire well worth searching for *Ramularia* species.

Species Accounts

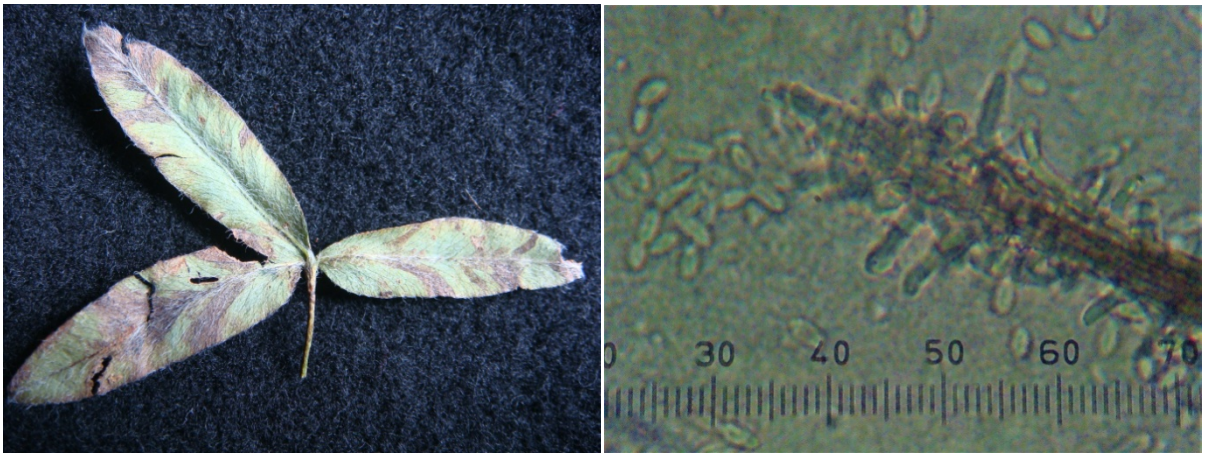
Many of the species are clearly very under-recorded in Britain and Ireland. There is little or no evidence in Wales that the distribution of any of the species departs from that of their host in anything other than rarity. Further recording, though, may well show patterns emerging. In general the numbers of records we give equate to one per tetrad (2 × 2 km square) so that, allowing for the great differences in recording effort in different vice-counties, they may give some indication of frequency of occurrence. Descriptive notes also refer as far as possible to what has been observed in this survey. Altitudes are only given when we have records at 300m or over. Comments on the British and Irish distributions are based on the FRDBI as well as on various other sources; very uneven and incomplete as these are, they do give some indication of distribution and abundance and are the best we have. “Confined to” in the following accounts indicates the fungus’s worldwide, not just Welsh, hosts. For an explanation of the vice-county abbreviations see the Welsh Census Catalogue in Appendix 1. The taxonomy of the White Moulds used here mostly follows Braun (1998) with a few modifications chiefly from Videira *et al*. (2016). Many of these names are at variance with those employed in the old and new versions of the FRDBI. Some synonymy is provided in the species accounts here, and further elucidation of many names used in earlier sources is provided in Appendix 1a below. Host taxonomy mostly follows Stace ed. 4 (2019) for vascular plants and Klenke & Scholler (2015) for other parasitic microfungi. For vice-county abbreviations see Appendix 1 below. Where a scale is shown in a photograph, each division equals 2.5µm.

Phacellium Bonord.

Videira *et al*. (2016), as a result of DNA sequencing, placed one of our Welsh species of *Phacellium*, *P. rufibasis*, in *Ramularia* as *R. rufibasis*. They tentatively synonymised the whole genus with *Ramularia*, but this needs confirming when one of our other species, *P. alborosellum*, the type of the genus (treated as a *Ramularia* below) has been investigated. Our *Phacellium* species are included here in *Ramularia* on the assumption that this will soon be confirmed, except for *P. trifolii* for which no appropriate name in *Ramularia* seems to be available. They are all characterised by having the conidiophores compacted into dense columns known as synnemata.

Phacellium trifolii (Jaap) U. Braun (*Graphium trifolii* Jaap)

Recorded only once, on *Trifolium medium* Zigzag Clover at the end of July 2017 on a grassy bank near Gorsgoch, Cards. Confined to this host species and apparently not previously recorded from Britain. Dark brown vein-delimited spots on the leaves had sparse greyish-white hypophyllous synnematous caespituli; conidia are 6-15 × 2-4µm, obovoid-ellipsoid or oblong, aseptate and mostly formed singly.

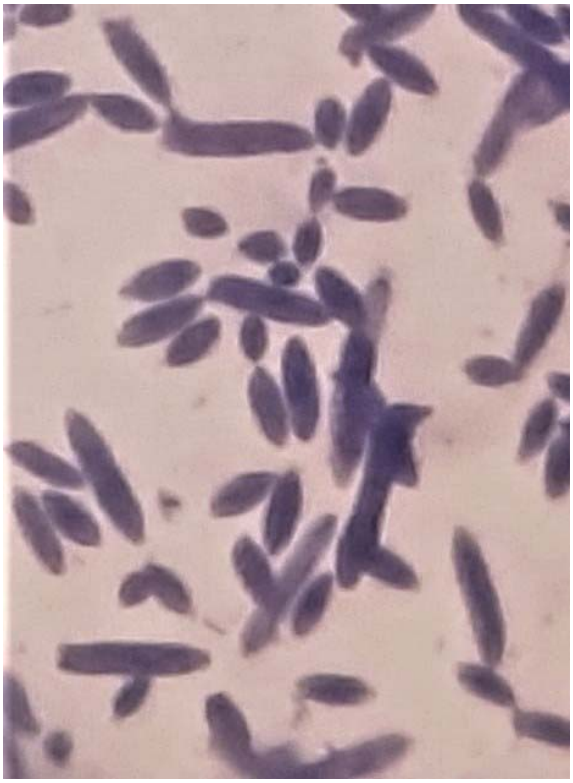


Phacellium trifolii on leaf of *Trifolium medium* above left and above right a synnema and conidia.

Ramularia Unger

Ramularia abscondita (Fautrey & F. Lamb) U. Braun (*Ramularia filaris* var. *lappae* Bres.)

Confined to *Arctium* Burdocks, there are only eight Welsh records. In July and August 2020, it was found on *A. lappa* Greater Burdock on the path to the bird hide at Llanbwchllyn, Rads, whilst on *A. minus* Lesser Burdock in the same vice-county it was found in a roadside hedge bottom at Pentre Caeau, Llandeilo Graban and on the bank of the River Wye below Boughrood. On *A. minus* in Brecs it occurred in a hedge bottom beside an arable field west of Old Gwernyfed, Felindre. In Denbs in October 2016 it was reported on *A. minus* from Alyn Waters Country Park, Gwernsyllt, and on *Arctium* sp. at Maeshafn in 2019. There is a single record from Mold in Flints in 1978 on *A. minus*. There is a scatter of records on the FRDBI (as *R. filaris* and vars.) from southern England and Ireland. With the specific name of “abscondita” which might be translated as “hidden” it is probably more widespread in Wales



than the few records suggest. The pure white densely tufted caespituli can be difficult to locate amongst the off-white spider's-web-like filaments that clothe the underside of the leaves. Fortunately, many caespituli are formed also on the upper leaf surface where their pure whiteness contrasts with the angular dark brown patches of the older infected basal leaves of the host plant; conidia are 5-20 × 2-5µm, obovoid to fusiform, 0-1-septate and formed in chains (see image above stained with cotton blue).

R. abscondita forming brown patches on the leaves of *Arctium minus*

Ramularia acris *Lindr.*

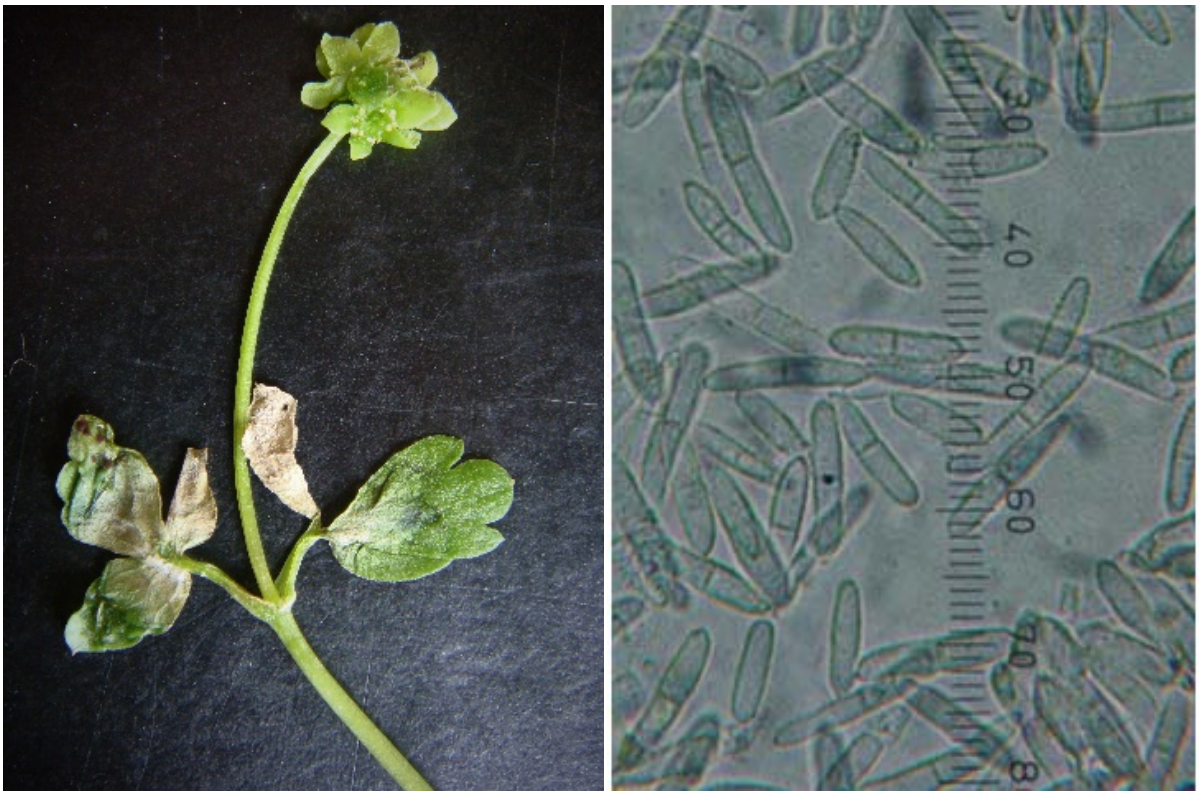
Confined to *Ranunculus* Buttercups, and *R. acris* Field Buttercup is the only British species on which it is said to occur (Braun 1998). It was found on this species in a heavily grazed damp pasture at Ystumtuen, Cards, in October 2020. It was present on the same leaf, though on different leaf-lobes, as *Ramuaria simplex*, the conidia being very conspicuously different. There is a September 1924 record from Fairy Glen, Caerns and a similar one from Flints; the host is unspecified and these two records cannot be accepted without confirmation. Leaf spots are pale yellowish becoming brownish, with amphiphyllous, greyish-white caespituli; conidia are 10-40 × 3-8µm, oblong-obovoid to fusiform, 0-3-septate, formed in chains (see image right). There are several records from England on

Ramularia acris on leaves of *Ranunculus acris*

Ranunculus acris. Records from England with no host specified, as well as one on *Ranunculus repens* Creeping Buttercup, also require confirmation (see comments under *Ramularia didyma*).

Ramularia adoxae P. Karst.

Confined to *Adoxa moschatellina* Moschatel and recorded three times in Cards; once each in Mons and Rads; twice in Flints and there is an 1870s record from Monts by Vize. There are scattered records in England, the great majority in the south. The caespituli are variously

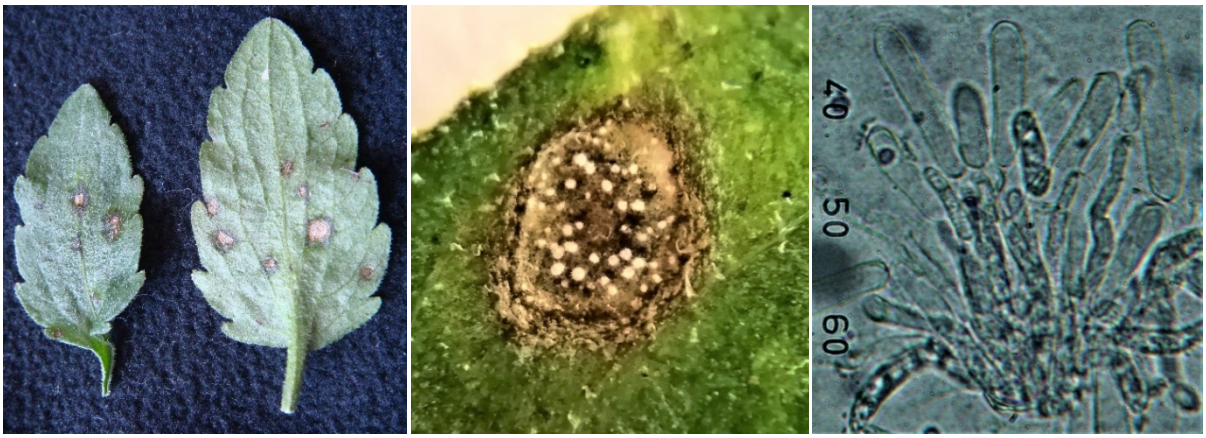


Ramularia adoxae on *Adoxa moschatellina*

hypophyllous and amphiphyllous, on greyish areas of slightly distorted leaves; conidia are 15-50 × 3-6µm, fusiform, 0-2(-3)-septate, formed in chains.

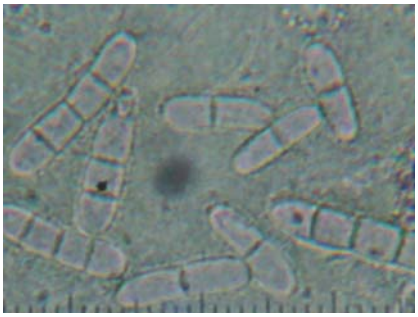
Ramularia agrestis Sacc.

Confined to *Viola* ssp. in the section Melanium Pansies. The only records are from Cards, where var. *agrestis* was recorded on *V. arvensis* Field Pansy twice in arable fields, at Gogerddan and Llan-non in July 2014 and 2020, and on pot plants of *V*. ×*wittrockiana* (*V*. "hybrida") Garden Pansy at Eglwys-fach and Aberystwyth in February and June 2019. There are records on both these hosts from England and Ireland with additional records on *V. tricolor* Wild pansy from England and Scotland. Leaf spots are yellowish to greyish, with fairly dense greyish caespituli; conidia are 10-40 × 4-10µm, obovoid-ellipsoid to fusiform, 0-1(-2)-septate, formed in chains.



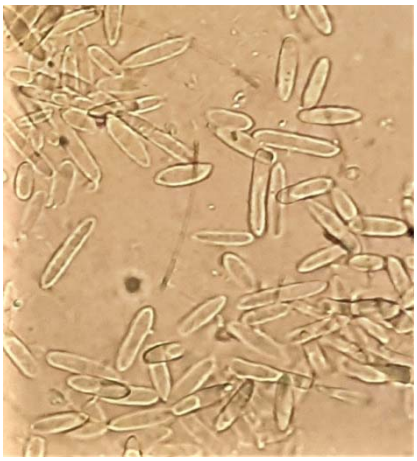
Ramularia agrestis var. *agrestis* on *Viola arvensis*.

Var. ***deflectens*** (Bres.) U. Braun, with longer conidiophores 20-250µm (as against 20-100µm) and 0-4-septate conidia (see image right), was found, also on *Viola arvensis*, among burnt Gorse on Pendinas, Aberystwyth, in mid-May 2016 and regularly thereafter. This variety is recorded on this host and *V*. ×*wittrockiana* in three sites in England.



Ramularia ajugae (Niessl) Sacc.

Confined to *Ajuga* Bugles and recorded in Wales, on *A. reptans* Bugle in six vice-counties. In 1973 it was noted in Glam. In late May 2020 it was found on a deeply-shaded colony in willow carr near Llysdinam and in June and September 2020 in a shaded garden nearby and on the edge of a forestry track near Llanafan-fawr, all in Brecs. There is a further record on a very remote Bugle colony on streamside rocks near Claerddu, Cards in early September 2014, at 425m altitude and there are four records from Caerns, two from Flints and one from Angl.



There are scattered records throughout the rest of Britain and Ireland. The conspicuous leaf spots are yellowish to greyish (see images below) with purplish margins in the Cards locality, whilst in Brecs in shade there was no differently coloured margin to the clay-buff-coloured colonies. The mostly hypophyllous caespituli are greyish-white; conidia (see image on previous page) are 5-30 × 2-5µm, obovoid-ellipsoid to fusiform, 0-1-septate and formed in chains.

Ramularia ajugae on *Ajuga reptans*

Ramularia alborosella (Desm.) Gjaerum (*Phacellium alborosellum* (Desm.) U. Braun)

Confined to *Cerastium* spp. Mouse-ears. Recorded in Wales on *C. fontanum* subsp. *vulgare* Common Mouse-ear, once in Mons, twice from Brecs in May and July 2020, once from Angl in May 2006 and from Cards where it has been found 17 times, up to 300m altitude, from late March to early November, throughout the county. It has been recorded from Cards once on *C. glomeratum* Sticky Mouse-ear. There are scattered records throughout the rest of Britain and Ireland. The synnematous conidiophores are very distinctive (see image right) and are mostly hypophyllous, emerging from the stomata. The yellowish leaf spots often cover the whole leaf; conidia are 10-40 × 2-10µm, obovoid-ellipsoid to oblong, 0-1(-2)-septate and formed singly.

Ramularia alborosella on *Cerastium fontanum*

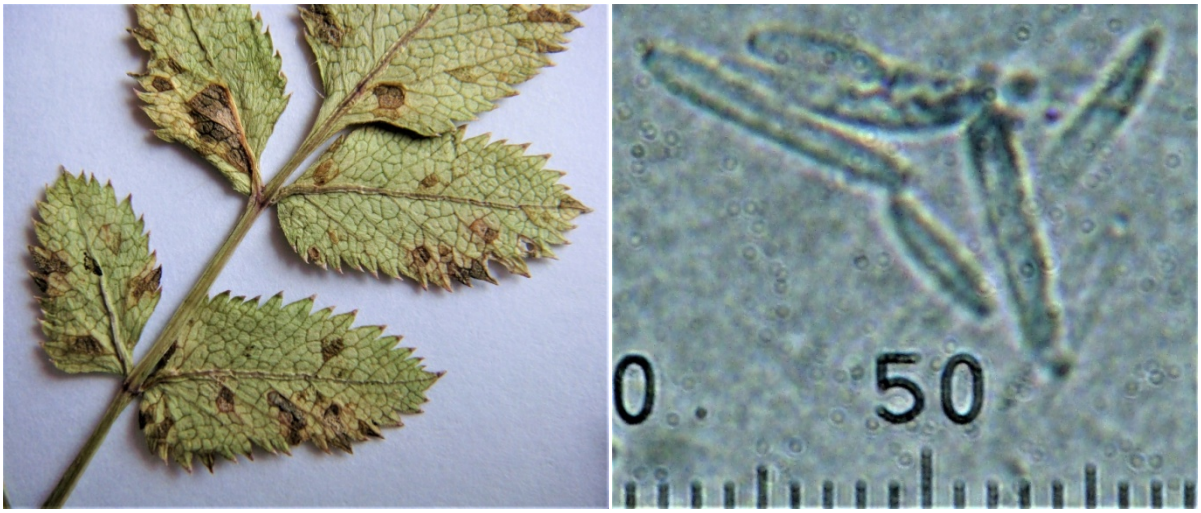
Ramularia aplospora Speg.

Confined to *Alchemilla* Lady's-mantles (excluding section Alpinae) and *Aphanes* Parsley-pierts. All twelve Welsh records, three from Brecs, four from Rads, two from Carms, four from Cards and one each from Monts, Mer and Caerns are on *Alchemilla mollis* Soft Lady's-mantle, mostly in gardens but also on road verges, from late May to August. The six other records on this host from England and Scotland also probably represent under-recording. It has been recorded (as *R. haplospora*) from East Norfolk, England, on *Aphanes arvensis*. The pale spots on the already yellowish-green, very hairy leaves of the host are initially difficult to detect, and it is probably very under-recorded, but later in the season angular brown spots betray its presence on the older leaves that have become hidden by later leaf growth. The whitish caespituli are hypophyllous; according to Braun (1998) and Videira *et al*. (2016) conidia are 5-16 × 3-11µm, subglobose to obovoid-ellipsoid, aseptate, usually formed in short chains (see image right). The teleomorph is possibly *Mycosphaerella alchemillae*. *R. alpina* (C. Massal.) Nannf., confined to *Alchemilla* section Alpinae, has been recorded on *A. alpina* in Scotland and Ireland; it differs chiefly in having the conidia 9-25(-28)µm wide, sometimes with 1(-2) septa and usually formed singly. Videira *et al*. (2016) confusingly say that *R. aplospora* is the only *Ramularia* on *Alchemilla*. The three Cards collections had the conidia 7-25µm wide and 0(-1)-septate, 6-20µm wide and aseptate and 6-20µm wide and 0(-1)-septate. Their identity, and the relationship between the two species needs further investigation.

Ramularia aplospora on leaves of *Alchemilla mollis*

Ramularia archangelicae Lindr. (*Ramularia angelicae* Höhn.)

Confined to *Angelica* Angelicas and recorded in Wales so far only from Cards, on *A. sylvestris* Wild Angelica in an upland flush at 350m altitude on Craig Clogan, Cwm Berwyn, in mid-July 2015, and in a rhos pasture at Rhos Llawr-cwrt in mid-May 2017. There are only six other British and Irish records. The greyish leaf spots are small but conspicuous, the caespituli are greyish-white and mostly hypophyllous and the host common, so *R. archangelicae* is probably genuinely rare. Conidia are 10-50 × 2-6µm, obovoid-ellipsoid to cylindrical, 0-1(-2)-septate and formed in chains.



Ramularia archangelicae on *Angelica sylvestris*

["*Ramularia ari*"

There are many records from Wales and the rest of Britain on *Arum* Lords-and-Ladies under this name, but no species of *Ramularia* is known on this genus and all such records appear to be referable to *Spermosporina aricola*, *Mycocentrospora acerina* or *Entylomella aricola* (Braun 1995, 1998).]

Ramularia armoraciae Fuckel (*Ramularia cochleariae* Cooke, *R. barbareae* Peck)

Confined to various genera of the Brassicaceae Cabbage family. There are September 1988 and August 2020 records from Caerns, from Mold, Flints post-1976 and from Red Wharf Bay, Angl on *Armoracia rusticana* Horse-radish. It is found annually throughout the year on *Barbarea intermedia* Medium-flowered Winter-cress on the verges of the Maesyrafon car park in Aberystwyth, Cards. There are scattered records throughout Britain and Ireland on these genera, though mostly on *Armoracia*, and records from Scotland and Ireland on *Cochlearia officinalis* Common Scurvygrass. Though a well-known horticultural problem elsewhere in the world, it does not seem to cause significant losses to Horse-radish crops in Britain. There are three records from Welsh gardens on *Hesperis matronalis* Dame's-violet, a host not reported elsewhere in Britain, from near Llanwrthwl in Brecs in June 2020, at Old Penywrlodd near Clyro, Rads in September, 2020 and at Ty Mawr Mill, Llysdinam, Brecs in October 2020. The small, pale to brown leaf spots with dense, greyish-white sometimes amphiphyllous caespituli are soon eaten out; conidia are 30 × 2-5µm, obovoid-ellipsoid to fusiform, 0-1-septate and formed in chains.

Ramularia armoraciae on *Hesperis matronalis*. Top left and centre show white caespituli on the underside of leaves in October. Bottom left and right show the top and bottom of a leaf with lesions in June.

Ramularia asplenii Jaap

Confined to *Asplenium* Spleenworts. Widespread throughout Cards on *A. ruta-muraria* Wall-rue, but not noticed until 2016; 19 records were made from mid-March to mid-June 2017, all where the host grew in crevices of old mortared walls (its only habitat in the county), but it was not found in 2018, 2019 or 2020. There are in addition records from the stone walls of a farmyard at Pen y Bont, Llysdinam, Brecs in June 2020; the old River Ithon Bridge south of Newbridge on Wye in June and October 2020 and on garden walls, Presteign, Rads in October 2020; from the slate walls of a roadside entrance near Abercegir, Monts, in June 2020; and from Holywell, Flints in June 2017. There are no records in the FRDBI, but Braun (1998) does record it for Britain and it must presumably be widespread. The dense caespituli are whitish or greyish and usually epiphyllous on the segments of dead or dying fronds, showing well against the rich brown of these fronds. In one case it was hypophyllous, and in another it was amphiphyllous as well as on the stipes. Conidia are 6-27 × 2-5µm, narrowly ellipsoid to fusiform, 0-1-septate, formed in chains. Occasionally the rust *Milesina murariae* is on the same fronds but is usually hypophyllous. *R. asplenii* has not been seen at other times of the year. The Llysdinam record above was only confirmed following incubation of discoloured fronds in a damp chamber. The other species on *Asplenium* is *R. scolopendrii*, but this is confined to *A. scolopendrium*.

Ramularia asplenii on *Asplenium ruta-muraria*

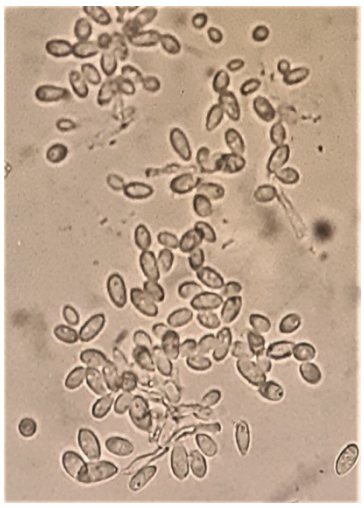
Ramularia beticola Fautrey & Lambotte

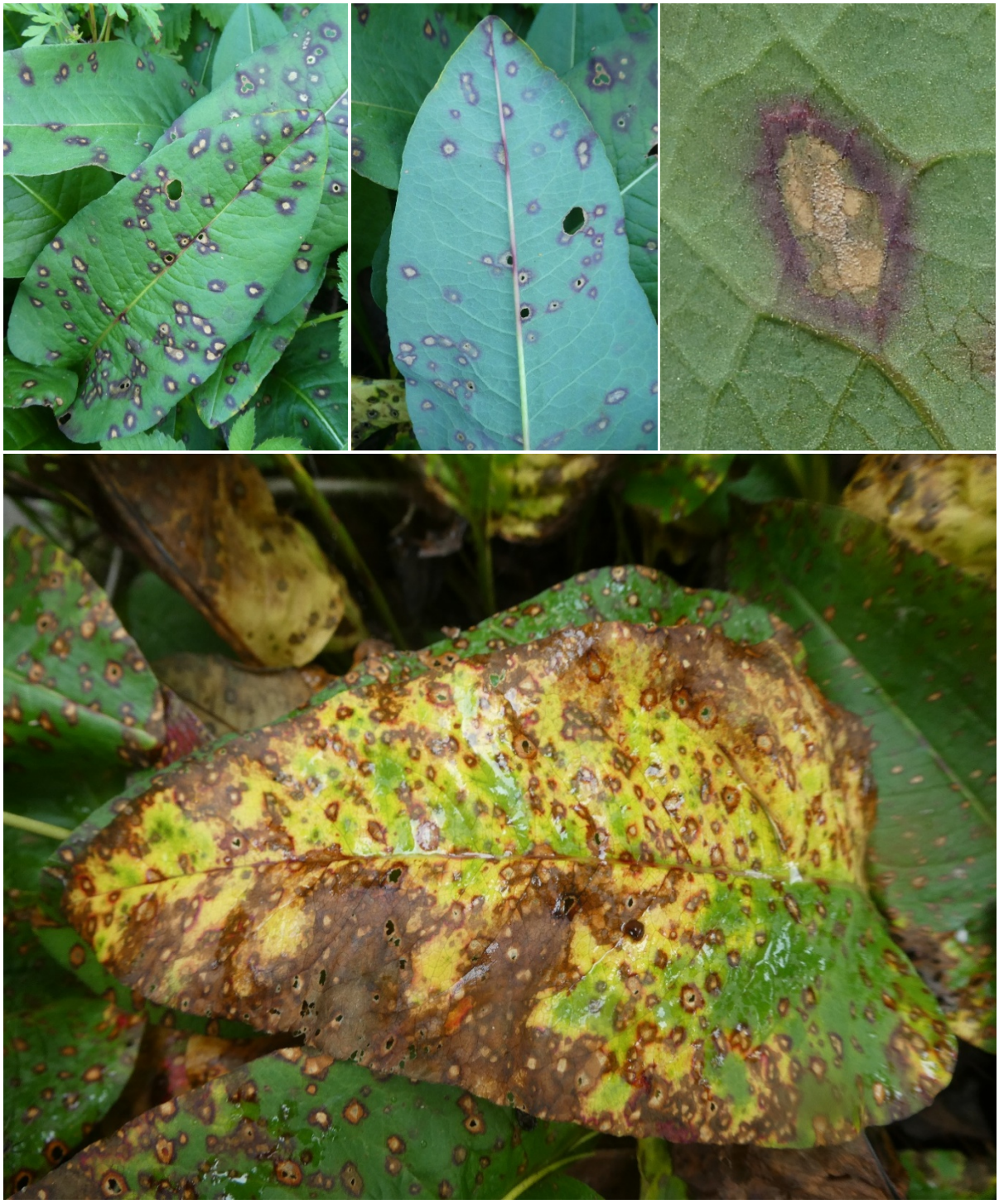
Confined to *Beta* Beets. Recorded in Wales on *Beta vulgaris* ssp. *maritima* from Point of Ayr, Flints. Eight other records are from vegetable beds, on *Beta vulgaris* ssp. *cicla* var. *cicla* Spinach Beet at Cwmdu, in April 2020 and on a leaf beet in a swede field at Ty Mawr, Llys-dinam, November 2020, both in Brecs and at Felinheli in Caerns in July 2020; on var. *flavescens* Swiss Chard, in May 2020 from Glasbury, Rads; in April 2017 at Eglwys-fach, Cards and in July 2019 at the Centre for Alternative Technology, Monts. In September 2020 it occurred on ssp. *vulgaris* Beetroot in a garden in Glasbury, Rads, and on a field crop Henfaes, Aber in Caerns in July 2007. There are few records of this species from England and Ireland, but as it is a well-known disease of Fodder and Sugar Beet crops it must be fairly widespread. Leaf spots usually develop on the older leaves and are pale brown, later darkening and with pale greyish or whitish centres. Caespituli are greyish-white; conidia are 6-30 × 2-6µm, obovoid-ellipsoid to fusiform, 0-1-septate, formed in chains. The infected leaves then become yellowish and die, but the disease is not usually very serious in Beet crops in Britain, unlike the case in Nordic countries.

Ramularia beticola on *Beta vulgaris* ssp. *cicla*

Ramularia bistortae Fuckel

Confined to *Bistorta* Bistorts, and recorded on *Bistorta officinalis* Common Bistort in churchyards, gardens and on road and track verges. In Cards it has been recorded a dozen times from the end of April to mid-June. Also noted once in Brecs and twice in Rads in June 2020, once in Pembs in 1987 and twice in Caerns in late June 2013 and mid-May 2020. There are widespread records in Britain and Ireland. The very conspicuous yellowish-brown leaf spots usually turn purplish, particularly around the edges, and the whitish caespituli are hypophyllous or occasionally amphiphyllous; conidia are 5-22 × 3-8µm, obovoid to oblong- obovoid, aseptate and are usually formed singly (see image right).





Ramularia bistortae on leaves of *Bistorta officinalis*

Ramularia bresadolae U. Braun

Confined to *Stachys* Woundworts. The only British record was made in July 2020 on *Stachys palustris* Marsh Woundwort (the one European species on which it occurs) from a marshy hollow in a pasture beside the Afon Cammarch near Beulah, Brecs (image opposite). Leaf spots are initially indistinct and from above yellowish. Infected patches later turn brown. Caespituli are hypophyllous, forming extensive pinkish-purple patches, paler around the edges, with greyish hypophyllous conidiophores; conidia are 10-30 × 4-8µm, obovoid to

fusiform, aseptate and formed in chains. The nearest known continental population is in Germany (Braun 1998).

Ramularia bresadolae on *Stachys palustris*

Ramularia caduca (W. Voss) U. Braun (*Ramularia circaeae* Allesch.)

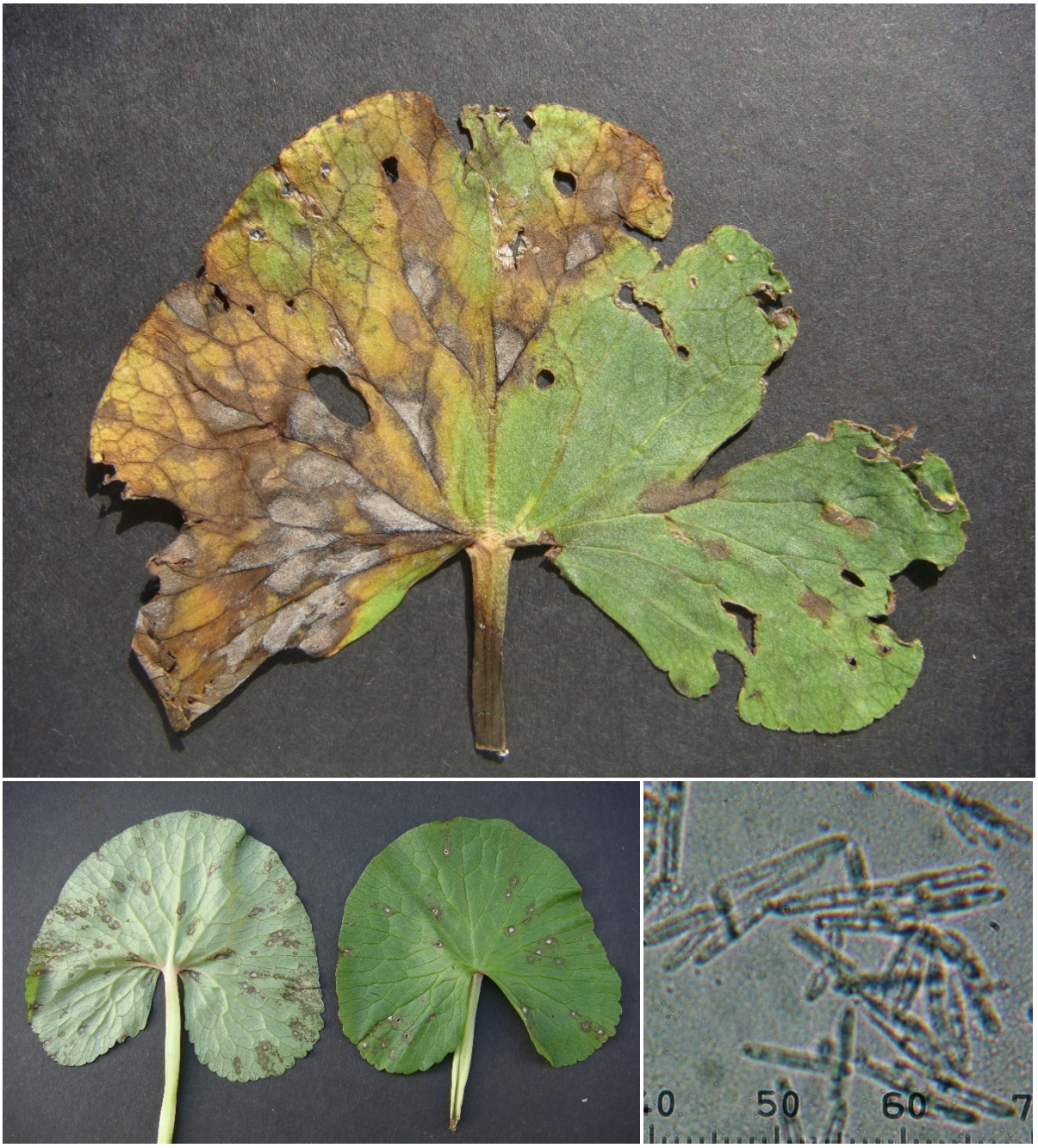
Confined to *Circaea* Enchanter's-nightshades. It is recorded from Wales only on *C. lutetiana* Enchanter's-nightshade, from mid-May to mid-September in the lowlands, chiefly in woodlands and on road and path verges. There is one record from Mons, two from Glam,

three each from Brecs and Rads, two from Carms, three from Pembs, seven from Cards, one from Mer, three from Caerns, one from Denbs, and two each from Flints and Angl. There are records throughout Britain and Ireland. Leaf spots are mostly obscure and brownish, and the greyish caespituli are hypophyllous and inconspicuous, so it is doubtless generally under-recorded; conidia are 10-25 × 2-5µm, narrowly obovoid-ellipsoid to fusiform, 0-1-septate, formed in chains. The material from a Brecs site was perhaps unusual in occurring on old near-basal leaves that had turned entirely yellow except for the brown spots of the *Ramularia*, each of which was outlined in a narrow green rim, rendering them highly visible.

Ramularia caduca on *Circaea lutetiana* leaves in summer above left and autumn above right

Ramularia calthae Lindr.

Confined to *Caltha* Marsh-marigolds, and recorded in Cards from 16 sites on *C. palustris* Marsh-marigold in fens, mires, wet woodland and pond and stream margins, from mid-May to late June, up to 305m altitude at Llyn Eiddwen. There are three records from Pembs in late May 1987, two records from Rads in a wet pasture and a fen meadow in June and July, five from Caerns on stream- and riversides from mid-April to mid-July and two from Cors Bodelio fen, Angl in July 2007 and August 2020. It is widely recorded throughout Britain and Ireland, occasionally as *R. didyma*. Sometimes only one leaf on a plant or in a whole colony is infected, the pale to dark brown, well-defined spots are very conspicuous, and the whitish caespituli are mostly hypophyllous; conidia are 6-40 × 2-4.5µm (averaging 2-3µm wide), narrowly fusiform, 0-1-septate and formed in chains. Formerly included in *R. didyma*, which differs chiefly in its wider conidia averaging 3-5 µm in width.



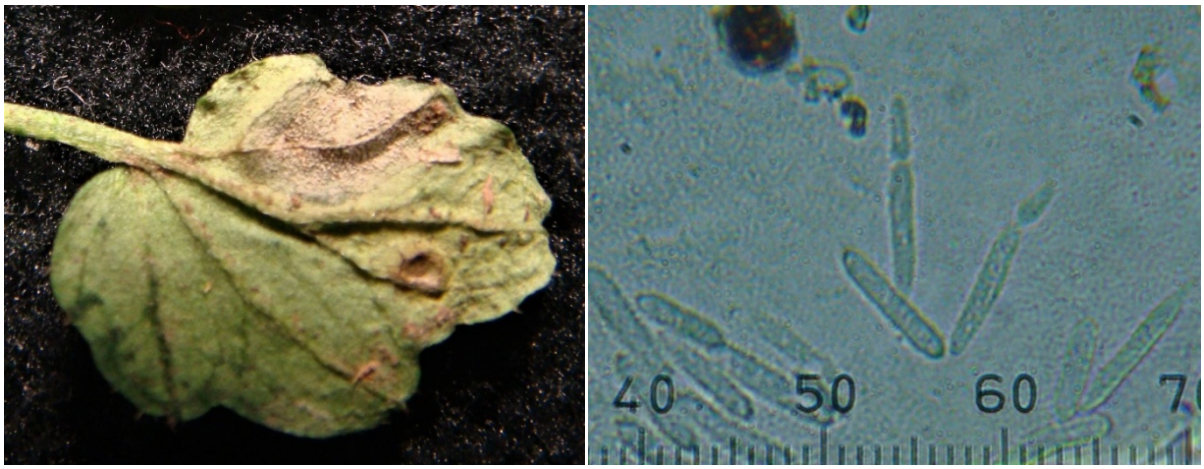
Ramularia calthae on *Caltha palustris*.

[*Ramularia campanulae-latifoliae* Allesch.

Confined to *Campanula* Bellflowers and *Sergia* Sergias and reported on *Campanula latifolia* Giant Bellflower from Ayrshire in Scotland, in 1913. *R. macrospora* Fresen., confined to various genera on the Campanulaceae Bellflower family, the only other species on hosts in this family in Britain and Ireland, has been recorded on *C. persicifolia* Peach-leaved Bellflower from Ireland, on *C. rapunculoides* Creeping Bellflower with no locality given, on an unspecified host from Cornwall, and on *C. glomerata* Clustered Bellflower from Cambridgeshire. *R. campanulae-latifoliae* has narrower conidia 2 × 5µm wide, while *R. macrospora* has wider conidia 3-10µm wide.]

Ramularia cardamines Syd.

Confined to *Cardamine* Bitter-cresses, and recorded three times on *C. flexuosa* Wavy Bitter-cress in Cards, on a shaded, sandy riverbank at Trawsgoed, on a roadside bank at Tyncelyn, and on a damp, shaded road verge at Ystrad Einion, in mid-March, the beginning of May and the end of November respectively, and there is a 1960 record from Monts. The record on *Cardamine pratensis* Cuckooflower from Mold, Flints in 1978 appears to be the only British record on this host. On unspecified species of *Cardamine* there are 1988 records from Caerns and Angl. There are scattered records through Britain and Ireland on several species of *Cardamine*. The leaf spots are small and yellowish or pale brown and the hypophyllous caespituli are whitish; conidia are 10-30 × 2-5µm, narrowly obovoid to fusiform and formed in chains.



Ramularia cardamines on *Cardamine flexuosa*

Ramularia carneola (Sacc.) Nannf. (*R. scrophulariae* Fautrey & Roum.)

Confined to *Scrophularia* Figworts in Wales from May to October, in the very wide range of habitats occupied by the host, and recorded eleven times on *S. nodosa* Common Figwort in Cards, with additional single records from Mons, Glam, Brecs, Denbs and Flints, two from Rads, Caerns and Angl, and three from Carms and Mer. There are six Welsh records on *S. auriculata* Water Figwort, from a flower bed in Llandrindod Wells, Rads in August 2020; from Bryn-ceirch, Carms in July 2019, from beside the Montgomery Canal below Bank Lock, north of Welshpool, Monts in August 2020; and three from a garden and verges at Y Felinheli, Caerns in July 2007 and May and June 2020. There are only a few records from England, three of them on *S. auriculata*, and it is probably fairly rare in Wales too. The conspicuous leaf spots change from pale yellowish- or whitish-green to purplish (like those caused by many other agencies on this genus), and the hypophyllous caespituli are whitish; conidia are 5-30 × 2-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1(-2)-septate and formed in chains.

Ramularia carneola on *Scrophularia nodosa*

Ramularia carneola on *Scrophularia auriculata*

Ramularia cerinthes Hollós

Confined to various genera of the Boraginaceae Borage family. The only Welsh records for what is probably a very overlooked fungus are on *Myosotis sylvatica* Wood Forget-me-not in gardens and roadsides. In 2020 it was recorded in Rads in September at Glasbury and in October below Cefn Cenarth near Pant y Dwr, in Knighton and in Newbridge on Wye, and in Cards at Ynys-hir. Elsewhere in Britain there are only two records, on the same host from Surrey in 2000, and on *Myosotis arvensis* Field Forget-me-not in East Norfolk in 2019. Leaf spots are yellowish becoming blackish and sometimes with a yellowish margin, and the often amphigenous caespituli are greyish-white and very inconspicuous; conidia are 5-25 × 2-6µm (sometimes longer and narrower in European material), narrowly ellipsoid-ovoid to fusiform,

Ramularia cerinthes on leaves of *Myosotis sylvatica*

0(-1)-septate, formed in chains (see image above right). Material from Europe, judging from the illustrations and descriptions in Braun (1998) and in Wołczańska (2005) (who gives it only on *Myosotis scorpioides* Water Forget-me-not), has generally longer and narrower, and more often septate, conidia, and the possibility that ours could be a different species, *R. myosotidis* Vasil'jevskij, requires further investigation.

Ramularia chaerophylli Ferraris (*Ramularia anthrisci* Höhn.)

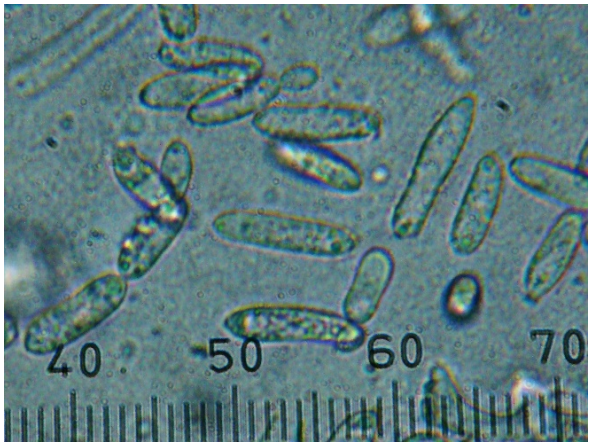
Confined to Apiaceae Carrot family subfamily Apioideae. The only Welsh record is on *Anthriscus sylvestris* Cow Parsley in mid-April 2011 on the riverbank at Cenarth, Cards. It is recorded from England on this host, and there are records from Surrey on *Torilis japonica* Upright Hedge-parsley and *Chaerophyllum temulum* Rough Chervil, so it may well be uncommon. On our plant the leaf spots were obscure, and the caespituli hypophyllous; conidia are 5-30 × 2-5µm, 0-1(-2)-septate, narrowly obovoid to fusiform and formed in chains.

Ramularia chamaedryos (Lindr.) Gunnerb.

Confined to *Veronica chamaedrys* Germander Speedwell according to Braun (1998). Recorded in Wales from March to September, from woodlands, grasslands, roadside banks and verges and a quarry. There is one record each from Mons, Brecs and Carms, three from Rads and Cards, one from Mer and two from Flints. There are only half a dozen records from England. The leaf spots are greyish to dark brown, with inconspicuous greyish-whitish hypophyllous caespituli. The separation of species parasitizing *Veronica* in Britain (*R. beccabungae*, *R. veronicae* and *R. coccinea* besides *R. chamaedryos*) can be difficult and confusing. Whereas *R. chamaedryos* has conidia 8-20 × 2-7µm, narrowly obovoid, aseptate and formed in chains, *R. coccinea* has the caespituli becoming pink or reddish and the conidia mostly septate, *R. veronicae* has the caespituli greyish-white and the conidia mostly septate, and *R. beccabungae* is the only species on *Veronica anagallis-aquatica* Blue Water-speedwell and *V. beccabunga* Brooklime. The many records of *Ramularia veronicae* on *Veronica chamaedrys* will be referable either to *R. chamaedryos* or to *R. coccinea*, so both

Ramularia chamaedryos on *Veronica chamaedrys*

may well be commoner than the records indicate. A *Ramularia* found on *Veronica montana* Wood Speedwell in August 2020 beside a forest track in the Cych valley, Pembs and on a roadside verge near Pennal, Mer with aseptate conidia might also be this species. Videira *et al*. (2016) suggest that the species on *Veronica* may not be distinct and are possibly a single species, in which case *R. veronicae* would be the earliest name.



Ramularia chamaenerii Rostr.

Confined to *Chamaenerion* Rosebay Willowherbs, and all our records are on *C. angustifolium* Rosebay Willowherb. There is an unlocalised 1972 record from Wales in the FRDBI and one from Alyn Waters Country Park, Gwersyllt, Denbs in October 2016. It is also recorded from several places in England and Scotland, mostly as *R. montana*. The small brownish or reddish spots have mostly hypophyllous greyish-white caespituli with colourless conidiophores; conidia are 10-45 × 5-15µm, obovoid or obovoid-oblong, 0-1-septate and formed singly. *Phaeoramularia punctiformis* (Schltdl.) U. Braun was recorded from the Loggerheads in Denbs in 1972 on *C. angustifolium* and differs chiefly in having pigmented, yellowish to brownish conidiophores and conidia 0-4-septate.

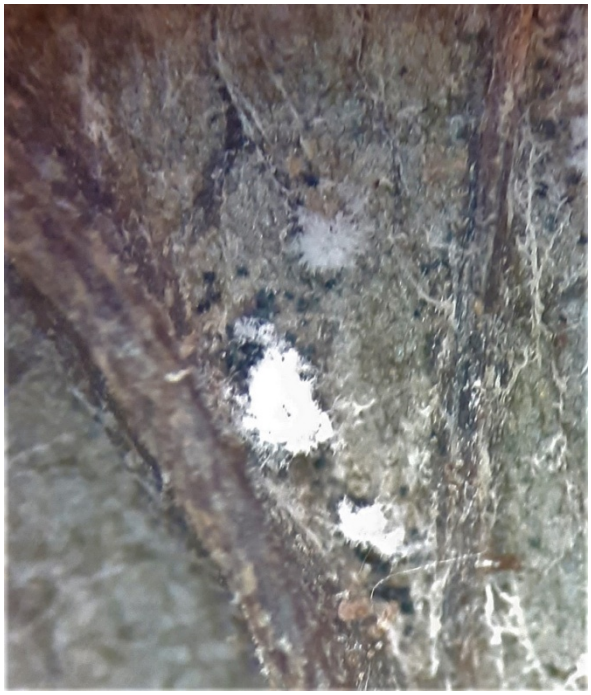
Ramularia coccinea (Fuckel) Vestergr.

Confined to *Veronica* Speedwells, and recorded five times on *V. chamaedrys* Germander Speedwell, all year round, in Cards from a pathside bank in woodland at Aberaeron, a wooded stream ravine at Cwmrhaiadr, on a road verge near Cellan at 320m altitude, and on roadside banks near Mydroilyn and at Glandyfi. There are also records on *V. montana* Wood Speedwell from mixed woodland and a green lane at Garn Ganol, Crwbin, Carms in May and July 2019. The only other records are on *V. chamaedrys* from South Hampshire in 2004, and on *Veronica austriaca* Large Speedwell from East Norfolk in 2019. Leaf spots are very similar to those of *R. chamaedryos*, but the conidiophores of *R. coccinea* are pinkish to reddish-brown as opposed to greyish-white; conidia are 10-28 × 2-8µm, obovoid or obovoid-oblong, 0-1-septate and formed in chains.

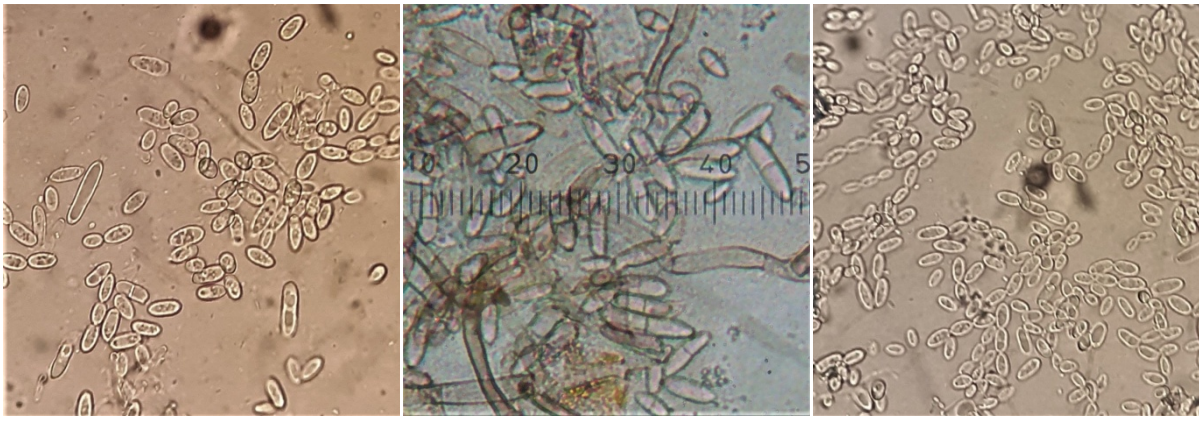
Ramularia coleosporii Sacc.

Hyperparasitic on colonies of the rust genera *Chrysomyxa* and *Coleosporium*. A *Ramularia* growing in very small quantity on the rust *Puccinia* (*Miyagia*) *pseudosphaeria* on *Sonchus arvensis* Perennial Sowthistle on a trackside by the Ynys-las boatyard, Cards in July 2017 had all the characters of *R. coleosporii*. The mostly 1-septate conidia were 10-35 × 4-8µm, too wide to be *R. inaequalis* which is the species normally on *Sonchus arvensis* in Europe (it has not been found though on this host in Britain). In view of the minute quantity, and the fact that *R. coleosporii* is not said by Braun (1998) to occur on *P. pseudosphaeria*, the record must

remain uncertain. On incubating leaves of *Petasites hybridus* Butterbur from beside the Neath Canal NE of Resolven, Glam in September 2020 to check for *R. major*, a number of sori of the rust fungus *Coleosporium tussilaginis* and another unidentified parasitic fungus on the leaves were found to support dense white caespituli bearing many small mostly aseptate conidia, mostly 12 × 3µm. Whilst the spore size is within the dimensions given by Braun (1998) for *R. coleosporii* he illustrates a much wider diversity of size, shape and septation than was present in the Neath Canal material. Incubating leaves of *Petasites japonicus* subsp. *giganteus* Giant Butterbur that were heavily infected with *Coleosporium tussilaginis* from beside the Afon Irfon in Builth Wells, Brecs in a damp chamber in September 2020 resulted in the discovery of a very few caespituli formed on or close to hypophyllous sori of *Coleosporium*. Conidia closely resembled those found on *P. hybridus* leaves though were slightly wider, being on average 13 × 5µm. Further material is required to confirm the presence of this fungus in Wales. There are only two records in the FRDBI, one on *Coleosporium tussilaginis* from North Hampshire in 2003, and one from Dovedale, Derbyshire in 1935 with no host given.



Caespituli of probable *R. coleosporii* on *Petasites hybridus* leaf

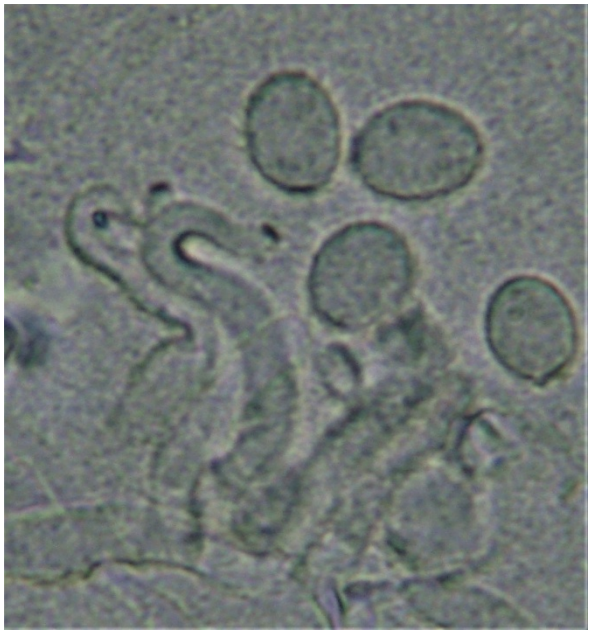


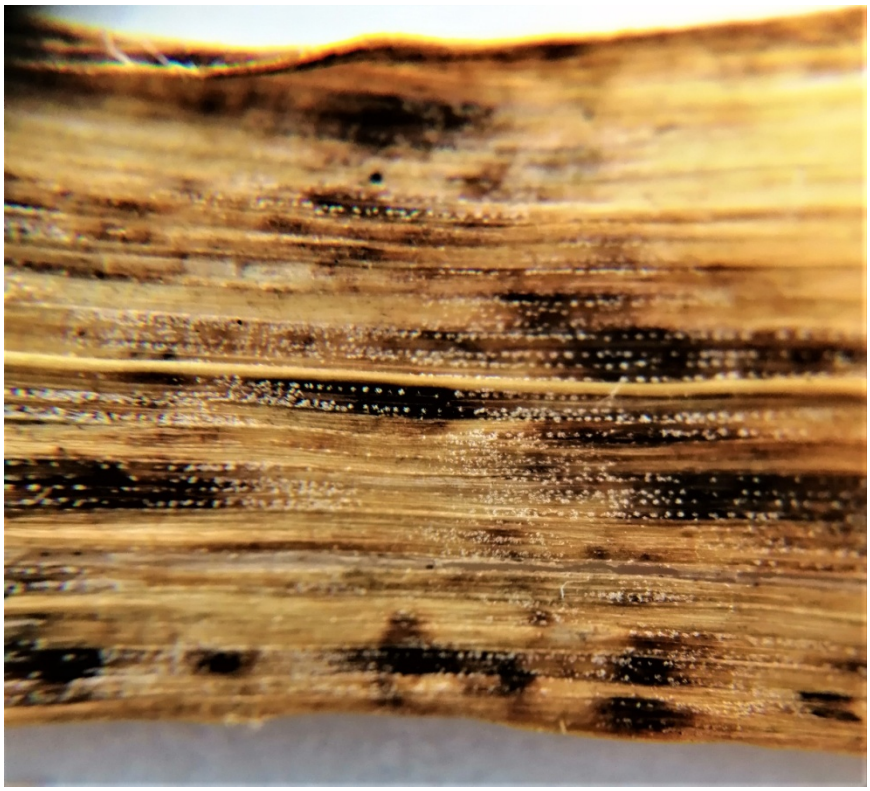
Possible *Ramularia coleosporii* conidia. Above left from *Coleosporium* sorus on *Petasites japonicus* leaf, Builth Wells, Breconshire. Centre from *Puccinia pseudosphaeria* on *Sonchus arvensis* leaf, Ynys-las, Cardiganshire and above right from *Coleosporium* on *Petasites hybridus* leaf near Resolven, Glamorgan.

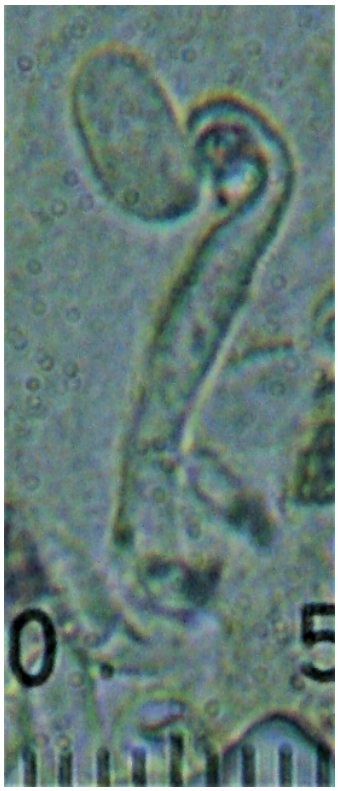
Ramularia collo-cygni B. Sutton & J.M. Waller

Confined to various genera of Poaceae Grasses, but in Europe chiefly on *Hordeum* spp. Barley and *Glyceria maxima* Reed Sweet-grass. First recorded, as *Ophiocladium hordei* Cav. in Italy in 1893, and then in the next century or so it spread throughout the Barley-

growing parts of Europe. Elsewhere it occurs in many parts of the Americas, and in New South Wales and New Zealand. First recorded in Scotland in 1998, since then it has become an increasingly serious disease in Britain and Ireland. It has recently shown a remarkably rapid ability to evolve resistance to the main fungicides, and in Britain is now believed to cause on average c.£10 million losses per year, with average losses of 0.5 tons per hectare (Havis *et al*. 2015, Pasture 2018). Actual records are elusive (the species does not even appear in the FRDBI), but it has been moving southwards and is now widespread in Britain including Wales, and in Ireland. Detailed records from Wales are, however, sparse. In 2020 the disease was present in *H. distichon* Two-rowed Barley on the Gower in Glam, on volunteer
plants at the edge of a maize field near Manordeilo Church, Pembs in August 2020 and it was found on this host in a crop at Llanrhystud, Cards in the same month. Contacts with agronomists in Wales confirm its presence in addition in both Mons and Brecs. Among many other accounts, see Oxley *et al*. (n.d.) for numerous photos and much useful information. Infection in the seeds leads to systemic infection in the young plants, but visible symptoms in the





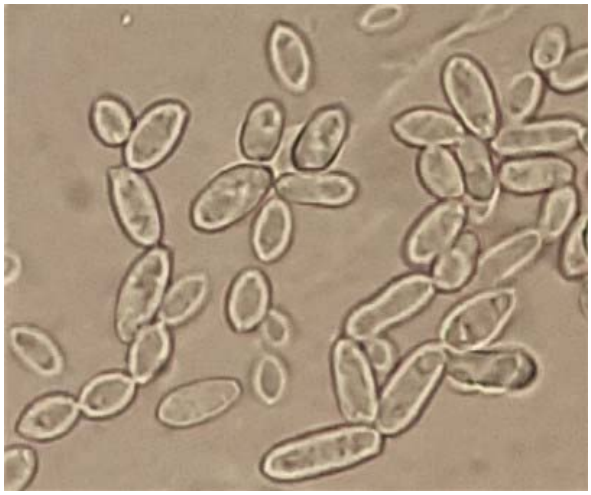


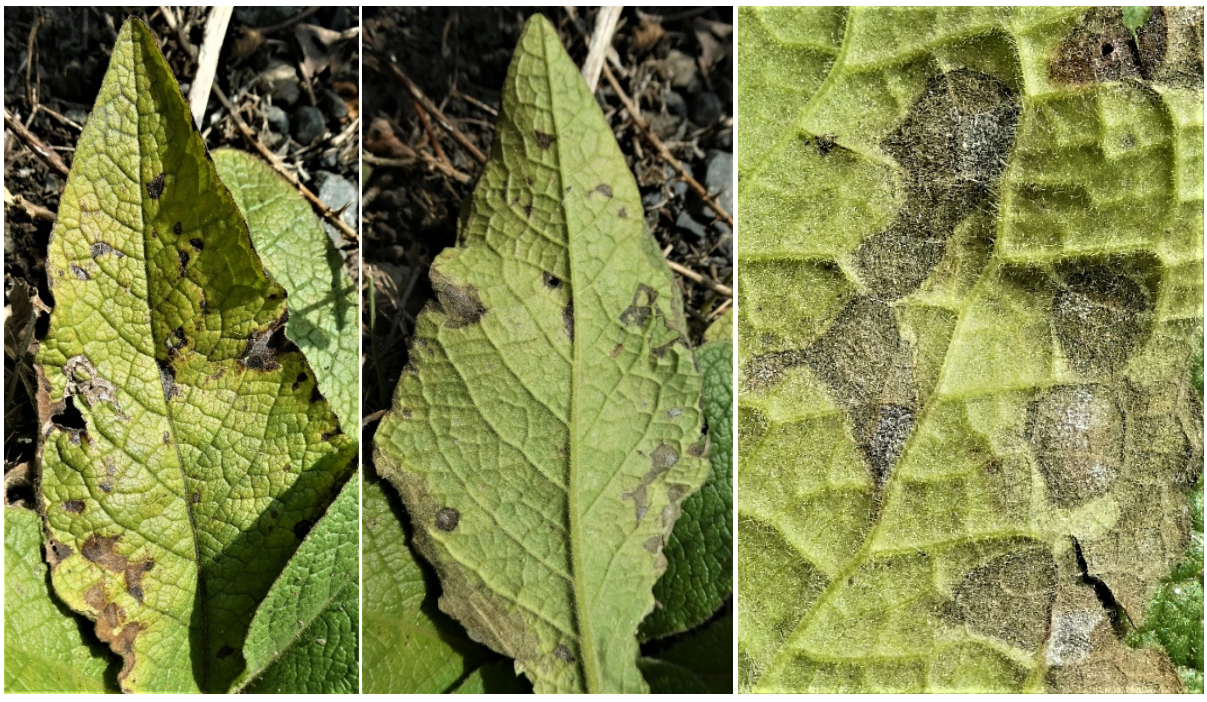
Ramularia collo-cygni caespituli appearing as white dots on the surface of a Barley leaf (below) and (right and below right) images of the recurved conidiophores and conidia.

form of leaf spots do not develop until flowering time. These spots are narrowly rectangular and brown, with a yellowish halo, and are straight-sided, defined by the main veins, and are clearly visible on both surfaces of the leaf. The whitish caespituli emerge well-separated in lines along lower or sometimes both surfaces, including away from the spots, and infected leaves later die back from the apex. Leaf sheaths, awns and even seed surfaces can also show the spots. Many or most of the conidiophores are uncinate and then recurved like the eponymous Swan's neck, a unique feature among *Ramularia* species. Conidia are 5-15 × 4-10µm, obovoid to sub-globose, aseptate, formed singly. Havis *et al*. (2015) report that in Europe it also now occurs on Wheat and Oats and several grasses. Braun (1998) reports that a morphologically very similar fungus has been collected on *Cannabis sativa* Hemp in Austria.

Ramularia cupulariae Pass.

Confined to the Asteraceae Daisy family genera *Carpesium*, *Codonocephalum*, *Inula* Fleabanes and *Pulicaria* Fleabanes, and to the latter two in the British Isles. Apparently rare in Britain, there are but two Welsh records on *Inula conyzae* Ploughman's Spikenard from a bank beside the A438 one km north east of Llowes, Rads where it was found in July 2020 and from the ledges of an old stone quarry at Stanner Rocks in September 2020. The FRDBI lists five other sites on this host in south and east England. At its Welsh localities it occurred on the





Ramularia cupulariae on *Inula conyzae*

yellowing aging leaves towards the base of the plant. The hypophyllous, off-white caespituli occurred on brown, vein-delimited patches but also less obviously on still green sections of leaf. Conidia are 6-30 × 2-5µm, narrowly obovoid to fusiform, aseptate to very occasionally 1(-2)-septate and formed in chains. In Wales it should be searched for on *Pulicaria dysenterica* Common Fleabane since there are records on this host from Somerset and Ireland.

Ramularia cynarae Sacc. (*R. cardui* P. Karst., *R. cirsii* Allesch.)

Confined to the Tribe Cynareae of the Asteraceae which includes a wide range of thistles, Alpine Saw-wort and Globe Artichokes. Rare in Britain, and in Wales only known from naturalized populations of *Cirsium heterophyllum* Melancholy Thistle in a garden at Ty Mawr Mill, Llysdinam, Brecs in August 2020 and in the farmyard at Gilfach Farm, Rhayader, Rads in October 2020. A search of the three native populations of this thistle at the southern edge of its British range in Rads in the same month failed to locate any *Ramularia* colonies. On *Cirsium arvense* Creeping Thistle it has been found growing beside the entrance to Newbridge on Wye Football Club carpark on the Breconshire bank of the River Wye at Llysdinam in June 2020, on a trackside near the Afon Irfon in Abergwesyn in September 2020, also in Brecs, in a pasture below Cefnllys Church, Rads in September 2020, and on a road verge at Plas Menai and in a farmyard at Henfaes, both in Caerns in September 2020. It is also reported from the underside of the leaves of *Cirsium dissectum*, Meadow Thistle in a species-rich wet pasture at Garth Fawr, Ciliau, Erwood, Rads, in June 2020 and a month later on the underside of the leaves of *Carduus nutans*, Musk Thistle growing on a former rubbish tip on common land on the Rogo, Howey, Rads. On *Cirsium rivulare* Brook Thistle it was found in a garden at Glasbury, Rads in July 2020 and on *Cirsium vulgare* Spear Thistle from Mold, Flintshire post 1978. This fungus was also found forming rounded clay-buff-coloured spots on the leaves of both *Cynara cardunculus* var. *cardunculus* Cardoon and *C. cardunculus* var. *scolymus* Globe Artichoke in the walled garden at Llysdinam House, Brecs in September 2020 and in October was found to be common on many plants of the latter

Ramularia cynarae on *Cirsium dissectum*

Ramularia cynarae on *Cirsium arvense* above left and centre and above right conidia from an infection on *C. heterophyllum*

growing in the communal allotments below Knucklas Castle, Rads. It appears to be the first time it has ever been reported on *Cirsium dissectum* and *C. rivulare* and is probably new to Britain on *C. heterophyllum*. In England most records have been made from the south on *Carduus crispus* Welted Thistle, *C. nutans*, *C. tenuiflorus* Slender Thistle, *Cirsium arvense*, *C. vulgare* Spear Thistle, *Cynara cardunculus* Globe Artichoke and *Onopordum acanthium* Cotton Thistle. The many large (up to 1cm diam.) circular, clay-buff to olivaceous-black amphiphyllous leaf spots, lacking a differently coloured marginal zone (so resembling *R. inaequalis* on *Taraxacum* Dandelion leaves) are conspicuous. The hypophyllous to occasionally amphiphyllous grey, rather tall and lax caespituli are much less obvious and lie amongst the leaf's own white, thread-like indumentum that itself resembles mycelial strands. If, despite the presence of the distinctive brown leaf spots, the caespituli cannot be located

Ramularia cynarae on leaves of *Cynara cardunculus* Globe Artichoke

beneath the indumentums, mounting a tuft of indumentum may reveal a mass of conidia that are 10-50 × 2-7µm, obovoid-ellipsoid to sub-cylindrical, 0-3-septate and formed in chains.

Ramularia cynoglossi Lindr.

Confined to Boraginaceae Borage family subfamily Cynoglossoideae. It was recorded in quantity in Cards in July 2020 on *Cynoglossum officinale* Hound's-tongue on the Ynys-las

Ramularia cynoglossi on *Cynoglossum officinale*

sand dunes. The only other British record is from South Lancashire on the same host. The greyish-white caespituli form under conspicuous brown or blackish spots, and sometimes on larger necrotic areas or even whole leaves, but are very inconspicuous under the indumentums of the host; conidia are 5-35 × 2-8µm, obovoid-ellipsoid to fusiform, 0-1(-2)-septate and formed in chains. A record in the FRDBI from Pembs in August 1987 on this host has the locality given as “Borth-Dovey estuary”, which is in Cards, and the record must be an earlier one from the same site in Cards.

Ramularia deusta (Fuckel) Karak. (*Erostrotheca multiformis* G.H. Martin & Charles)

Probably confined to *Lathyrus* Peas. Two varieties occur in Wales. In the FRDBI some of the records of *Ramularia* on *Lathyrus* are placed under *Erostrotheca multiformis*, and these were originally recorded variously as *Cladosporium album*, *Hyalodendron album* and *Ramularia alba*; these last three names are synonymised under var. *alba* in Braun (1998). The records on *Lathyrus odoratus* Sweet Pea we assume to be of var. *alba*, the others var. *deusta*.

Ramularia deusta var. *deusta* on *Lathyrus latifolius*

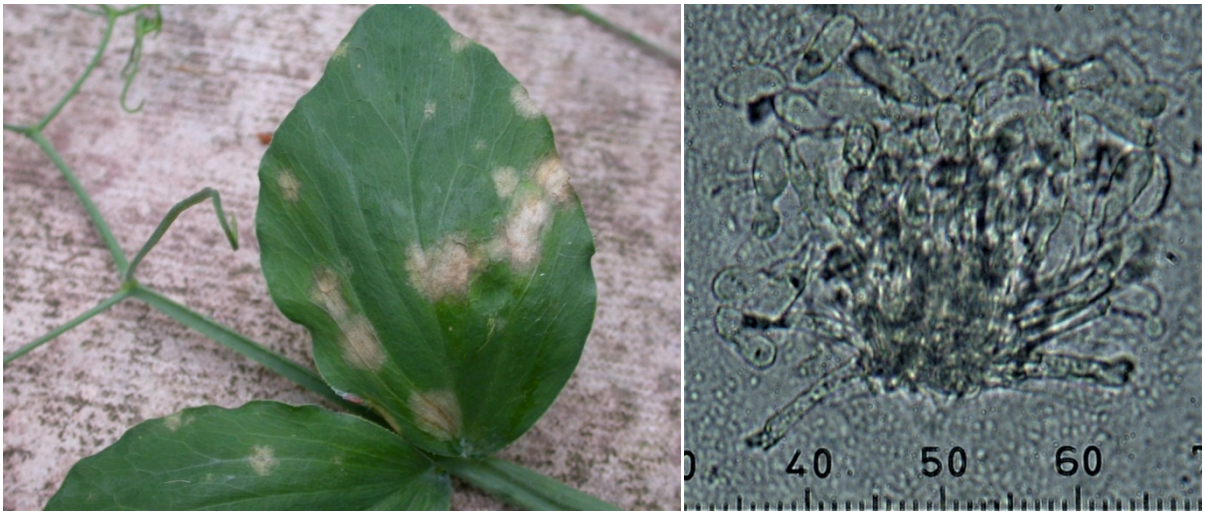
Phacellium carneum (Oudem.) U. Braun has been recorded on *Lathyrus pratensis* Meadow Vetchling in England and Scotland and differs conspicuously in having the conidiophores gathered in typical *Phacellium*-type synnemata.

Var. ***deusta***

There are about ten records of *R. deusta* in the FRDBI from the rest of Britain and Ireland on six species of *Lathyrus*, excluding those on *L. odoratus* Sweet Pea which are attributable to var. *alba* (as well as a couple on *Ulex* which is not known to host any *Ramularia*). It has been recorded once in Wales on *L. pratensis* Meadow Vetchling in Carms in 2013 and on *L. latifolius* Broad-leaved Everlasting-pea twice in Cards in 2020 in a garden at Pennant and in a roadside hedge at Bow Street. There is also a single record from *L. linifolius* Bitter-vetch from Maes-y-groes, Flints in 1978. This variety differs from var. *alba* in having leaf spots mostly only up to 8mm in diameter, pale yellowish brownish and later darkening, and the amphiphyllous caespituli being pale yellowish-brown or sometimes pinkish; conidia are only 5-25 × 2.5-6µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains.

Var. ***alba*** U. Braun

Confined to *Lathyrus* Peas, and recorded on *L. odoratus* Sweet Pea in an allotment at Aberaeron, Cards at the end of August 2019; in a garden near Llysdinam, Brecs in September 2020; in Rads in gardens in Newbridge on Wye and Clyro in September 2020



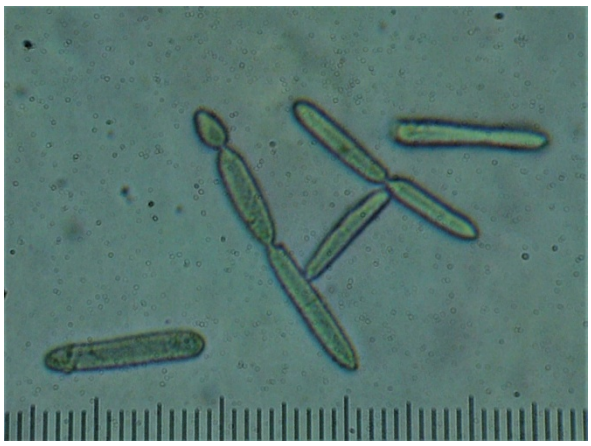
Ramularia deusta var. *alba* on *Lathyrus odoratus*

and on the cultivars ‘Juliet’ and ’Miss Wilmott’ in a garden at Glasbury, in June 2020 and on three cultivars, ‘Leamington’, ‘White Ensyn’ and ‘Winston Churchill’ in the National Botanic Garden of Wales, Carms in August 2019. The mould was first recorded in Britain at the RHS Gardens, Wisley in 1922 (Robinson & Cox 2017). There are few actual records from England, but it is in fact common and widespread on *L. odoratus* (Buczacki & Harris 1998, Robinson & Cox 2017) and can cause significant damage to the leaves and also occurs on the stems (Rice 2002). It differs from var. *deusta* in the leaf

spots often being up to 15mm in diameter and diffuse at the edges, the caespituli being whitish and the conidia up to 30 × 6µm (see image on previous page).

Ramularia didyma Unger var. ***didyma*** (*R. aequivoca* (Ces.) Sacc.)

The variety is confined to *Ranunculus* and *Anemone*. It has been recorded in Wales on *Ranunculus repens* Creeping Buttercup, from May to October, mostly on road and path verges and in woodland, at one site in Mons, one in Glams, three in Rads, one in Carms, two in Pembs, four in Cards, one in Mer, two in Caerns and one in Denbs, Flints and Angl. There is also a single Welsh record on *R. auricomus* Goldilocks from The Warren, Presteign, Rads in April 2017. It is rare on *R. acris* Meadow Buttercup with records in Cards from a heavily grazed damp pasture at Ystumtuen, in August 2020 where it was growing on the same leaf as *Ramularia acris* and at Strata Florida it was growing mixed with the powdery mildew *Erysiphe ranunculi* on the same leaf; in Flints it was recorded from Mold in 1978. The leaf spots are extensive, very conspicuous and brownish, with greyish caespituli; conidia are 10-45 × 2-6µm, obovoid-ellipsoid to narrowly fusiform, 0-1(-2)-septate, formed in chains (see image right). It has been recorded commonly throughout Britain and Ireland, and this apparent discrepancy with its rarity in Wales may perhaps be explained by its nomenclatural and morphological confusion with *Ramularia simplex* which has conidia 5-16µm wide, 0-1-septate and formed in chains. *Ramularia acris* Lindr. has 0-3-septate conidia 3-8µm wide and formed in chains.



Ramularia didyma var. *didyma* on *Ranunculus repens*

Ramularia didymarioides Briosi & Sacc.

Confined to *Silene* Campions and recorded in Wales eleven times on *Silene dioica* Red Campion. Noted twice in Brecs in July 2020 from hedge banks in both Llanafan-fawr and Llanfihangel Brynpabuan; once in Rads from the bank of the R. Wye below Boughrood in August 2020 and eight times in Cards, from the end of March to late-November. There is one record on *S. latifolia* subsp. *alba* White Campion from Flints in 1972. A May 1998 record of *R. kriegeriana* on *Silene dioica* from Lligwy Woods, Angl may be of this species, or perhaps of *R. lychnicola*. There are only a few records of *R. didymarioides* from England, all on *S. dioica*, and on *S. flos-cuculi* Ragged Robin from Scotland. The pale leaf spots, becoming brownish and sometimes with purplish margins are similar to other leaf spots on this host, and the caespituli are often rather sparse, so it is probably overlooked. The caespituli though are often amphiphyllous, with almost as many emerging from the upper epidermis as well as through the stomata on the lower surface of the leaf; conidia are 12-40 × 4-12µm, obovoid-to fusiform, 0-2-septate. *R. lychnicola*, the other species on these hosts, has shorter and narrower conidia, 8-20 × 2-5µm.

Ramularia didymarioides on *Silene dioica*

Ramularia digitalis (Fuckel) U. Braun (*Ramularia variabilis* Fuckel)

Confined to *Digitalis* Foxgloves and *Verbascum* Mulleins. On *Digitalis purpurea* Foxglove there are records from all 13 vice-counties, with 56 records from Cards from mid-May to mid-November and up to 400m altitude. It has been recorded on this host throughout Britain and in Ireland. The brown to blackish leaf spots resemble others on the leaves, but the hypophyllous, whitish caespituli are usually fairly conspicuous. Videira *et al*. (2016) suggest that two different species are involved on the two genera, and that the one on *Digitalis* is likely to be referable to *R. digitalis-ambiguae* Arx, but Braun & Bensch (2020) show that *R. digitalis* is the correct name for our fungus, and that *R. variabilis* will be the name for the one on *Verbascum* if it proves to be a separate species. It was reported in June 2020 on *Verbascum thapsus* Great Mullein from the garden of Ty Mawr Mill,

Ramularia digitalis on *Digitalis purpurea*

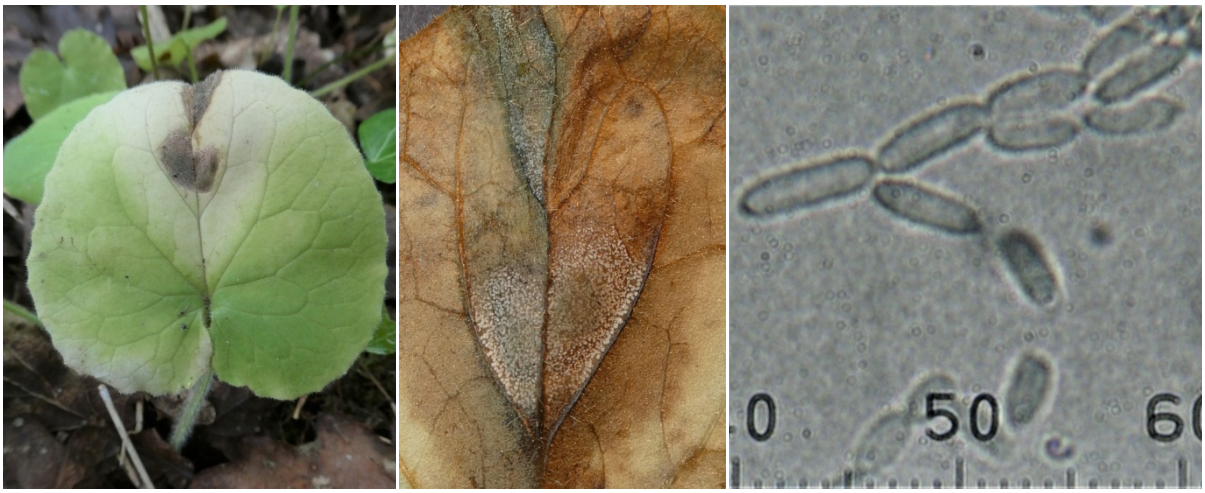
Ramularia digitalis on mature *Verbascum thapsus* leaves

Ramularia digitalis on old *Verbascum thapsus* leaves

Llysdinam, Brecs, when it occurred on the lower leaves; the only other British records on *Verbascum* are from North Hampshire in 1956 on *V. densiflorum* Dense-flowered Mullein and from Cambridgeshire in 2019 on *V. nigrum* Dark Mullein. The presence of angular yellowing, vein-delimited patches on the upper leaf surface betrayed its presence, visible even through the thick hair covering of the leaves. Caespituli are mostly hypophyllous, dense and white so as to stand out amongst the mostly greyer leaf hairs; conidia are 5-25 × 2-7µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains. It was soon afterwards found on this host again in a garden in Howey, Rads and has probably been widely overlooked on this genus.

Ramularia doronici Pass. & Thüm.

Confined to *Doronicum* Leopard's-banes. An effort to visit most of the 15 extant colonies in Cards of *D. pardalianches* Leopard's-bane from mid-May to early June in 2014 and 2015, resulted in this *Ramularia* being found on six of them, on roadside banks and in mixed woodland. It has also been found in gardens near Llysdinam in Brecs in May 2020, at Glasbury, Rads, in Carms near Talley in July 2019, and in Caerns on a bank at Tal-y-bont in May 2007 on this host. It was recorded on *D. plantagineum* Plantain-leaved Leopard's-bane at one of this host's only two sites in Cards, in roadside woodland at Penbryn in May 2014. It is widely recorded in Britain on *Doronicum pardalianches*, as well as on *D. columnae* Eastern Leopard's-bane in Scotland. Leaf spots are conspicuous, pale greenish becoming brown, with conspicuous greyish-white hypophyllous caespituli; conidia are 5-25 × 2.5-5.5µm, obovoid-ellipsoid to narrowly fusiform, 0(-1)-septate and formed in chains.



Ramularia doronici on *Doronicum pardalianches*

Ramularia epilobiana (Sacc. & Fautrey) B. Sutton & Piroz. (*Ramularia montana* auct. non Speg.)

Confined to *Epilobium* Willowherbs and recorded in Wales on *E. hirsutum* Great Willowherb from a roadside south of Stanton, Mons in Aug 2020, from Cors y Llyn National Nature Reserve, Newbridge on Wye and Burfa Boglands, Burfa, Rads in July 2020; beside the Montgomery Canal below Bank Lock north of Welshpool in August 2020 and Caerns in

September 1988; and on *E. montanum* Broad-leaved Willowherb from Glam in September 1997 (as *R. pratensis*) and from Caerns in September 1988. There are scattered records, sometimes as *R. pratensis* or *R. epilobii*, from Britain and Ireland on several species. The large pale patches become brownish, with white, glistening hypophyllous caespituli; conidiophores are colourless and conidia are 10-22 × 2.5-16µm, subglobose to fusiform, aseptate, usually formed singly. The chunky conidia can obscure the conidiophores when they may look under a hand lens more like a rather squat downy mildew.

A similar species, *Passalora montana* (Speg.) U. Braun & Crous has been recorded throughout Britain and Ireland on several species of *Epilobium*, and differs from *Ramularia epilobiana* conspicuously in its conidiophores becoming yellowish or brownish, and in its conidia being 0-3(-4)-septate, so records need checking. (Its synonyms include *Ramularia montana* Speg., *R. epilobii* P. Karst., *R. epilobii-palustris* Alesch. and *Phaeoramularia punctiformis* (Schltdl.) U. Braun (Crous & Braun 2003)). *Passalora montana* is recorded from England, Scotland and Ireland on several species of *Epilobium*. In Wales it has been found on *E. ciliatum* American Willowherb in a garden near Llysdinam, Brecs and in Rads in wet grassland by The Bog, Newbridge on Wye, both in July 2020 and on *E. montanum* on a lane verge near Cwmbach Llechrhyd, Rads in June 2020. All these specimens were characterised by the presence of scattered brown spots on the discoloured infected segments of leaves caused probably by pigmentation of parts of the mycelium.

Ramularia epilobiana on *Epilobium ciliatum* leaves above left and centre. *Passalora montana* on *E. montanum* leaf above right.

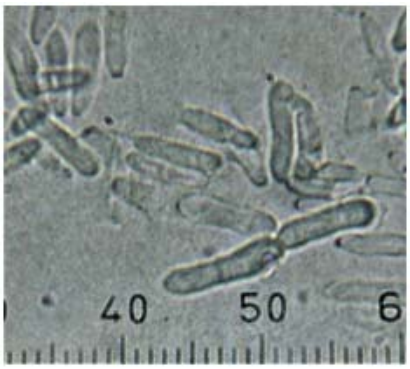
Ramularia episphaeria (Desm.) Gunnerb. (*Phacellium episphaerium* (Desm.) U. Braun)

Confined to *Stellaria* Stitchworts, and recorded only once in Wales, on *Stellaria holostea* Greater Stitchwort on a hay meadow margin at Bryn-ceirch, Cynwyl Elfed, Carms in July

2019. There are a few records from England, on *Stellaria graminea* Lesser Stitchwort, *S. holostea* and *S. nemorum* Wood Stitchwort. The yellowish spots turn orange-brown, and can cover the whole leaf, with greyish-white hypophyllous caespituli; conidia are 6-24 × 3-8µm, obovoid-ellipsoid to narrowly ellipsoid, aseptate and formed singly or in chains.

Ramularia filaris Fresen. (*Ramularia senecionis* (Berk. & Broome) Sacc., *Ramularia pruinosa* Speg.)

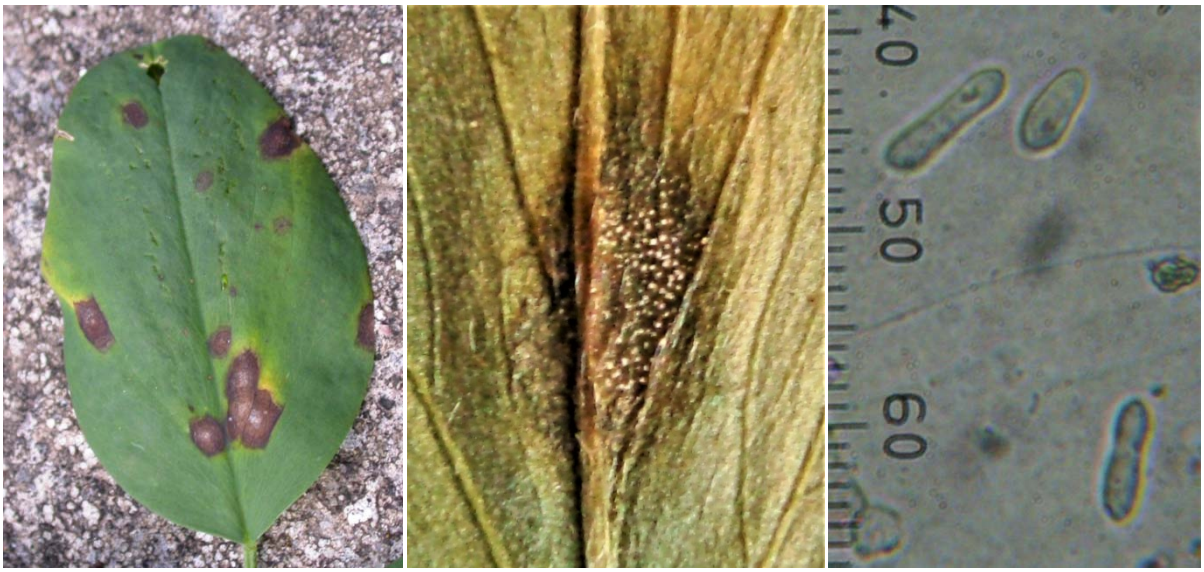
Confined to *Ligularia* Leopardplants, *Jacobaea* and *Senecio* Ragworts, and recorded six times in Cards, once on *Jacobaea aquatica* Marsh Ragwort in *Salix cinerea* Grey Willow carr at Rhos Fulbrook at the end of August 2014, and seven times on *J. vulgaris* Common Ragwort mostly near the coast from late April to mid-May, three times in Caerns on *J. vulgaris* at Coedydd Aber in September1988 and on a roadside bank and verge at Y Felinheli in April and May 2008, and once on the same host from Mold, Flints post-1978. On *J. aquatica* the whitish, hypophyllous caespituli were entangled with the powdery mildew *Podosphaera senecionis*. There are scattered records on these species and on *Senecio vulgaris* Groundsel elsewhere in Britain and Ireland. The leaf spots are diffuse and pale green becoming brownish, with hypophyllous greyish-white caespituli; conidia are 10-40 x 2.5-10µm, obovoid-ellipsoid to narrowly fusiform, 0-2-septate and formed in chains.



Ramularia filaris on *Jacobaea vulgaris*

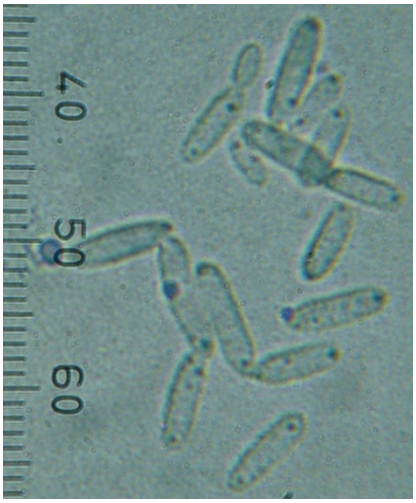
Ramularia galegae Sacc.

Confined to *Galega* Goat's-rues, and recorded once in Wales on *Galega officinalis* Goat's-rue in a garden at Glasbury, Rads in July 2020. There are a dozen records from the south of England. Small brownish spots which develop white centres have often amphiphyllous, greyish-white caespituli; conidia are 7-30 × 2-5µm, narrowly ellipsoid to narrowly fusiform, 0-1(-2)-septate.



Ramularia galegae on *Galega officinalis*

Ramularia gei (A.G. Eliasson) Lindr.



Confined to *Geum* Avens. Widespread in Wales and recorded from twelve vice-counties on *Geum urbanum* Wood Avens, including 28 times in Cards, from late March to the end of October. There is one Cards record on the naturalised and rapidly spreading *G. macrophyllum* Large-leaved Avens from a road verge at Neuadd Cross in September 2016. There is also a single record on the hybrid *G.* × *intermedium* (*G. rivale* × *G. urbanum*) from Lakeside Wood, Llandrindod Wells, Rads in June 2020. The wood supports extensive stands of both parent species and a variety of hybrids. *R. gei* was very rare but was noted on *G. urbanum* as well as the hybrid but not on the extensive stands of *G. rivale* Water Avens. It occurred on this latter host in 1982 at Erddig, Denbs and recently in two sites in Flints. It is only reported elsewhere in Britain on this host from Yorkshire and a single site in Scotland. It has, however, been widely recorded throughout Britain on *Geum urbanum*. The conspicuous leaf spots are pale at first, becoming brown or blackish with pale centres, and the caespituli are greyish-white and amphiphyllous; conidia are 6-28 × 2-6µm, narrowly ellipsoid to narrowly fusiform, 0-1(-2)-septate and formed in chains.

Ramularia gei on *Geum urbanum*

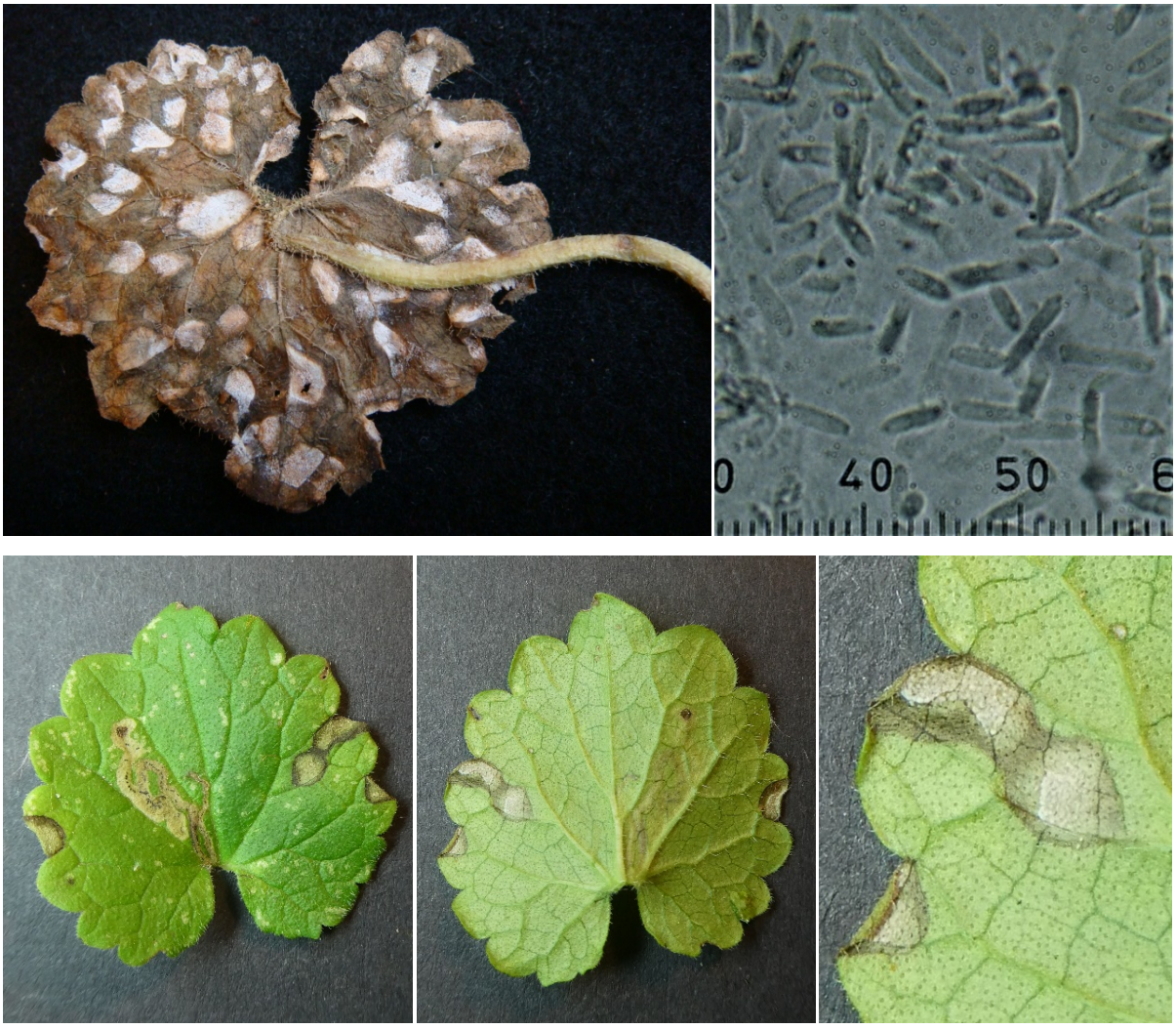
Ramularia geranii Fuckel var. ***geranii***

Confined to *Erodium* Stork's-bills and *Geranium* Crane's-bills and recorded in Wales only on *Geranium robertianum* Herb-Robert, twice in Denbs, at Erddig in 2016 and Maeshafn in 2019. This is surprising as, besides one record on this host from Wiltshire in 2011, it has

been widely recorded from Britain and Ireland on at least six other species of *Geranium*, mostly in southern England. Leaf spots are pale yellowish green becoming dark brown, often vein-delimited, with usually hypophyllous greyish-white caespituli; conidia are 10-50 × 2-7µm, ovoid-ellipsoid to fusiform-cylindrical, 0-3-septate and formed in chains. Var. *erodii* Sacc., on *Erodium* spp., with somewhat longer and narrower conidia 15-55 × 2-3.5µm, up to 4-septate, is known from England and Scotland.

Ramularia glechomatis U. Braun (*Ramularia calcea* (Desm.) Ces. misapplied)

Confined to *Glechoma hederacea* Ground-ivy, and recorded once in Brecs, twice in Rads, three times in Carms, once in Pembs, 14 times in Cards, once in Monts, six times from Caerns and seven times from Angl, from mid-April to late October. There are also records from Denbs and Flints. There are about a hundred other records throughout Britain and in Ireland. The mostly pale, slightly concavo-convex spots are conspicuous, as are the often very dense whitish caespituli and it is perhaps genuinely uncommon in Wales in general. In two of the collections the caespituli are amphiphyllous, those on the upper surface being erumpent through the epidermis (not mentioned in Braun 1998); conidia are 5-30 × 2-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains.



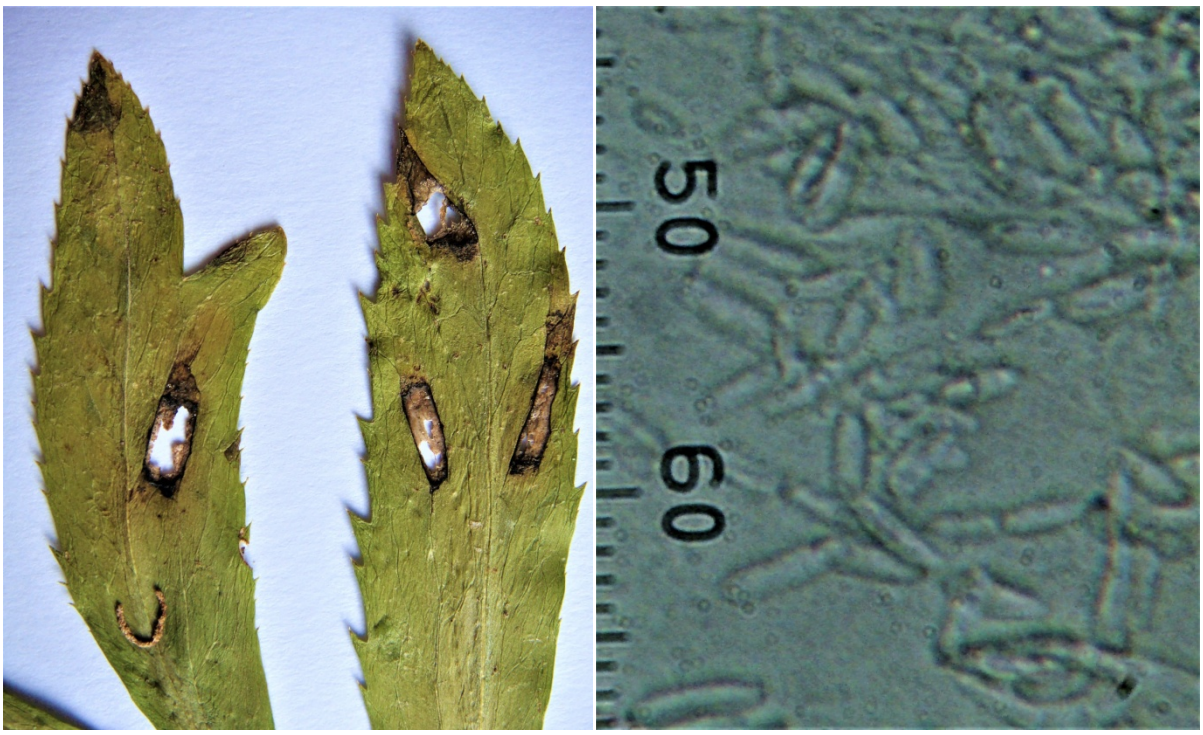
Ramularia glechomatis on *Glechoma hederacea*

Ramularia grevilleana (Oudem.) Jørst. var. ***grevilleana*** (*R. arvensis* Sacc., *R.tulasnei* Sacc.)

Only so far recorded in North East Wales on *Potentilla* Cinquefoil and *Fragaria* Strawberry species. It was noted on *Potentilla reptans* Creeping Cinquefoil in Alyn Waters Country Park, Gwersyllt in October 2016 and on *Potentilla* sp. from Pot Hole quarry, Llanferres, also in Denbs in 2016. Given that in the rest of Britain *R. grevilleana* and its teleomorph *Mycosphaerella fragariae* are considered to be the cause of a widespread Garden Strawberry leaf spot disease (though it is rarely made clear which state it is that is recorded), it is surprising that there is but a single record from Wales of *R. grevilleana* on a *Fragaria* sp. from Mold in Flints in 1978. There are records though of the anamorph on *Fragaria ananassa* Garden Strawberry from England, Scotland and Ireland, on *F. vesca* Wild Strawberry from England and Ireland, and on *Potentilla anserina* Silverweed and *P. reptans* from England. Leaf spots are pale yellowish, becoming reddish or purplish with a darker margin, with greyish-white hypophyllous caespituli; conidia are 10-50 × 1.5-5µm, 0-2(-3)-septate, formed in chains.

Ramularia hellebori Fuckel

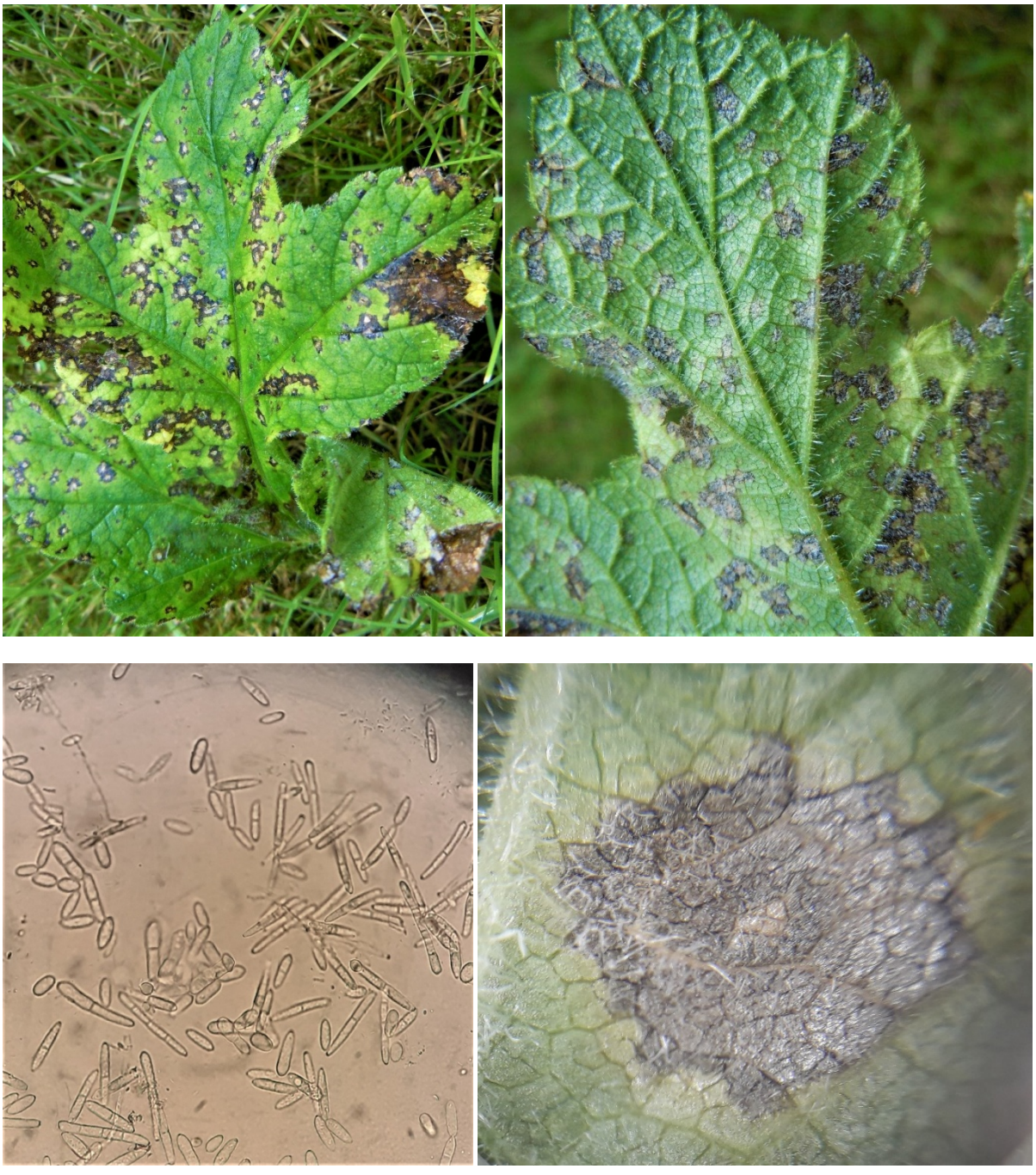
Confined to *Helleborus* Hellebores and recorded once, on *Helleborus viridis* Green Hellebore in mixed woodland in Allt Beili-mawr, north of Penrhiw-llan, Cards in early June 2015. There are some 25 records scattered in England on *H. viridis* and *H. foetidus* Stinking Hellebore. The blackish leaf spots were like many other spots on *Helleborus* leaves, and the conspicuous whitish caespituli were mostly hypophyllous; conidia are 5-30 × 2-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains.



Ramularia hellebori on *Helleborus viridis*

Ramularia heraclei (Oudem.) Sacc. (*Ramularia pastinacae* Bubák, *R. cicutae* P. Karst., *R. coriandri* Moesz & Smarods)

Confined to Apiaceae Carrot family, subfamily Apioideae. Recorded on *Heracleum sphondylium* Hogweed (see images below) from 28 sites, from May to October, mostly on roadsides, riverbanks and field margins, one in Mons and Glam, two each in Brecs and Rads, three times in Pembs, eleven in Cards, one each in Mer, Denbs and Angl, and three each in Caerns and Flints. It has also been found once on *Helosciadum nodiflorum* Fool's-water-cress (a host species not mentioned by Braun 1998) on the Aberleri Fields, Ynys-las, Cards in early August and once on *Levisticum officinale* Lovage in a garden at Llanigon, Brecs in June 2019. There are some 70 records on *H. sphondylium* throughout Britain and



Ramularia heraclei on *Heracleum sphondylium*

Ireland. There are two records on *Cicuta virosa* Cowbane, from Norfolk in England and from Ireland, two each on *Levisticum officinale* and *Pastinaca sativa* Parsnip, and one on *Apium graveolens* Wild Celery from England, as well as horticultural records on *Coriandrum sativum* Coriander from England. The small leaf spots and mostly hypophyllous greyish-white caespituli are easily overlooked on the often-discoloured leaves; conidia are 5-45 × 2-6µm, obovoid-ellipsoid to narrowly fusiform, 0-3-septate and formed in chains. Videira *et al*. (2016) suggest that it may be a species complex and that it requires further study.

Ramularia holci-lanati (Cavara) Deighton

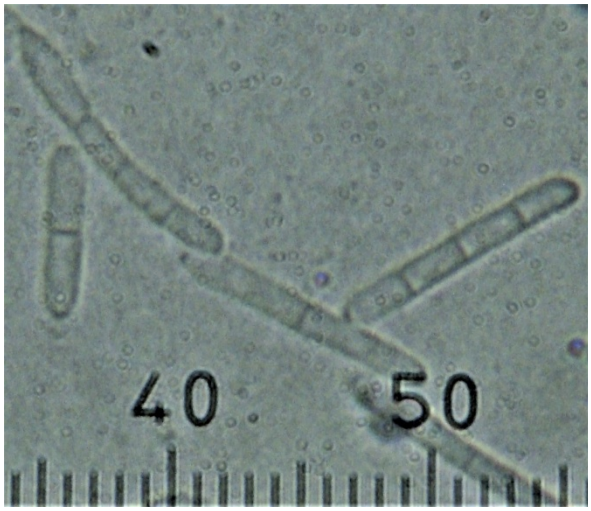
Confined to *Holcus* Soft-grasses, and found by Ellis Griffiths for the first time in Britain, as *Ramulospora holci-lanati*, on *H. lanatus* Yorkshire-fog in Cards near Llanfarian in 1954, and near Tre'r-ddol in 1955 (Griffiths 1957). It was refound in mid-June 2017 in a damp meadow by the river 500m SSE of the road bridge at Llanfarian. There are as yet no other British records. The oblong spots were pale reddish brown, pale green in the centre, and with a yellowish halo, with few, inconspicuous greyish-white hypophyllous caespituli (exactly as described by Braun 1998); conidia are 15-28(-32) × 5-15µm, obovoid, aseptate, echinulate (under oil immersion lens) and formed singly. A record on *Phalaris arundinacea* Reed Canary-grass from Coll in the Mid Ebudes in Dennis (1986), should, judging by Braun (1998), presumably be referred to the morphologically very similar *Ramularia pusilla* which occurs on many grasses but not *Holcus*.

Ramularia holci-lanati on *Holcus lanatus*

Ramularia inaequalis (Preuss) U. Braun (*Ramularia hypochoeridis* Magnus, *R. picridis* Fautrey & Roum., *R. taraxaci* P. Karst.)

Confined to various genera in the Asteraceae Daisy family, subfamily Cichorioideae. It has been recorded on *Helminthotheca echioides* Bristly Oxtongue once in Brecs on a soil heap in Talgarth in June 2020; in Rads in July 2020 beside a track in the limestone quarries of Dolyhir and in September 2020 beside the old railway station at Stanner, in Carms at the Pavillion, Pwll and on Machynys golf course in July 2019, at Gwenllian Hall, Kidwelly in August 2019 and at the Felinfoel Industrial Estate in September 2019; twice in Pembs in November 2020 at the edge of a car park in Pembroke Dock and from Tenby near Castle December 2020; and on waste ground by the Britannia Bridge in Caerns in July 2004; and on *Hypochaeris radicata* Cat's-ear, on a road verge south-east of Cellan in mid-September 2014 at 320m altitude and on the disused railway on Cors Caron in early June 2017, both in Cards. On *Picris hieracioides* ssp. *hieraciodes* Hawkweed Oxtongue there is a single record from a road verge on limestone

south of the Strines Quarry near Weythel, Dolyhir in September 2020. There are a number of records on *Taraxacum* sp. Dandelion mostly from road and path verges and gardens, from May to October, two from Glam, three from Brecs, seven from Rads, one from Pembs, eleven from Cards, one from Mer, four from Caerns and three from Flints. It has been recorded on these hosts throughout Britain and Ireland, mostly on *Helminthotheca echioides* and *Hypochaeris radicata*, and also on *Scorzoneroides autumnalis* Autumn Hawkbit from Dorset, England. The leaf spots on *Hypochaeris*



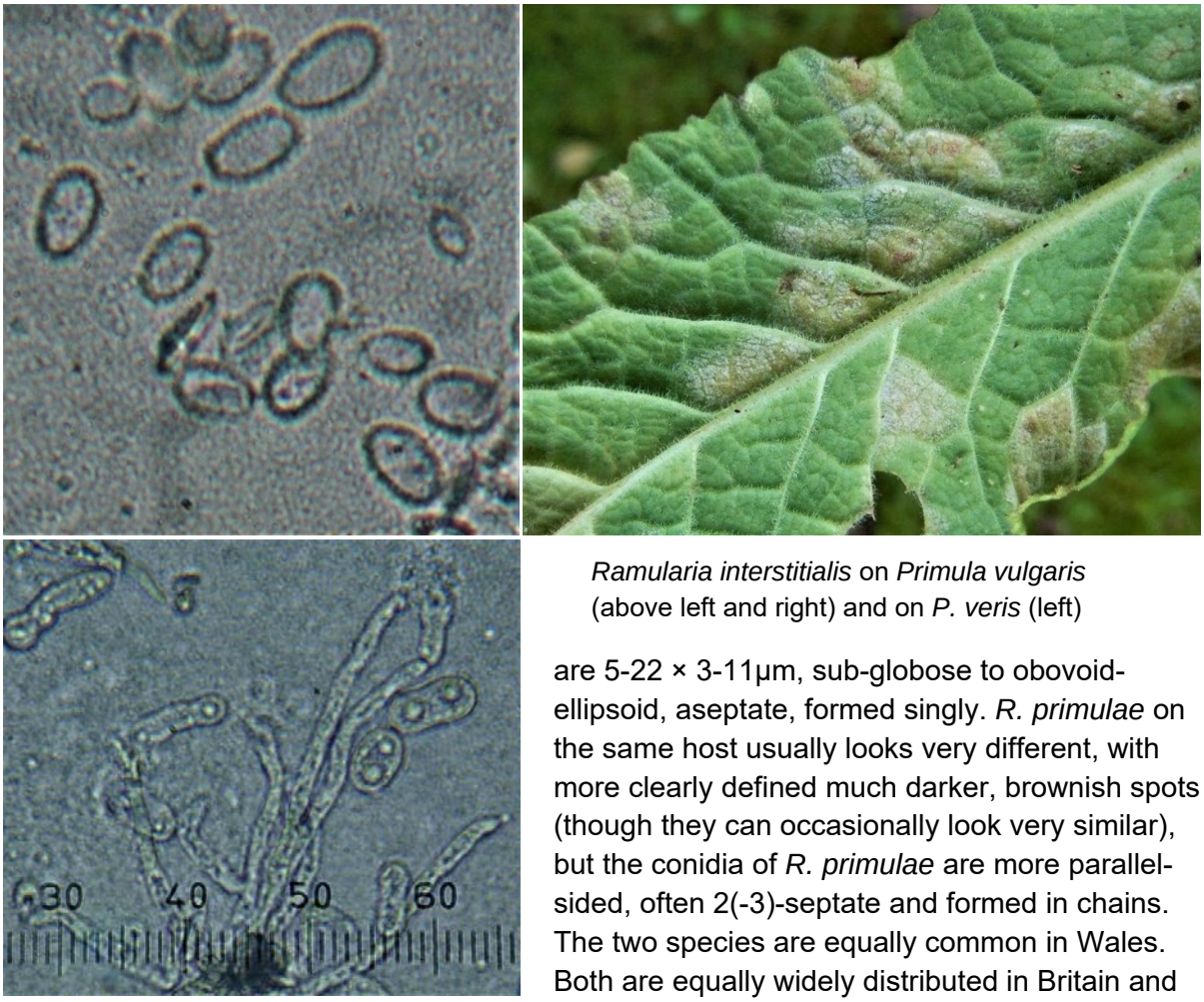
Ramularia inaequalis on *Taraxacum sp.* (above) and *Helminthotheca echiodes* (below)

are blackish or dark brown, as sometimes are those on *Taraxacum*, whereas those on *Helminthotheca* and sometimes those on *Taraxacum* are pale brown, and they often have concentric ridges or rings; the mostly hypophyllous caespituli are white or greyish; conidia are 4-60 × 1.5-8µm, narrowly obovoid to cylindrical, 0-3(-7)-septate and formed in chains.

Ramularia interstitialis (Berk. & Broome) Gunnerb. & Constant.

Confined to *Primula* Primroses. It has been recorded on *Primula vulgaris* Primrose once in Glam on a shaded road verge near Burry Green on Gower in July 2020, twice in Brecs, growing in a spring-head flush near the Journeys End Ranges, Mynydd Epynt in July 2019 and on Primroses naturalised in a lawn near Llanwrthwl; in Rads in flowerbeds in two properties in Newbridge on Wye in June and July 2020 and on a bank in the limestone quarries at Dolyhir in July 2020; in Carms in woodland at Garn Ganol, Crwbin in July 2017 and at Felin-gwm in June 2020; in Pembs once in November 2020 beside a woodland path near Bentlass; in Cards 37 times from the end of March to mid-November, up to 300m altitude; in Mer at Aberdyfi in June 2011 and in April 2017 and on a track verge near Llanystumdwy, Caerns in September 2020. On *P.* × *polyantha* Gold-Lace Polyanthus in a garden, Ty Mawr Mill, Llysdinam in May 2019; and on *P. veris* Cowslip it has been recorded in Cards from Llanina churchyard in May 2018, and in grassland at the Teifi Marshes in June 2018 (at this latter site the rather large conidia 10-22 × 8-10µm were slightly constricted in the middle, strongly biguttulate and uncharacteristic for *R. interstitialis*). The leaf spots are usually pale greenish or yellowish and diffuse, with whitish hypophyllous caespituli; conidia

Ramularia interstitialis on *Primula vulgaris*



Ramularia interstitialis on *Primula vulgaris* (above left and right) and on *P. veris* (left)

are 5-22 × 3-11µm, sub-globose to obovoid-ellipsoid, aseptate, formed singly. *R. primulae* on the same host usually looks very different, with more clearly defined much darker, brownish spots (though they can occasionally look very similar), but the conidia of *R. primulae* are more parallel-sided, often 2(-3)-septate and formed in chains. The two species are equally common in Wales. Both are equally widely distributed in Britain and Ireland, though *R. primulae* is much more often recorded, doubtless because *R. interstitialis* was not described in Ellis & Ellis (1997).

Ramularia kriegeriana Bres. (*Ramularia plantaginis* Ellis & G. Martin nom illegit.)

Confined to *Plantago* Plantains, the only species on *P. major* Greater Plantain on which it has been recorded once in Caerns, at Capel Curig in September 1988 and at Mold, Denbs in 1970. Widely recorded in England, on *P. media* Hoary Plantain too, and in Ireland, chiefly as *R. rhabdospora*. The leaf spots are pale, often with a dark margin, with greyish amphiphyllous caespituli; conidia are 10-35 × 3-6µm, obovoid to cylindrical, 0-3-septate and formed in chains. The conidia are finely echinulate (oil immersion lens required!), whereas in *R. rhabdospora*, which is only on *P. lanceolata* Ribwort Plantain in Britain, the conidia are verruculose, the patterning being rather larger.

Ramularia lactea (Desm.) Sacc. (*Ramularia violae* Trail)

Confined to *Viola* section *Viola* Violets. On *V. riviniana* Common Dog-violet, recently there are two records from Mons, seven from Brecs, four from Rads and Carms, one from Pembs, three from Mer, two old and seven recent ones from Caerns, one recent one from Denbs, two from Flints and three from Angl, but as it has been recorded in Cards 57 times, from mid-April to mid-October it must be common and widespread throughout Wales; one Carms

Ramularia lactea on *Viola riviniana*

record was at 300m altitude. There are in addition records from Rads on *V. riviniana* Purpurea group from a garden in Newbridge on Wye in March 2020 and on *V. odorata* Sweet Violet from a churchyard at Kinnerton in September 2020; and on *V. odorata* growing on a lane verge/bank in Llandeiniolen, Caerns in January 2021. This fungus has been widely recorded throughout Britain and in Ireland on several perennial species of *Viola*. The

Ramularia lactea on *Viola riviniana*

conspicuous brownish, usually zonal leaf spots have mostly whitish hypophyllous caespituli. As much of the spots and the caespituli are often eaten out, and anyway similar spots can be caused by other factors, they should not be recorded as *R. lactea* unless caespituli are present; conidia are 5-25 × 1.5-8µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains. Where caespituli are not present they can often be induced to form if the leaf is placed in a damp chamber for a few days. (The species on *Viola* section *Melanium* is *R. agrestis* with mostly larger conidia, usually 10-40 × 4-9µm).

Ramularia lamii Fuckel var. ***lamii*** (*Ramularia exilis* Syd. & P. Syd., *R. lamiicola* C. Massal., *R. stachydis* (Pass.) C. Massal.)

Confined in Wales to various genera of the Lamiaceae family Dead-nettles subfamilies Lamioideae and Nepetoideae. On *Galeopsis bifida* Bifid Hemp-nettle in September 2020 it was abundant in a wet pasture at Burfa Boglands, Burfa in Rads; on a road verge south-east of Cilcennin, Cards in early August 2016 and in Flints it was on a common at Waen Ganol north of Bwlchgwyn in September 2020. On *Galeopsis tetrahit* Common Hemp-nettle it occurred in species-rich wet grassland, Llangors Common, Brecs in July and September 2020. In this latter month it was found again on this host in damp grassland at The Bog, Newbridge on Wye, Rads. On *Lamiastrum galeobdolon* Yellow Archangel it was recorded from a wooded roadside bank near Cwmbach Llechrhyd, Rads in October 2020. On *Lamium album* White Dead-nettle it occurred on a road verge at Southgate, Gower, Glam in February 2020. It was also found on this host in Brecs in a garden at Llanwrthl in April 2019 and June 2020; and in Rads on a roadside at Presteigne in August 2019, on road verges near Cregrina and Burfa in July 2020, a roadside by Burfa Boglands in September 2020 and on a track verge below Stanner Rocks in September 2020. In Cards it has been recorded only twice on *L. album* on a grassy riverbank at Cenarth in mid-April and late October 2011; in Caerns in September 2020 on a trackside at Henfaes, Abergwyngregyn; in Flints in Loggerhead Country Park in 1978 and in Angl on a lane verge near Llandrygan in November 2008. It has been recorded at only a single site in Wales on *L. hybridum* Cut-leaved Dead-nettle in a fallow field at Gogerddan, Cards in June 2020. On *L. purpureum* Red Dead-nettle it was found in grassland in the Groe Park, Builth Wells in April 2019 and in the same locality

Ramularia lamii var. *lamii* on *Lamium album*

Ramularia lamii var. *lamii* on *Lamium hybridum*

a year later, demonstrating a surprising persistence. In Monts it has been recorded in the 1870's on *L. purpureum* at Forden and in Caerns in March 2007. On *Mentha spicata* Spearmint it was found in a garden in Glasbury, Rads, probably the first record on this host in Britain. There is but a single record from Wales on *Lycopus europaeus* Gypsywort from Llangors Common, Llangors, Brecs in September 2020. In Cards it was found on *Stachys sylvatica* Hedge Woundwort on a wooded trackside at Commins Coch in August 2020; in Caerns on this host on verges at Parc Menai and on a track verge at Henfaes, both in September 2020; and in a churchyard Rhos on Sea, Denbs in December 2020.

There are scattered records from Britain and Ireland on these genera, and a record from East Norfolk in 2019 on *Betonica macrantha* Big Betony. The only species on *S. palustris* Marsh Woundwort is *R. bresadolae*, which occurs in Wales and differs chiefly in having aseptate conidia; neither *Ramularia* seems to have been recorded on the very common *S.* × *ambigua* (*S. palustris* × *sylvatica*) Hybrid Woundwort. The leaf spots are usually inconspicuous at first, later becoming brown, with whitish hypophyllous caespituli (on *G. tetrahit* agg. the caespituli were tall and well intertwined, with individual caespituli difficult to see); conidia are 5-55 × 1.5-7µm, obovoid-ellipsoid to cylindrical, 0-1(-3)-septate and formed in chains.

Ramularia lamii var. *lamii* on *Lamiastrum galeobdolon*

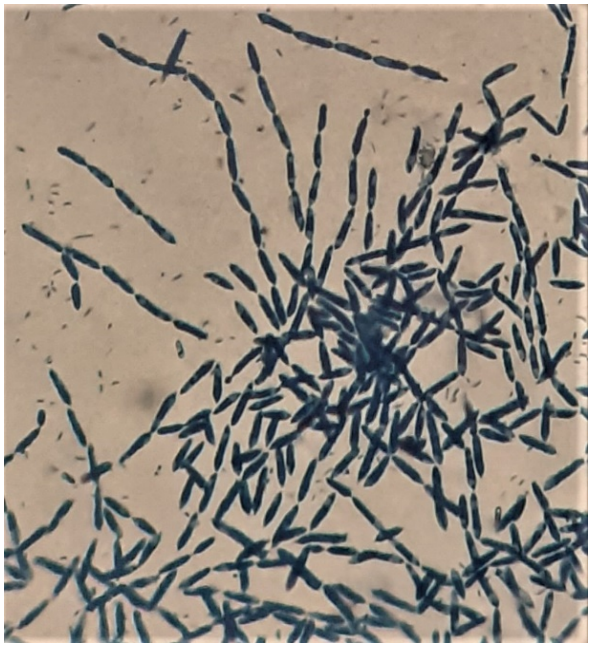
Ramularia lamii var. *lamii* on *Galeopsis bifida*

Ramularia lamii var. *lamii* on *Mentha spicata* above left and on *Stachys sylvatica* above right

Ramularia lamii var. ***minor*** Braun

Confined to hosts in subfamily Lamioideae, and first noted in September 2020 on the leaves of *Stachys arvensis* Field Woundwort in a vegetable garden at Ty Mawr Mill, Llysdinam, Brecs and in a nearby Swede field in November 2020. White caespituli were formed mostly

Stachys arvensis leaves infected late in the season (October) with *R. lamii* var. *minor*

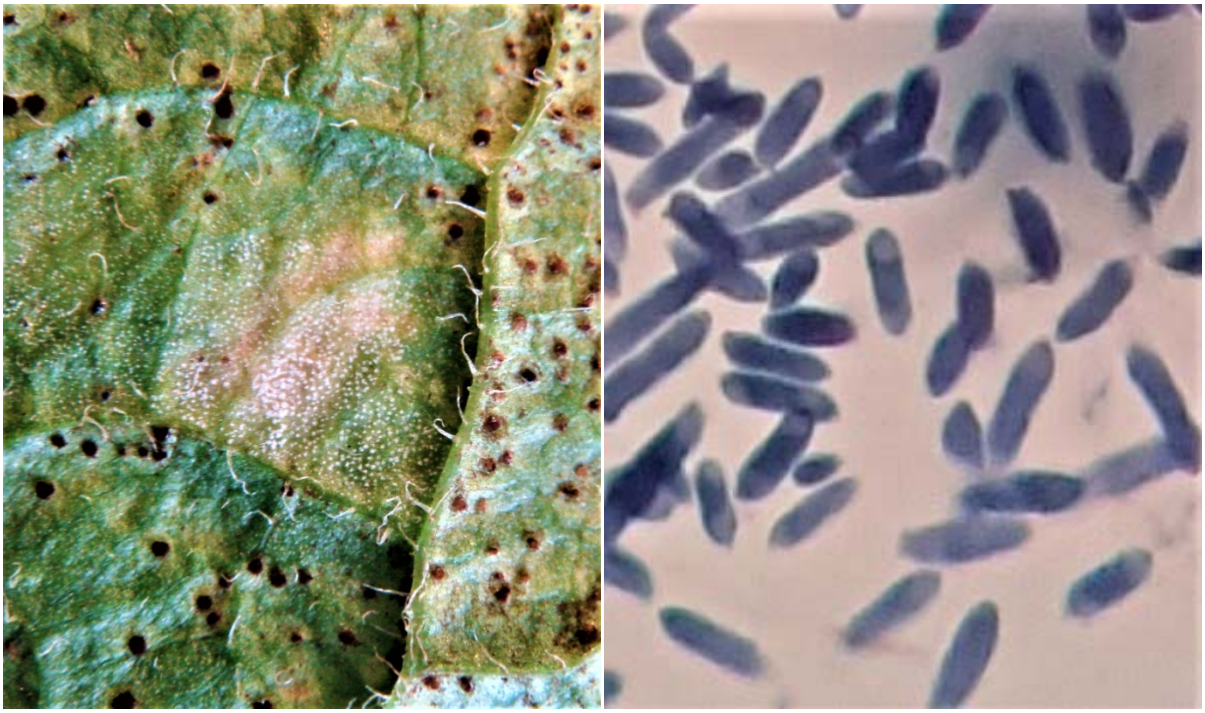


on the lower leaf surfaces on small discrete white spots surrounded by a purple-brown ring but later in the season over whole browned leaf tips. Conidia were 0-1-septate and narrow, 13-15µm × 2.5-3µm and formed in chains (see image right, stained with cotton blue). This is possibly the only British record on this host. Elsewhere in Europe Braun (1998) only reports a population in Portugal. It has, however been reported on *Prunella vulgaris* Selfheal in England.

Ramularia lampsanae (Desm.) Sacc.

Confined to *Lapsana*, with about 120 records in Cards on *Lapsana communis* subsp. *communis* all year round, up to 380m altitude, and with a few records from eleven other vice-counties it must be widespread and probably one of the commonest species in Wales. Widely recorded throughout Britain and Ireland. The pale greenish or yellowish leaf spots have conspicuous white, usually amphiphyllous caespituli which are sometimes equally abundant on both surfaces; conidia are 5-25 × 1.5-6µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate, formed in chains. The powdery mildew *Neoerysiphe nevoi* and the rust

Ramularia lampsanae on *Lapsana communis*



Ramularia lampsanae caespituli with *Puccinia lapsanae* above left and conidia stained in cotton blue above right

Puccinia lapsanae are sometimes present on the same leaf as *Ramularia lampsanae* together with the downy mildew *Bremia lapsanae*. The intrusive but correct “m” in the epithet derives from an old spelling of the host genus.

Ramularia linariae Baudyš & Picb. (*Didymaria linariae* Pass.)

Confined to *Linaria* Toadflaxes and known only from a single site in Wales on *Linaria vulgaris* Common Toadflax growing on a roadside verge near Boughrood Brest in Rads in September 2019 and re-found in the same site in August 2020. The only other British records are from this host in South Devon in 1965 and 1995. The fungus causes extensive yellowing and browning of upper stem leaves, making the infected plant highly visible (see image below right). Conidiophores are formed on both leaf surfaces (see image below left) creating caespituli that are distinctly shaped, their lower parts being densely aggregated together. Whilst it is difficult to overlook the damage to the host, individual caespituli, if sparsely produced, are very small and straw-coloured like the host leaf. They are best observed along the leaf edge against a dark background. Conidia are 15-35 × 2-8µm, broadly obovoid-ellipsoid to fusiform, (0-)1-septate and are usually formed singly. *R. linariae* appears likely to be genuinely rare in Wales.

Ramularia linariae on *Linaria vulgaris*

Ramularia lychnicola Cooke

Confined to *Silene* Campions, and recorded in Wales only from Denbs in Pot Hole Quarry, Llanferres in 2016, in Flints from Hawarden in 1972, Ysceifiog in 1976, Gwysaney, Mold in 1978, Bodelwydden in 1996 and Loggerheads in 2016, and from a footpath verge at Church Bay, Angl, April 2008, all on *S. dioica* Red Campion. There are a few records from the rest of Britain on *S. dioica*, *S. flos-cuculi* Ragged Robin and *S. latifolia* subsp. *alba* White Campion. The pale spots darken, with mostly greyish-white hypophyllous caespituli; conidia are 8-20 × 2-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed singly. *Ramularia didymarioides* on the same hosts has longer and wider conidia, 12-35 × 4-9µm.

Ramularia lysimachiae Thüm. (*Ramularia lysimachiarum* Lindr.)

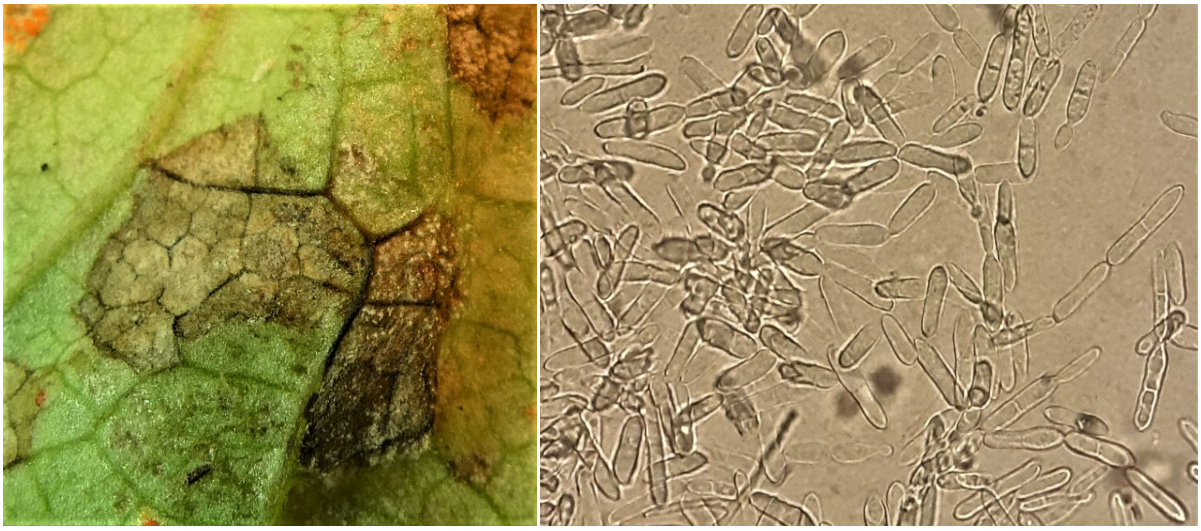
Confined to *Lysimachia* Loosestrifes, and recorded in Wales only four times, on *L. nummularia* Creeping-Jenny in an Alder wood on the shore of Llangors Lake, Brecs, on a shady roadside verge near Cwmbach Bridge, Cwmbach Llechrhyd, Rads, both in June 2020, on a hedgebank at Llain near Brechfa, Carms in July 2014 and on the shaded bank of an overflow channel of the River Severn above Llandinam, Monts in July 2020. There are scattered records from England and Scotland on this species as well as on *L. nemorum* Yellow Pimpernel and *L. vulgaris* Yellow Loosestrife. The yellowish-brown leaf spots, often towards the leaf tips, have greyish-white mostly hypophyllous caespituli; conidia are 8-35 ×2-6µm, obovoid-ellipsoid to narrowly fusiform, 0-3-septate and formed in chains.

Ramularia lysimachiae on *Lysimachia nummularia*

Ramularia major (Unger) U. Braun (*Ramularia purpurascens* auct.)

Confined to *Adenostyles* Adenostyles, *Homogyne* Purple Colt's-foots and *Petasites* Butterburs in the Asteraceae. Despite its specific name and that it grows on the leaves of *Petasites hybridus* Butterbur, a plant with some of the largest leaves in the British flora, it escaped detection in Wales until July 2020. It was then found on the banks of a small stream below the parish church of Glascwm in Rads on the underside of the widely brown-spotted

oldest leaves. In August 2020 it was found in Mons on a road verge in Cwmyoy, in Brecs in several sites around Llandefallte Church and in September around Llangors Lake (image below). In August 2020 in Carms it was found on a verge near Pen-twyn-mwn, Dyffryn Twyi, and in Myddfai churchyard, and in October 2020 on a road verge at Caernarfon Road near Caernarfon, Caerns. As the season progresses the brown spots darken, become more extensive, though some retain a paler centre. In central Wales all populations of the host examined have been found to support this fungus and it may prove to be widespread. It is reported elsewhere under the name of *R. purpurascens* (now reserved for the fungus on *P. pyrenaicus*) from several vice-counties in the south-west and midlands of England and from Ireland. It was, however rarely detectable in the field under a x10 lens and only revealed its presence under the stereomicroscope. The hypophyllous caespituli are mostly lax, somewhat distant and compared to many other *Ramularia* species are tall, grey and merge well with the brown background colour of the leaf spots. Beside Llangors Lake, however, the caespituli were paler, more visible and extended beyond the brown leaf patches onto still green leaf tissue. Conidia are 10-45 × 2-7µm, obovoid-ellipsoid to narrowly fusiform, 0-3(-5)-septate and formed in chains.



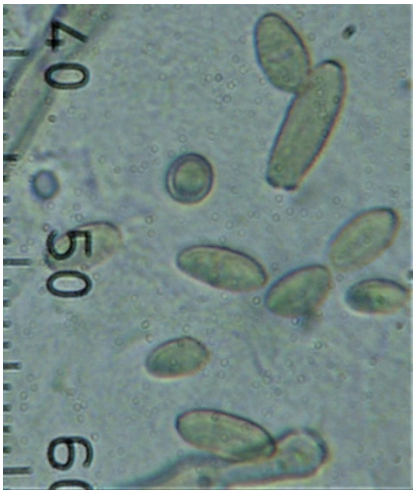
Ramularia major on *Petasites hybridus*. Caespituli on underside of leaf above left. Conidia above right.

Ramularia moehringiae Lindr. (*Ramularia arenariae* A.L. Smith & Ramsb.)

Confined to *Arenaria* Sandworts and *Moehringia* Three-nerved Sandworts and recorded only twice in Wales, on *Moehringia trinervia* Three-nerved Sandwort. Once with the host growing on an ancient horizontal *Salix fragilis* Crack Willow trunk on the shore of Llangors Lake, Brecs in June 2020, and in Cards in a wooded dingle at Penglais, Aberystwyth in late May 2019. There are only a few records from the rest of Britain. The pale or yellowish spots became pale greyish-brown, and the greyish-white caespituli were hypophyllous; conidia are

Ramularia moerhingiae on *Moerhingia trinervia*

6-31 × 2-4µm, narrowly obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed singly.



Ramularia moehringiae conidia

Ramularia onobrychidis Allesch.

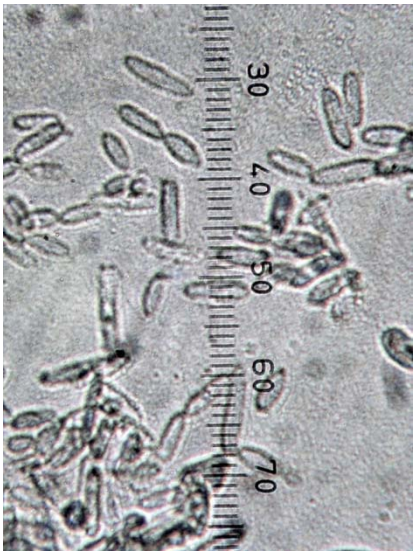
Confined to *Arachis* Ground-nuts and *Onobrychis* Sainfoins in the Fabaceae Pea family, and a significant disease of crops. It was first found in Britain in 1943 on *Onobrychis viciifolia* Sainfoin in the Vale of Glamorgan, and later in Hampshire and the Cotswolds. Hughes (1949) gives its history and describes its life cycle in great detail based on material in crops at Gileston, Llantwit Major and Southerndown in Glam. There are a few records from the south of England, but it is, or was when Sainfoin was more often grown, doubtless more common. The leaf spots start dark brown and become paler from the centre, finally becoming pale throughout or with a dark marginal ring; they are darker on the upper surface, and are often entirely pale brown beneath. The greyish-white caespituli are mostly hypophyllous; conidia are 10-45 × 2-6µm, obovoid-ellipsoid to narrowly fusiform, 0-3-septate and formed in chains.

Ramularia parietariae Pass.

Confined to *Parietaria* Pellitories-of-the-wall, and recorded on *P. judaica* Pellitory-of-the-wall from late March to mid- December, mostly on pavements or walls and especially near the sea, from single sites in Mons, Glam and Brecs, two in Carms, seven in Cards, four in


Ramularia parietariae on *Parietaria judaica*

Caerns, two in Denbs, and one in each of Flints and Angls. At most of these sites it is frequent on many plants in the population. Recorded throughout much of England and in Ireland. Infected dark brownish spots on the leaves, with whitish, hypophyllous sometimes diffuse and inconspicuous caespituli, usually merge with dead, shrivelled parts of the leaves and are easily missed; conidia are 4-25 × 2-7µm, obovoid-ellipsoid to fusiform, 0-1(-2)-septate and formed in chains.

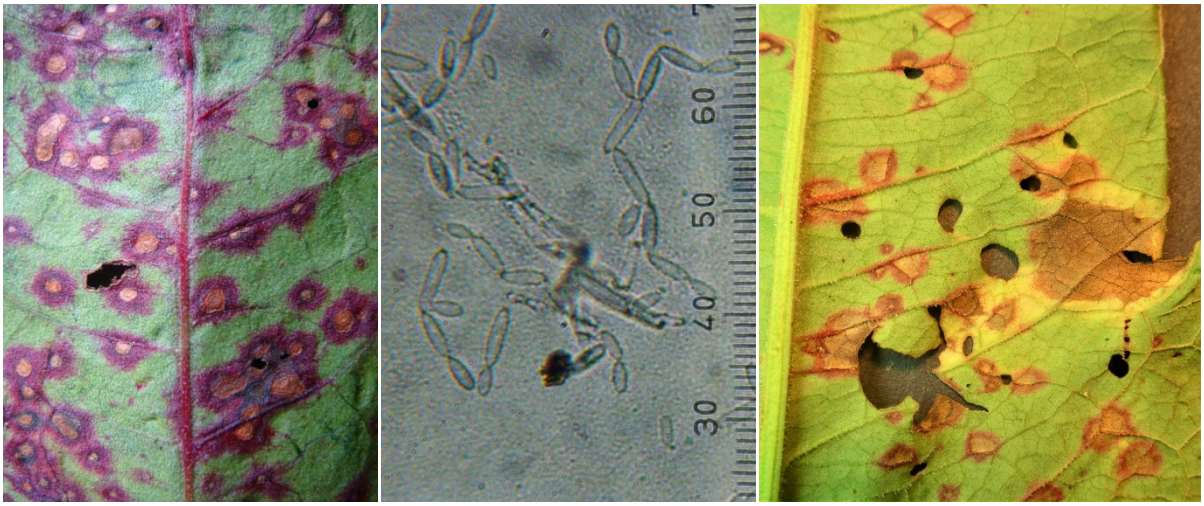


Ramularia parietariae conidia

Ramularia pratensis Sacc. var. ***pratensis***

Confined to *Oxyria* Mountain Sorrels, *Rheum* Rhubarbs and *Rumex* Docks. In Wales it has been recorded on *Rheum* × *rhabarbarum* Rhubarb from Brecs, Rads, Carms, Cards, Monts and Denbs, on *Rumex acetosa* subsp. *acetosa* Common Sorrel from Mons, Brecs, Rads, Pembs, Cards, Mer, Caerns and Angl; on *R. acetosella* Sheep's Sorrel from Loggerheads, Flints in 2016 and in a cemetery, Minffordd, Mer in November 2020, a rare host for this fungus; on *R. conglomeratus* from Glam and Rads, on *R. crispus* subsp. *crispus* Curled Dock from Glam, Rads and Carms and on subsp. *uliginosus* from Cards, on *R. crispus* subsp. undetermined in Brecs, on *R. hydrolapathum* Water Dock from Glam, on *R. maritimus* Golden Dock from winter-flooded fields by Llangors Lake, Brecs, on *Rumex obtusifolius* Broad-leaved Dock from Mons, Glam, Brecs, Rads, Carms, Cards, Monts, Mer, Caerns, Denbs, Flints and Angl; on *R. sanguineus* var. *viridis* Wood Dock from Brecs, Rads, Pembs, Cards and Angl, with an old record from Denbs and on *Rumex* × *dufftii* from Carms, Mer, Denbs and Flints and *R.* × *pratensis* from Carms and Mer. Most records are from mid-May to early October, and up to 345m altitude. It has been recorded throughout Britain and in Ireland on various species of *Rumex* and on *Rheum*. On *Rheum* × *rhabarbarum* infection starts as small reddish-brown dots on the leaves which enlarge and

become paler, and then spots and lesions appear on the stalks, causing them to rot; it is a significant disease of Rhubarb crops. In the Brecs garden, however, it was present on only one of four strains being grown (see image previous page) and a search of other Rhubarb plants in the vicinity and more widely in Mid Wales found it to be very rare. The brownish leaf spots often have a purple edge like many others on these hosts, and the usually hypophyllous greyish-white caespituli look like those of *R. rubella*; conidia are 5-37 × 2-6µm, narrowly obovoid-ellipsoid to narrowly fusiform, 0-3-septate and are formed in chains. *R. rubella* on similar hosts has wider, aseptate conidia 6-15µm wide.

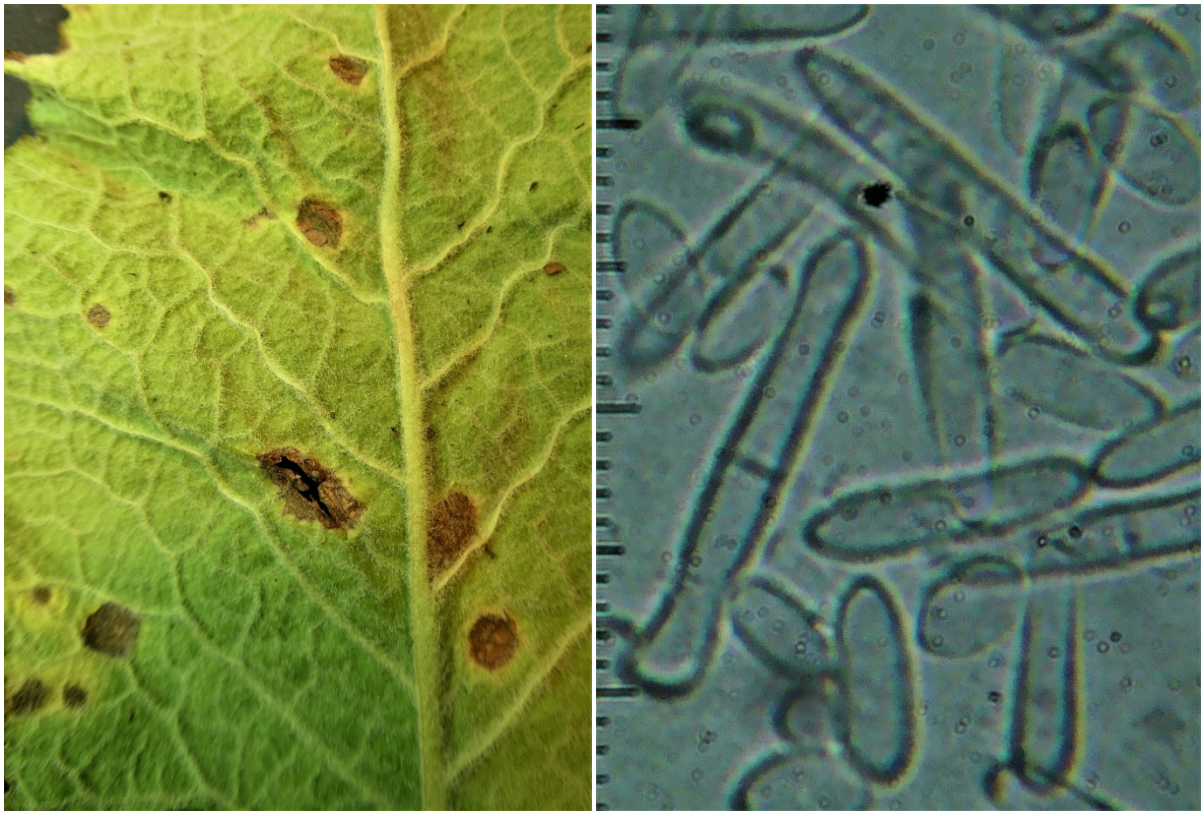


Ramularia pratensis on *Rumex obtusifolius* above left and above right forming somewhat circular spots, often with a purple margin. The extensive brown spot centre right of the above right image with a yellowish margin is *Ramularia rubella*.

Ramularia primulae Thüm.

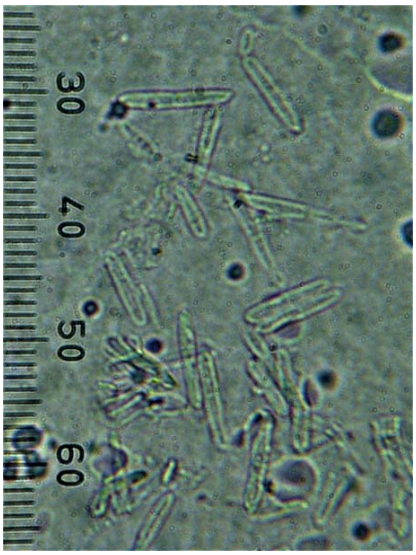
Confined to *Primula* Primroses and as widespread but much commoner in Wales than *R. interstitialis* on *Primula vulgaris* Primrose, being recorded from nine vice-counties from mid-

Ramularia primulae on *Primula veris*



Ramularia primulae on *Primula vulgaris*. Underside of leaf above left and conidia above right

March to early October up to 410m altitude. *R. primulae* has well-defined brownish leaf spots that darken with age and usually have a yellowish margin, and whitish hypophyllous caespituli; conidia are 8-40 × 3-7.5µm, obovoid-ellipsoid to cylindrical, 0-2(-3)-septate and formed in chains. The two species are separable chiefly on microscopic characters of the conidia (see *R. interstitialis*). Widely recorded in Britain and Ireland on *P. vulgaris*, *P. veris* Cowslip and on garden Primulas, there are but two records from Wales on *Primula* × *polyantha* Polyanthus from Mont and Flints and single records on *P. veris* from Rads, Carms, Denbs and Flints and two from Caerns. At the Rads site the infected Cowslip grew through Primrose leaves. There was no sign of the Primrose being infected, hinting at the existence of differing pathotypes. However, some extensive populations of Primrose may only have a single infected leaf.



Ramularia purpurascens conidia

Ramularia purpurascens G. Winter

Confined to *Petasites pyrenaicus* (*P. fragrans*) Winter Heliotrope and recorded from Brecs, Rads (in September), Carms, Pembs (in November), Cards (22 times from New Year to early October in the lowlands), Monts, Mer, Caerns and Denbs and it is doubtless frequent throughout Wales. Widely recorded in England, Scotland and Ireland. The dark purplish leaf spots are like many other spots on this host, and the hypophyllous greyish caespituli can be very inconspicuous; rarely a few

caespituli are epiphyllous, emerging through the upper epidermis on the spots; conidiophores are 5-30µm and conidia are 6-28 × 2-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains. Records on *Petasites hybridus* Butterbur from England and Ireland presumably refer to *R. major* (Unger) U. Braun which has much longer conidiophores 10-150µm, and larger conidia 10-45µm, and does not occur on *P. japonicus* (Braun 1998). *Ramularia coleosporii*, hyperparasitic on, or associated with, the rust genera *Coleosporium* and *Chrysomyxa*, has been recorded on *Petasites* (see under *R. coleosporii* above).

Ramularia purpurascens on *Petasites pyrenaicus*

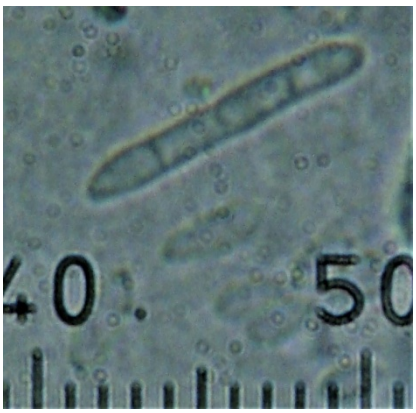
Ramularia rhabdospora (Berk & Broome) Nannf. (*Ramularia plantaginis* auct.)

Confined to *Plantago* Plantains. Recorded on *Plantago lanceolata* Ribwort Plantain 23 times in nine vice-counties from June to October. There are scattered records from Britain and Ireland. The mostly circular or sometimes diffuse brown leaf spots sometimes have a yellowish marginal zone and are highly visible, but the greyish-brown hypophyllous to amphiphyllous caespituli merge well with the background and can be difficult to spot; conidia are 10-50 × 3-7µm, obovoid-ellipsoid to cylindrical, 0-3(-4)-septate and formed in chains. (See *R. kriegeriana* for differences.)

Ramularia rhabdospora on *Plantago lanceolata*

Ramularia rhabdospora on *Plantago lanceolata*

Ramularia rosea (Fuckel) Sacc.



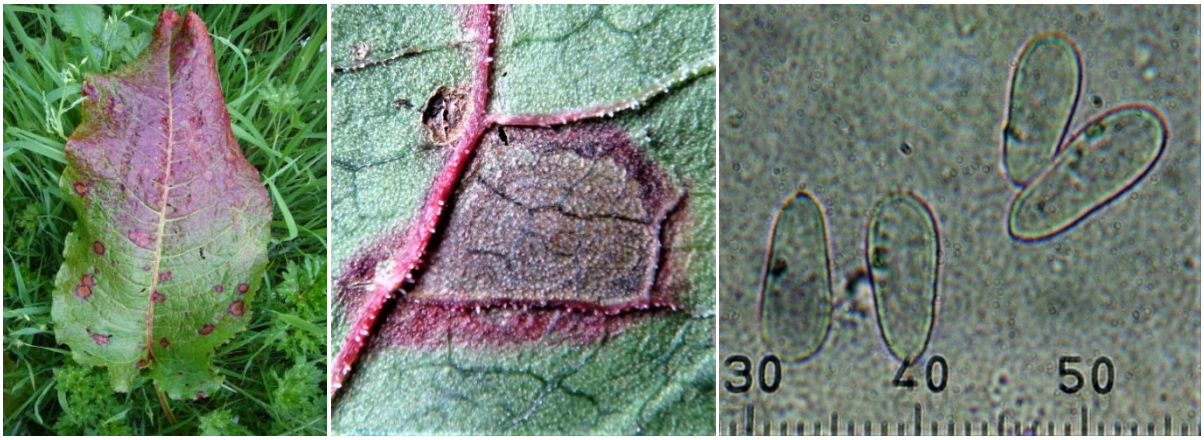
Confined to *Populus* Poplars and *Salix* Willows. Recorded in Wales on *Salix cinerea* subsp. *oleifolia* Grey Willow at Glanyrafon, Cards, in September 2020 and from Wynnstay Park, Denbs in 2019. There are two records from the south of England on *Salix caprea* Goat Willow and *S. triandra* Almond Willow and an unlocalised record on *S. viminalis* Osier, probably from England. Leaf spots are very obscure, merging with general discolouration of

Ramularia rosea on *Salix cinerea* subsp. *oleifolia*

the leaf, and the hypophyllous caespituli are greyish white or pinkish; conidia are 5-25 × 2-5µm, narrowly ellipsoid to fusiform, 0-4-septate and formed in chains. The Cards material was mixed with the rust *Melampsora epitea*, which is said usually to be the case.

Ramularia rubella (Bonord.) Nannf.

Confined to *Rumex* Docks and *Persicaria hydropiper* Water-pepper, though known on the latter only from Poland. One of the commonest species in Wales and recorded from all the vice-counties from the end of March to the end of November, up to 435m altitude on *Rumex*



Ramularia rubella on *Rumex obtusifolius*

Ramularia rubella on *Rumex alpinus*

obtusifolius Broad-leaved Dock. There is a single record on *R. alpinus* Monk's-rhubarb in a garden near Llysdinam in Brecs in June 2020 from where it was also noted on *R. sanguineus* var. *sanguineus* Bloody Dock. The latter infection was also discovered in a garden in Glasbury, Rads in September 2020. There are several records elsewhere in Wales on *R. sanguineus* var. *viridis* Wood Dock, *R. conglomeratus* Clustered Dock and *R. crispus* subsp. *crispus*, subsp. *littoreus* and subsp. *uliginosus* Curled Dock, and the hybrid Docks *R.* × *dufftii* and *R.* × *pratensis*. Widely recorded in Britain and Ireland on several species of *Rumex*. The brownish leaf spots, often rimmed in purple on *Rumex* leaves, are visible on

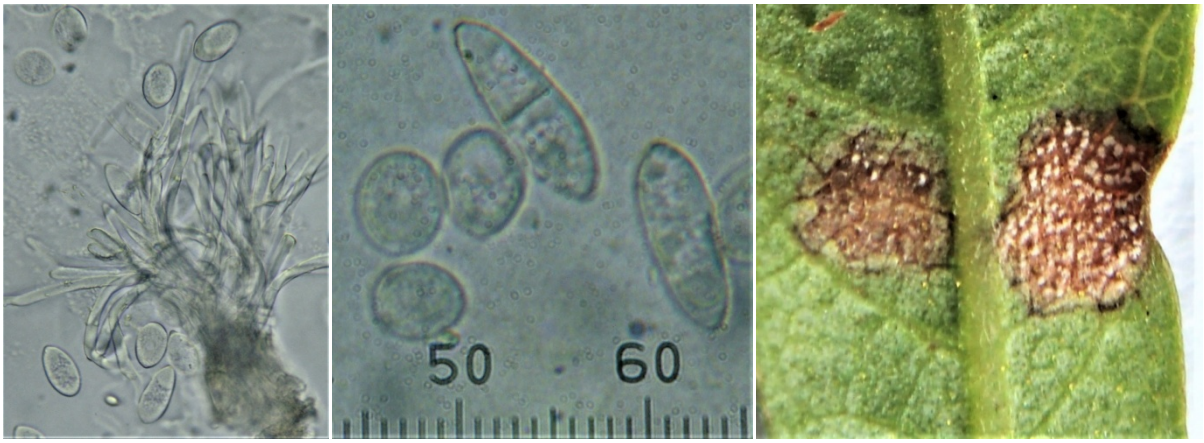
Ramularia rubella on *Rumex sanguineus* var. *sanguineus*

both leaf surfaces but the caespituli are usually hypophyllous; conidia are 10-37 × 6-15µm, obovoid to obovoid-ellipsoid, aseptate (very rarely 1-septate) and formed singly. It is readily distinguishable microscopically from *Ramularia pratensis* which has conidia 2-6µm wide with at least some that are septate. Hatcher & Paul (2000) have shown that infection of *R. obtusifolius* by *Ramularia rubella*, among other fungal pathogens, significantly reduces the amount of grazing by the widespread and common Green Dock Beetle *Gastrophysa viridula*.

Ramularia rufibasis (Berk. & Broome) Gunnerb. & Constant. (*Phacellium rufibasis* (Berk. & Broome) U. Braun, *Ramularia destructiva* W. Phillips & Plowr.)

Confined to Myricaceae Bog-myrtle family. Recorded in Cards from seven sites, from mid-May to late July on *Myrica gale* Bog-myrtle from around Cors Fochno and on Cors y Sychnant, Tyn-y-graig. The only other records are from the Cors Bodeilio fen, Angl in August 2020, and a 1945 unlocalised one from Caerns, but it is doubtless present wherever this host occurs in Wales. There are scattered records throughout Britain and Ireland. There are three distinct types of infection on the host, at least in the Cors Fochno populations in Cards. New shoots arising from the base of the bushes, slightly etiolated and pale, suggesting systemic infection, develop conspicuous small reddish-brown necrotic patches with often slight distortion on the leaves, on the underside of which the white synnematous conidiophores develop. A week or two later similar spots and distortion, but no etiolation or paling, occur on normal leaves higher up on the bushes. The third type is the very dense growth of synnemata on the terminal stems, sometimes looking like a white crust. Conidia are 10-30 × 2-15µm, obovoid-ellipsoid to narrowly ellipsoid, usually aseptate although a very few at the Cards sites were 1-septate and they are formed singly or in short chains. It is one of the few species on woody hosts in Wales.

Ramularia rufibasis on *Myrica gale* showing above left white synnemata covering the stem and centre and right synnemata on the leaves



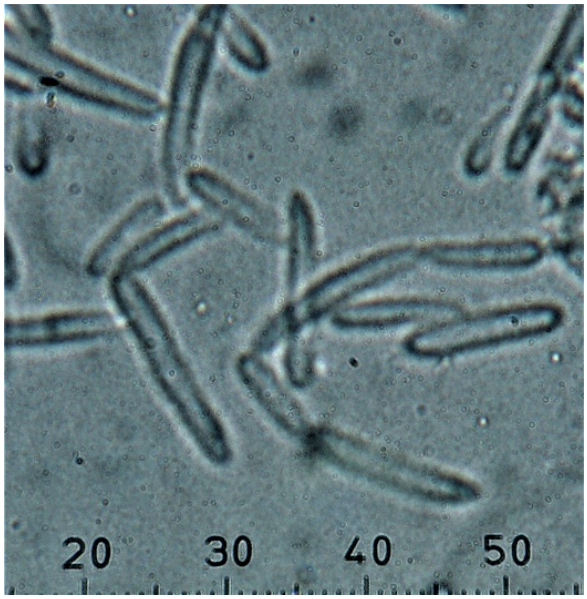
Myrica gale, the yellowing shoots with *Ramularia rufibasis* which is possibly systemic

Ramularia rufomaculans Peck

Confined to *Persicaria* Knotweeds and *Bistorta* Bistorts, and recorded twice on *Persicaria hydropiper* Water-pepper in Cards, in *Salix* scrub by the Afon Rheidol at Lovesgrove in early October 2014, and in marshy scrub at Ynys-hir in mid-September 2015. It appears not to have been recorded before in Britain. The often very extensive pale brown to reddish-brown spots have greyish-white hypophyllous caespituli; conidia are 5-30 × 1-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains. *Ramularia rubella* has been recorded in Poland on *Persicaria hydropiper*, but *Ramularia rufomaculans* is quite distinct in having much narrower conidia (mostly less than 5µm as against more than 5µm).

Ramularia sambucina Sacc.

Confined to *Sambucus* Elders and recorded on *S. nigra* Elder six times in Cards, from mid-July to late September, and up to 290m altitude; twice in Brecs at Llanigon in July 2014 and at Llwycus, Beulah in Sept 2020; in Rads at Glasbury in Jul 2020, in a hedge below Stanner Rocks in September 2020 and in the same month beside a track to the west of Llyn Heilyn, Forest Inn; twice in Carms at the edge of Poor Man's Wood in June 2015 and at Felingwm in July 2020; and in Denbs from Maeshafn in 2019. Widely recorded in England and in Ireland. The roundish, pale greenish to brownish leaf spots, ultimately becoming whitish, have mostly hypophyllous whitish caespituli; conidia are 8-40 × 3-8µm, obovoid-ellipsoid to narrowly fusiform, 0-1(-2)-septate and formed in chains (see image right). It is one of the few species on a woody host in Wales.

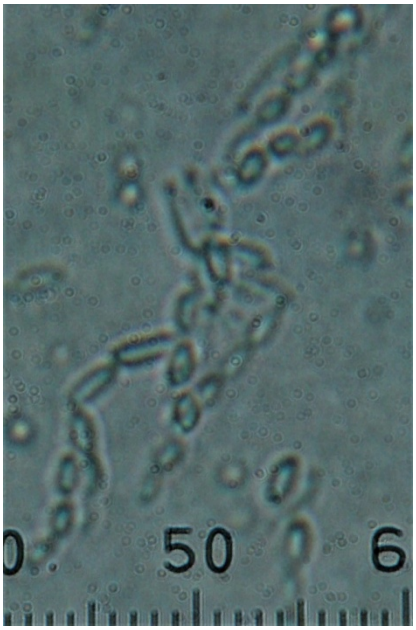


Ramularia sambucina on *Sambucus nigra*

Ramularia scolopendrii Fautrey

Confined to *Asplenium scolopendrium* Hart's-tongue, and recorded from early January to early August from Mons (one site), Brecs (five sites), Rads (two sites) and Cards (17 sites), though undoubtedly it will prove to be more widespread. There are scattered records from England, Scotland and Ireland, mostly in the south. The brownish leaf spots are often

confluent with and indistinguishable from other spots or necroses, and the sparse, whitish hypophyllous caespituli are inconspicuous and easily overlooked, especially when associated with the white spores of the rust *Milesina scolopendrii*; conidia are 5-16 × 2.5-4µm, obovoid-ellipsoid to narrowly fusiform, aseptate and formed in chains. This must explain why there are no records from other vice-counties in Wales. A study of five host populations around Newbridge on Wye in Mid Wales in late May following a long dry spell failed to detect this fungus in the field, but extensive browning of the old previous season's fronds hinted at its presence. Incubating the leaves in a damp chamber for 48 hours led to extensive production of conidiophores and confirmation of its presence, even on fronds from a stunted specimen on a sub-optimal (for the fern host) garden drystone wall.



Ramularia scolopendrii on *Asplenium scolopendrium*

Ramularia septata (Bonord.) Bubák

Confined to *Galanthus* Snowdrops and possibly *Pancratium* Sea Daffodils. Widespread on cultivated and naturalised *Galanthus nivalis* Snowdrop in Cards and recorded 52 times from

Ramularia septata on Galanthus nivalis

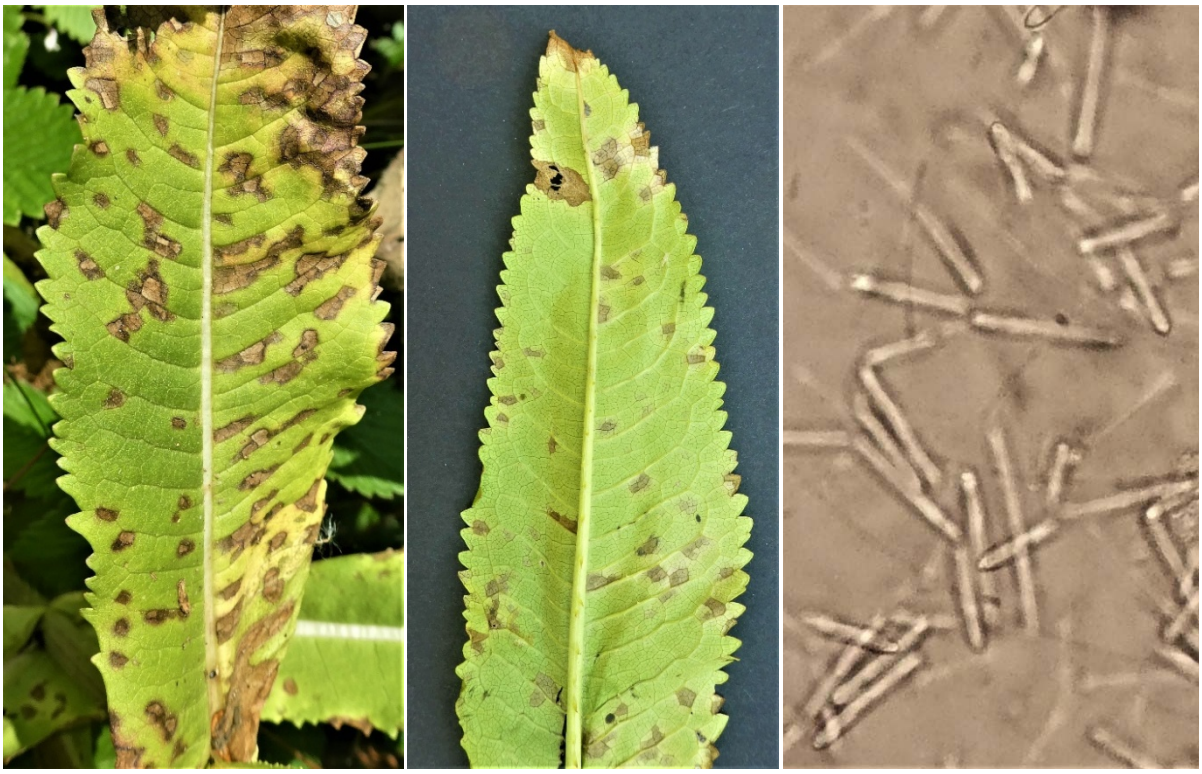
Ramularia septata on *Galanthus nivalis* leaves

mid-March to late May. There have been four records from Brecs, two from Rads and one from Carms on this host. In Brecs it was also noted on naturalised populations of *G. elwesii* Greater Snowdrop and *G. plicatus* Pleated Snowdrop on a wooded river bank near Builth Wells. It seems likely to be widespread throughout Wales on *Galanthus* spp. Recorded elsewhere mostly from the middle and south of England. Infected leaves are characteristically curved apically for several centimetres, usually greyish-brown and withered or necrotic all along one side of the midrib and usually also at the apex. The greyish caespituli are often amphiphyllous and rather obscure; conidia are 15-45 × 3-5µm, narrowly obovoid-ellipsoid to cylindrical, 0- 2(-3)-septate and usually formed in chains.

Ramularia silvestris Sacc.

Confined to *Cephalaria* Giant Scabious and *Dipsacus* Teasels in the Dipsacaceae Teasel family. There is a single Welsh record from *D. fullonum* Wild Teasel growing in a garden at Ty Mawr Mill, Llysdinam Brecs from Aug to Sept 2020. It is reported from England on both this species and in Herefordshire from *D. pilosus* Small Teasel. Despite a significant population of the latter species growing in close proximity to the infected *D. fullonum* in the Llysdinam garden no evidence of infection of this latter species was detected. Similarly a search of wild populations of *D. pilosus* beside the River Wye below Boughrood in Rads failed to locate any infection. There are scattered records from England north to Warwickshire, all on *D. fullonum* except for the one on *D. pilosus* mentioned above. The pale brown, amphigenous colonies were numerous and up to 1cm in diameter with a somewhat angular, vein-delimited margin. The greyish-white hypophyllous caespituli were

inconspicuous; conidia were 35 × 2.5-3.5(-4.5)µm, mostly aseptate and narrowly cylindrical and formed in branched chains.



Ramularia silvestris on *Dipsacus fullonum.*

Ramularia simplex Pass.

Confined to *Ranunculus* Buttercups, *Anemone* Anemones, *Pulsatilla* Pasqueflowers and *Trollius* Globeflowers in the Ranunculaceae Buttercup family. It has been recorded on *Ranunculus repens* Creeping Buttercup in a wide range of habitats, chiefly road and path verges, wet pastures and gardens, from the beginning of February to mid-November. There are three records from Brecs, nine from Rads, three from Pembs, 48 from Cards, one from Monts, three from Mer, eleven from Caerns, one from Denbs, two from Flints and seven from Angl. On *R. repens* at Gilfach Farm, Rads, *Ramularia didyma* and *Ramularia simplex* were growing together on the same leaf lobe. There are three records from Wales on *R. acris* Meadow Buttercup, two in Rads, on a trackside verge near Glan Elan, Llansantffraed Cwmdeuddwr and in a wet pasture near Craffryn, Llanfihangel Rhydithon, both in August 2020, and one in Cards where it was with *Ramularia acris* on the same leaf, but on different lobes, in a heavily grazed damp meadow at Ystumtuen in October 2020. There are scattered records on *R. repens* and *R. acris* from the rest of Britain. The conspicuous yellowish to blackish leaf spots are similar to many other leaf spots on

Ramularia simplex on *Ranunculus repens*

these hosts, and the hypophyllous caespituli are greyish white; conidia are 12-40 × 5-16µm, obovoid to oblong-ellipsoid, 0-1-septate, formed singly. As Ellis & Ellis (1997) do not describe *R. simplex*, it is likely to have been confused with and recorded as *R. didyma* which has narrower conidia 2-6µm wide and formed in chains.

Ramularia sphaeroidea Sacc.

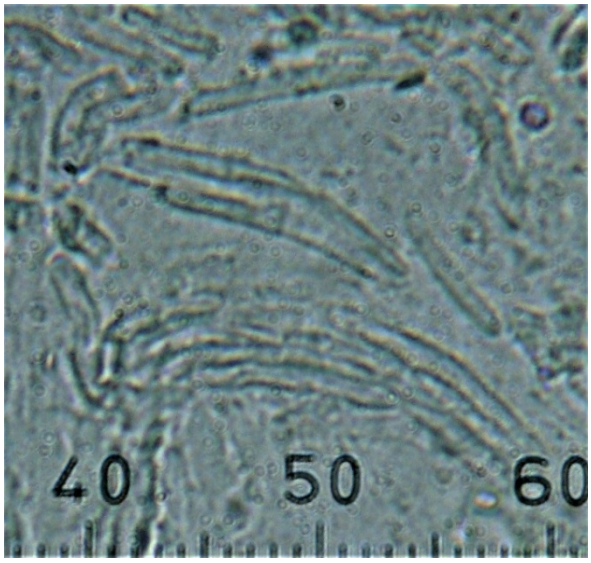
Confined to various genera in the Fabaceae, but in Wales confined to *Lotus* Bird's-foot-trefoils. On *L. pedunculatus* Greater Bird's-foot-trefoil it is very common, with 59 records from Cards from mid-June to late October, up to 440m altitude, mostly on the glabrous var. *pedunculatus*, but with two records on the hairy var. *vestitus*. There are also records on this species from nine other vice-counties and it is doubtless ubiquitous. On *L. corniculatus* Common Bird's-foot-trefoil there is one record from Welsh St Donats, Glam in September

Ramularia sphaeroidea on *Lotus pedunculatus*

Ramularia sphaeroidea on *Lotus pedunculatus*

1973, one from Trefor, Caerns in October 2011 and one from Mold, Flints in 1978. The small yellow to brown leaf spots are conspicuous on the upper surface of the leaf, and the hypophyllous caespituli are very conspicuously dense and white; conidia are 6-18 × 5-15µm, globose to broadly obovoid-ellipsoid, aseptate and formed singly. In *R. schulzeri*, the other species on the same hosts in Britain (but not in Wales), the conidia are 0-1-septate and formed in chains. Widely recorded throughout Britain and Ireland.

Ramularia succisae Sacc.



Confined to *Succisa pratensis* Devil's-bit Scabious and recorded only four times in Wales. Once in Brecs on a shaded bank in a species-rich pasture of Vicarage Meadows, Abergwesyn in September 2020, twice in Cards, on the bank of the Afon Tywi south of Dolgoch in mid-September 2014, and on a flushed cliff slope above Llyn Llygad Rheidol, Pumlumon at the end of August 2015 at 600m altitude and once in Flints in Loggerheads Country Park in 2016. There are only about ten other records from Britain and Ireland, not confined to the uplands. The

brown and blackish-purple leaf spots look like many others on the leaves of *Succisa*. In the Brecs population the *Ramularia* infections differed from other leaf spots in being small and angular and purplish-chestnut with a slightly more yellow-green margin (not purple and circular as in many other leaf spots). The hypophyllous caespituli are whitish and

Ramularia succisae on *Succisa pratensis*

conspicuous; conidia are 6-25 × 2-5µm, obovoid-ellipsoid to narrowly fusiform, 0-1(-3)-septate and formed in chains.

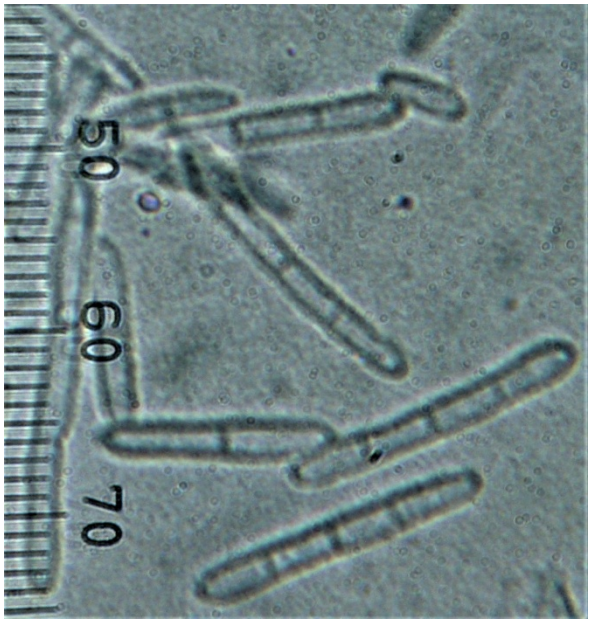
Ramularia tanaceti Lind

Ramularia tanaceti on *Leucanthemum vulgare*

Confined to *Leucanthemum* Oxeye Daisies and *Tanacetum* Tansies. Noted in Wales in early August 2020 on *Leucanthemum vulgare* Oxeye Daisy in a garden in Glasbury, Rads. Caespituli were small but amphigenous. Conidia were 8-22(-30) × 3-4.5µm, cylindrical, 0-1(-2)-septate and formed in chains. This is believed to be the first British record on this host. Braun (1998) reports records on *L. vulgare* only from Poland and the Ukraine. A second species, *R. bellunensis*, also occurs on this host in Europe and differs only in the average width of the conidia, being less than 5µm in *R. tanaceti* and more than 5µm in *R. bellunensis*. Two species are recorded on *Tanacetum* Tansies in England that might occur in Wales. They are *R. tanaceti* on *T. vulgare* Tansy with narrower conidia 2-6µm wide, formed in chains, and *R. bellunensis* on *T. parthenium* Feverfew with wider conidia 4-7µm wide and mostly formed singly.

Ramularia triboutiana (Sacc. & Letendre) Nannf. (*Ramularia centaureae* Lindr.)

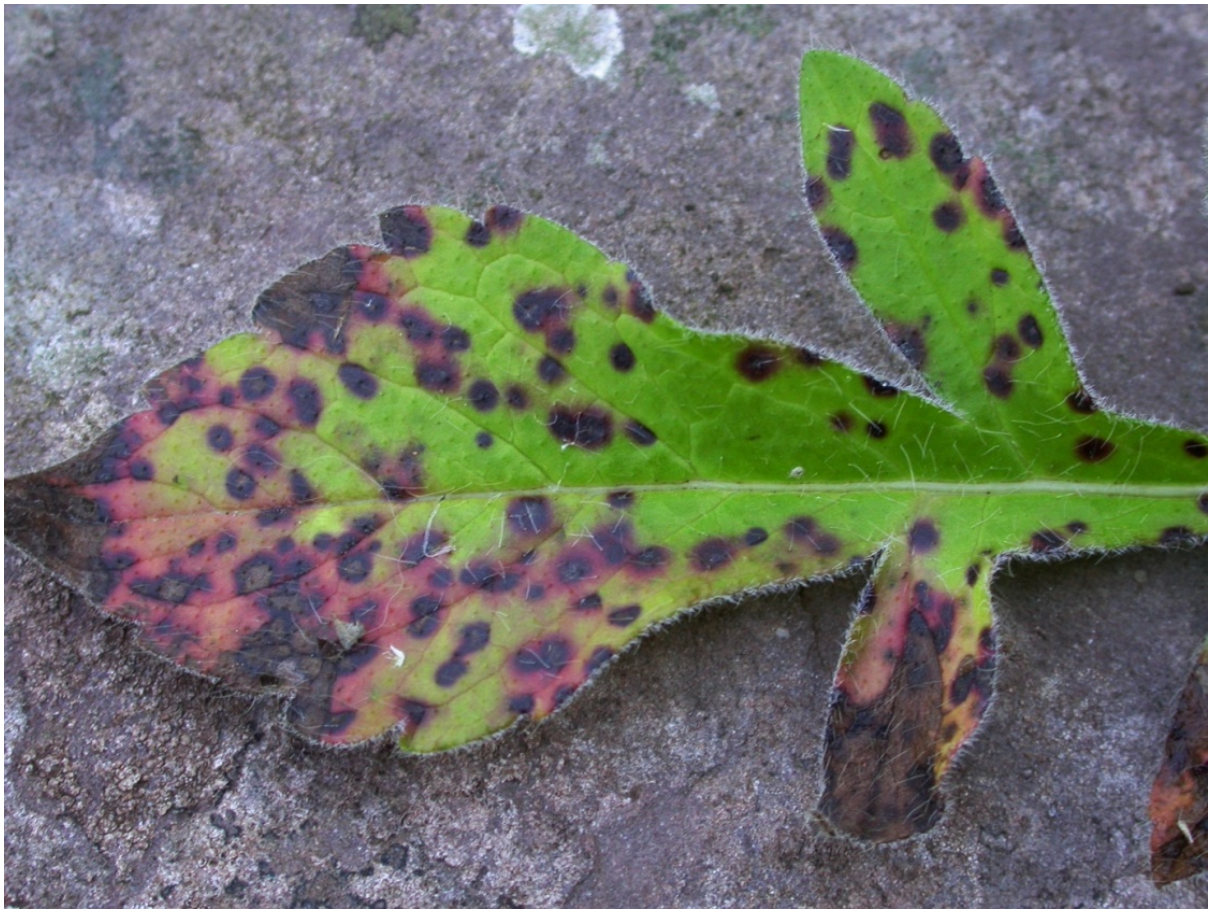
Confined to *Centaurea* Knapweeds and *Rhaponticum* Russian Knapweeds. Found in Wales only on *Centaurea nigra* Common Knapweed, and recorded 21 times in eight vice-counties from July to December and up to 360m altitude. There are only a few other records from Britain on this host and on *Centaurea scabiosa* Greater Knapweed. The greyish-white hypophyllous caespituli are very inconspicuous and scarcely visible in the field, occurring on often extensive brown sectors of the infected leaves. Conidia are 10-80 × 1.5-5µm, narrowly fusiform to cylindrical, 0-3-septate and formed in chains. These patches are like many others on the host (see image overleaf) and it is almost certainly under-recorded.



Ramularia tricherae Lindr.

Confined to *Knautia arvensis* Field Scabious with a single Welsh record from a garden in Glasbury, Rads in August 2020. It has been rarely reported in England with records from Warwickshire, Cambridgeshire and Surrey. The fungus creates conspicuous purplish spots on the upper leaf surface like those that are frequently generated by other means, so it may have been much overlooked. Caespituli are mainly hypophyllous and greyish white; conidia are 6-20 × 2-4µm, obovoid-ellipsoid to narrowly fusiform, echinulate (oil immersion lens), 0-1-septate and formed in chains.

Ramularia triboutiana on *Centaurea nigra* (above)



Ramularia tricherae on *Knautia arvensis*

Ramularia ulmariae Cooke

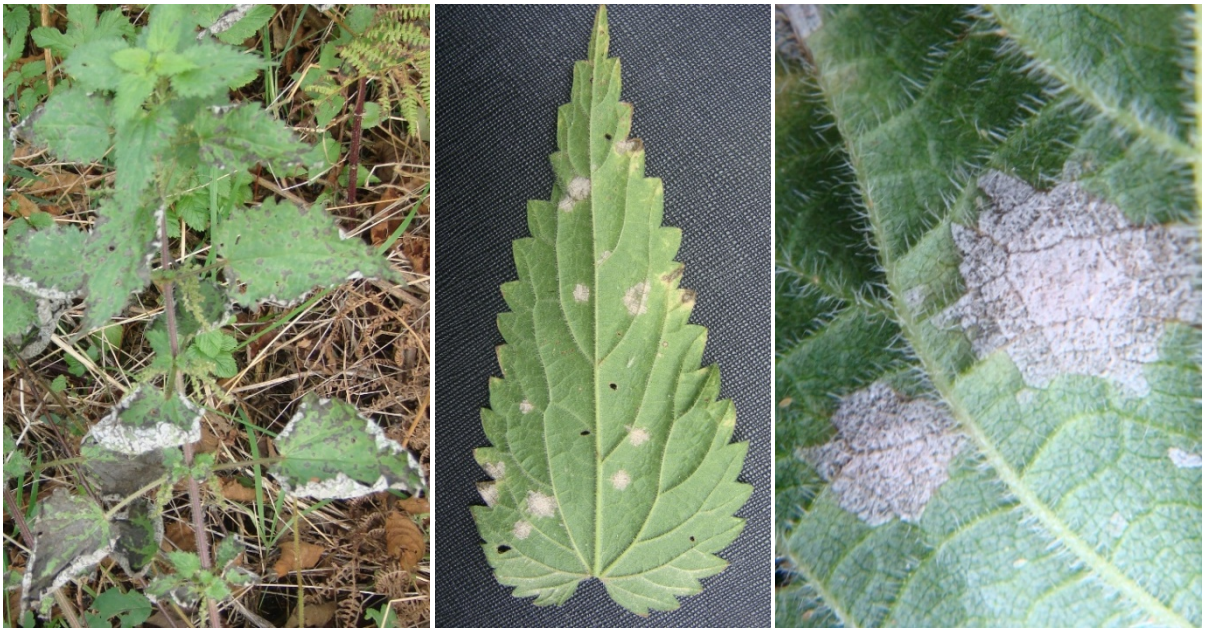
Confined to *Filipendula* Meadowsweets. Found once in Cards, on *F. ulmaria* Meadowsweet on a road verge south-south-west of Pont Llanfair at the end of October 2016, once in Glam;

twice in Denbs in 2016 at Loggerheads and in Pot Hole quarry, Llanferres and twice in Flints in 1978 at Mold and Bagillt. There are scattered records throughout Britain and in Ireland, all on this host. The numerous small, pale greenish leaf spots had conspicuous, dense, whitish, hypophyllous caespituli; conidia are 7-40 × 1.5-6.5µm, narrowly obovoid-ellipsoid to narrowly fusiform, 0-1-septate and formed in chains. Coincidentally, at its only Cards site nearby along the same bit of road verge on the same host was the rare smut, *Urocystis ulmariae*.

Ramularia ulmariae on *Filipendula ulmaria*

Ramularia urticae Ces. (*Ramularia superflua* (Auersw.) Spooner ined.)

Confined to *Urtica*, and possibly one of the commonest and most conspicuous species in Wales, all records being on *U. dioica* Common Nettle. Although there are 114 records from Cards, all year round and up to 425m altitude, there are only rather few other modern records from the other 12 other vice-counties. It has been recorded throughout the rest of Britain and Ireland. The black leaf spots on the upper leaf surface, common for other reasons too on the host leaves, have very conspicuous dense, white, usually felt-like caespituli which are hypophyllous, or occasionally epiphyllous and emerge through the epidermis (not mentioned in Braun 1998); conidia are 6-40 × 2-10.5µm, obovoid-ellipsoid to cylindrical, 0-1(-3)-septate and formed in chains.



Ramularia urticae on *Urtica dioica*

Ramularia valerianae (Speg) Sacc.

Var. ***valerianae***

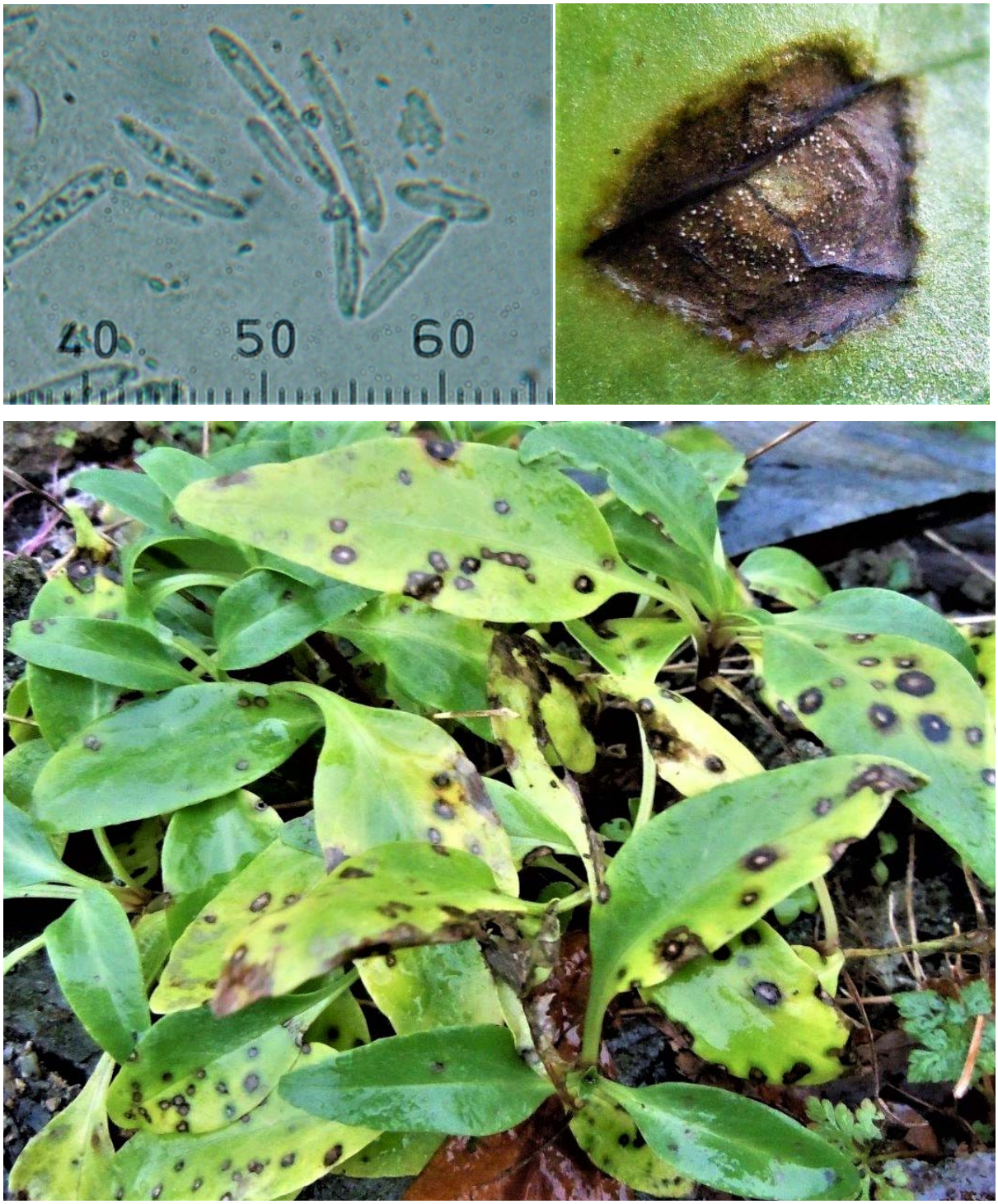
Confined to *Valeriana* Valerians and in Wales only noted on *V. officinalis* Common Valerian. In Glam it occurred in a trackside ditch in Rheola Forest west of Blaengwrach in September 2020; in Brecs it was found in a rhos pasture near Llanwrthwl in June 2020 and from a damp hollow on Llangors Common in July 2020; in Rads in the same month in a fen meadow beside Llanbwchllyn; in Carms in wet woodland at Pen-y-graig-goch in July 2017, and from Cards in eleven sites from early May to mid-September, and up to 360m altitude. There are scattered records throughout Britain and in Ireland on this host, and on *V. dioica* Marsh

Ramularia valerianae var. *valerianae* on *Valeriana officinalis*

Valerian from Norfolk. The brownish leaf spots have sparse, whitish, hypophyllous caespituli; conidia are 8-55 × 1.5-7µm, obovoid-ellipsoid to cylindrical, 0-2(-3)-septate and formed in chains.

Var. ***centranthi*** (Brunaud) U. Braun (*Ramularia centranthi* Brunaud)

Confined to *Centranthus ruber* Red Valerian, there are 22 Welsh records; two in Brecs, five in Rads, one in Carms, two in Pembs, four in Cards, one in Mer, three in Caerns and two in



Ramularia valerianae var. *centranthi* on *Centranthus ruber*

each of Denbs and Angl. It has been reported widely in southern England as far north as Shropshire and in Ireland, and will almost certainly prove to be more widespread in Wales than the current records suggest. Causing dark brown sectors and spots to form on leaves, the white hypophyllous caespitulae are conspicuous and often occur inside a “bull’s eye” of slightly differently coloured leaf tissue.

Ramularia vallisumbrosae Cav.

Confined to *Narcissus* Daffodils, *Leucojum* Snowflakes and *Pancratium* Sea Daffodils and causing sufficient damage to cultivated Daffodils and Narcissi to earn it an English name of Narcissus White Mould and in Welsh Llwydni Gwyn Narcissus. Recorded in Cards 17 times on *Narcissus* from mid-March to mid-May, up to 220m altitude. Twelve of the records were on *N. pseudonarcissus* or its cultivars, two were on *N. hispanicus* cultivars and one each were on a *N. poeticus* hybrid, a *N. bicolor* cultivar and *N.* × *incomparabilis*. There are also single records from Monts and Mer, but it must be widespread in Wales. Diligent searches in the spring of 2020, however, in Brecs and Rads failed to locate any colonies and it may vary in abundance from year to year. There are only about 15 other records throughout Britain in the FRDBI but since it is sometimes a significant disease in commercial Daffodil cultivation it must be very under-recorded. The leaf spots are usually greyish or yellowish-brown, elongated along the leaf and often merging into necrotic stretches, and the infected part of the leaf is usually curved. The often amphiphyllous caespituli can be dense and greyish-white or yellowish; conidia are 5-50 × 2.5-7.5µm, obovoid-ellipsoid to cylindrical, 0-3-septate and formed in chains. Much information can be found in Gregory (1939).

Ramularia vallisumbrosae on *Narcissus pseudonarcissus*

Ramularia veronicae Fuckel

Confined to *Veronica* Speedwells, and for the separation of the three species of *Ramularia* parasitizing *Veronica* see under *R. chamaedryos*. In Wales known from both *V. persica* Common Field-speedwell and *V. arvensis* Wall Speedwell growing on both these hosts on a pavement edge in May 2020 in Newbridge on Wye and on the former host in a garden at Glasbury in July 2020, both in Rads; on *V. persica* in a garden at Pennant in July 2020 in Cards and on *V. arvensis* in a vegetable garden in Llysdinam in May 2020, and on *V. persica* in a vegetable garden near Llanwrthwl in June 2020, both in Brecs. It was also found in Brecs in July 2020 on *V. agrestis* Green Field-speedwell possibly for the first time in Britain, on waste ground near Cilmery. There are records from England on *V. arvensis*, *V. persica* and on *V. montana* Wood Speedwell. Probably much overlooked since large infected sections of the lower leaves become orange brown and might be mistaken for the natural die-back of old leaves, but they differ in that some leaf sectors remain yellow-green. Neatly tufted caespituli form on the lower leaf surface; conidia are 6-28 × 2-8µm, obovoid-ellipsoid to fusiform, 0-1-septate and formed in chains. Several collections of *Ramularia* sp. on *V. montana* from wet woodland in Glam, Brecs, Rads, Carms, Pembs and Flints and on *V. persica* from a field gateway near Boughrood Brest and a trackside below Stanner Rocks,

Ramularia veronicae with aseptate conidia on *Veronica persica*

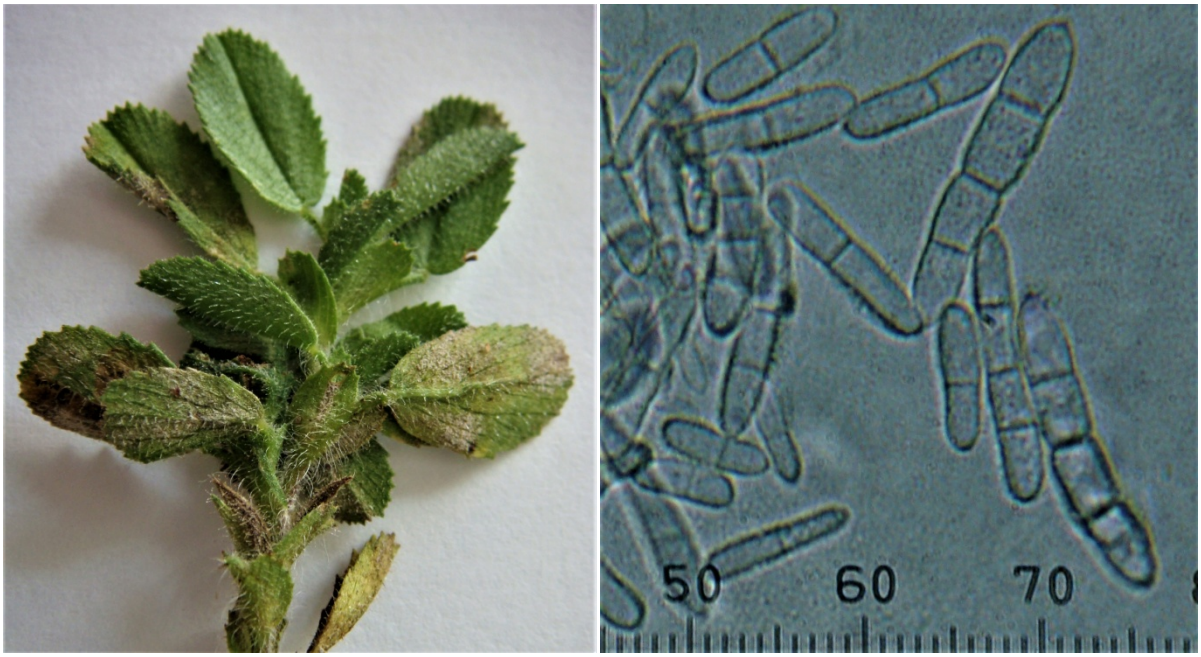
Ramularia veronicae caespituli on *Veronica arvensis* above left and on *V. persica* centre and right

both in Rads, in a garden at Felin-gwm in Carms and in a garden in Cards have proved difficult to place since all had aseptate conidia suggesting *R. chamaedryos*, but this fungus is considered by Braun (1998) only to occur on *V. chamaedrys* Germander Speedwell. Videira *et al*. (2016) suggest that the species on *Veronica* may not be distinct and are possibly a single species, in which case *R. veronicae* would be the earliest name.

Ramularia winteri Thüm.

Confined to *Ononis* Restharrows, and in Wales found only on *O. repens* Common Restharrow. It was recorded in Glam in August 1997, in Carms at Ashpits Pond, Pwll in July 2019 and at Bwlch-y-gwynt, Machynys in September 2019. In Cards it has been recorded at three sites along the coast, on a sandy slope on Tan-y-bwlch beach, Aberystwyth in late August 2011 and 2019, on a grassy slope at Mwnt at the end of July 2011, and on a clay slope at Gwbert in late August 2012. There are scattered records throughout Britain and in Ireland, but it is doubtless rather under-recorded. The leaf spots are diffuse, obscure and pale greenish or brownish, and the hypophyllous caespituli are rather sparse and whitish; conidia are 8-43 × 2-9µm, obovoid-ellipsoid to fusiform, 0-3(-4)-septate and formed in chains.

Ramularia winteri on *Ononis repens*



Ramularia winteri on *Ononis repens*

Census Catalogue

The box below provides a list of Welsh vice-counties (see Watson, 1883 for details), their abbreviations and the numbering system used in the catalogues.

35	Monmouthshire **Mons**	47	Montgomeryshire **Monts**
41	Glamorgan **Glam**	48	Merionethshire **Mer**
42	Breconshire **Brecs**	49	Caernarvonshire **Caerns**
43	Radnorshire **Rads**	50	Denbighshire **Denbs**
44	Carmarthenshire **Carms**	51	Flintshire **Flints**
45	Pembrokeshire **Pembs**	52	Anglesey **Angl**
46	Cardiganshire **Cards**		

Tabulated below alphabetically by both fungus taxon and by host (p98) are records from the thirteen vice-counties of Wales. We have not separated records into date classes since almost all the records have been made post 1970.

White Mould	**Host** (Stace 2019)	**Distribution**
Phacellium trifolii	*Trifolium medium*	46
Ramularia abscondita	*Arctium lappa*	43
Ramularia abscondita	*Arctium minus*	42 43 50 52
Ramularia acris	*Ranunculus acris*	46
Ramularia acris	*Ranunculus acris* ?	49 51
Ramularia adoxae	*Adoxa moschatellina*	35 43 46 47 51
Ramularia agrestis var. *agrestis*	*Viola arvensis*	46
Ramularia agrestis var. *agrestis*	*Viola* × *wittrockiana*	46
Ramularia agrestis var. *deflectens*	*Viola arvensis*	46
Ramularia ajugae	*Ajuga reptans*	41 42 46 49 51 52
Ramularia alborosella	*Cerastium fontanum* ssp. *vulgare*	35 42 46 52
Ramularia alborosella	*Cerastium glomeratum*	46
Ramularia aplospora	*Alchemilla mollis*	42 43 44 46 47 48 49
Ramularia archangelicae	*Angelica sylvestris*	46
Ramularia armoraciae	*Armoracia rusticana*	49 51 52
Ramularia armoraciae	*Barbarea intermedia*	46
Ramularia armoraciae	*Hesperis matronalis*	42 43
Ramularia asplenii	*Asplenium ruta-muraria*	42 43 46 47 51
Ramularia beticola	*Beta* sp.	47
Ramularia beticola	*Beta vulgaris* ssp. *cicla* var. *cicla*	42 49
Ramularia beticola	*Beta vulgaris* ssp. *cicla* var. *flavescens*	43 46 47
Ramularia beticola	*Beta vulgaris* ssp. *maritima*	51
Ramularia beticola	*Beta vulgaris* ssp. *vulgaris*	43 49
Ramularia bistortae	*Bistorta officinalis*	42 43 45 46 49
Ramularia bresadolae	*Stachys palustris*	42

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia caduca	*Circaea lutetiana*	35 41 42 43 44 45 46 47 48 49 50 51 52
Ramularia calthae	*Caltha palustris*	43 45 46 49 52
Ramularia cardamines	*Cardamine flexuosa*	46 47
Ramularia cardamines	*Cardamine pratensis*	50
Ramularia cardamines	*Cardamine* sp.	49 52
Ramularia carneola	*Scrophularia auriculata*	43 44 47 49
Ramularia carneola	*Scrophularia nodosa*	35 41 42 43 44 46 48 49 51 52
Ramularia cerinthes	*Myosotis sylvatica*	43 46
Ramularia chaerophylli	*Anthriscus sylvestris*	46
Ramularia chamaedryos	*Veronica chamaedrys*	35 42 43 44 45 46 48 51
Ramularia chamaedryos ?	*Veronica montana*	45 48
Ramularia chamaenerii	*Chamaenerion angustifolium*	50
Ramularia coccinea	*Veronica chamaedrys*	46
Ramularia coccinea	*Veronica montana*	44
Ramularia coleosporii ?	*Miyagia pseudosphaeria* on *Sonchus arvensis*	46
Ramularia coleosporii	Indet fungus on *Petasites hybridus*	41
Ramularia coleosporii	*Coleosporium tussilaginis* on *Petasites japonicus*	42
Ramularia collo-cygni	*Hordeum distichon*	35 41 42 45 46
Ramularia cupulariae	*Inula conyzae*	43
Ramularia cynarae	*Carduus nutans*	43
Ramularia cynarae	*Cirsium arvense*	42 43 49
Ramularia cynarae	*Cirsium dissectum*	43
Ramularia cynarae	*Cirsium heterophyllum*	42 43
Ramularia cynarae	*Cirsium rivulare*	43
Ramularia cynarae	*Cirsium vulgare*	51
Ramularia cynarae	*Cynara cardunculus* var. *cardunculus*	42
Ramularia cynarae	*Cynara cardunculus* var. *scolymus*	42 43
Ramularia cynoglossi	*Cynoglossum officinale*	46
Ramularia deusta var. *alba*	*Lathyrus odoratus*	42 43 46
Ramularia deusta var. *alba*	*Lathyrus odoratus* ‘Juliet’	43
Ramularia deusta var. *alba*	*Lathyrus odoratus* ‘Leamington’	44
Ramularia deusta var. *alba*	*Lathyrus odoratus* ‘White Ensyn’	44
Ramularia deusta var. *alba*	*Lathyrus odoratus* ‘Miss Wilmott’	43
Ramularia deusta var. *alba*	*Lathyrus odoratus* ‘Winston Churchill’	44

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia deusta var. *deusta*	*Lathyrus latifolius*	46
Ramularia deusta var. *deusta*	*Lathyrus linifolius*	51
Ramularia deusta var. *deusta*	*Lathyrus pratensis*	44
Ramularia didyma var. *didyma*	*Ranunculus acris*	46 51
Ramularia didyma var. *didyma*	*Ranunculis auricomus*	43
Ramularia didyma var. *didyma*	*Ranunculus repens*	35 41 43 44 45 46 48 49 50 51 52
Ramularia didymarioides	*Silene dioica*	42 43 46
Ramularia didymarioides	*Silene latifolia* var. *alba*	51
Ramularia digitalis	*Digitalis purpurea*	35 41 42 43 44 45 46 47 48 49 50 51 52
Ramularia digitalis	*Verbascum thapsus*	42 43
Ramularia doronici	*Doronicum pardalianches*	42 43 44 46 49
Ramularia doronici	*Doronicum plantagineum*	46
Ramularia epilobiana	*Epilobium hirsutum*	35 43 47 49
Ramularia epilobiana	*Epilobium montanum*	41 49
Ramularia episphaeria	*Stellaria holostea*	44
Ramularia filaris	*Jacobaea aquatica*	46
Ramularia filaris	*Jacobaea vulgaris*	46 49 51
Ramularia galegae	*Galega officinalis*	43
Ramularia gei	*Geum macrophyllum*	46
Ramularia gei	*Geum rivale*	50 52
Ramularia gei	*Geum urbanum*	35 42 43 44 45 46 47 48 49 50 51 52
Ramularia gei	*Geum* × *intermedium*	43
Ramularia geranii var. *geranii*	*Geranium robertianium*	50
Ramularia glechomatis	*Glechoma hederacea*	42 43 44 45 46 47 49 50 51
Ramularia grevilleana var. *grevilleana*	*Fragaria* sp.	51
Ramularia grevilleana var. *grevilleana*	*Potentilla reptans*	50
Ramularia grevilleana var. *grevilleana*	*Potentilla* sp.	50
Ramularia hellebori	*Helleborus viridis*	46
Ramularia heraclei	*Heloscia dium nodiflorum*	46
Ramularia heraclei	*Heracleum sphondylium*	35 41 42 43 45 46 48 49 50 51 52
Ramularia heraclei	*Levisticum officinale*	42
Ramularia holci-lanati	*Holcus lanatus*	46
Ramularia inaequalis	*Helminthotheca echioides*	42 43 44 45 49
Ramularia inaequalis	*Hypochaeris radicata*	46
Ramularia inaequalis	*Picris hieracioides* ssp. *hieracioides*	43

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia inaequalis	*Taraxacum* sp.	41 42 43 45 46 48 49 51
Ramularia interstitialis	*Primula veris*	46
Ramularia interstitialis	*Primula vulgaris*	41 42 43 44 45 46 48 49
Ramularia interstitialis	*Primula* × *polyantha* 'Gold Lace'	42
Ramularia kriegeriana	*Plantago major*	49 51
Ramularia lactea	*Viola odorata*	43 49
Ramularia lactea	*Viola riviniana*	35 42 43 44 45 46 48 49 50 51 52
Ramularia lactea	*Viola riviniana purpurea* group	43
Ramularia lamii var. *lamii*	*Galeopsis bifida*	43 46 51
Ramularia lamii var. *lamii*	*Galeopsis tetrahit*	42 43
Ramularia lamii var. *lamii*	*Lamiastrum galeobdolon*	43
Ramularia lamii var. *lamii*	*Lamium album*	41 42 43 46 49 51 52
Ramularia lamii var. *lamii*	*Lamium hybridum*	46
Ramularia lamii var. *lamii*	*Lamium purpureum*	42 47 49
Ramularia lamii var. *lamii*	*Lycopus europaeus*	42
Ramularia lamii var. *lamii*	*Mentha spicata*	43
Ramularia lamii var. *lamii*	*Stachys sylvatica*	46 49 50
Ramularia lamii var. *minor*	*Stachys arvensis*	42
Ramularia lampsanae	*Lapsana communis* ssp. *communis*	35 42 43 44 45 46 47 48 49 51 52
Ramularia linariae	*Linaria vulgaris*	43
Ramularia lychnicola	*Silene dioica*	50 51 52
Ramularia lysimachiae	*Lysimachia nummularia*	42 43 44 47
Ramularia major	*Petasites hybridus*	35 41 42 43 44 47 49 50
Ramularia moehringiae	*Moehringia trinervia*	42 46
Ramularia onobrychidis	*Onobrychis viciifolia*	41
Ramularia parietariae	*Parietaria judaica*	35 41 42 44 46 49 50 51 52
Ramularia pratensis var. *pratensis*	*Rheum* × *rhabarbarum*	42 43 44 46 47 50
Ramularia pratensis var. *pratensis*	*Rumex acetosa* ssp. *acetosa*	35 42 43 45 46 48 49 52
Ramularia pratensis var. *pratensis*	*Rumex acetosella*	48 51
Ramularia pratensis var. *pratensis*	*Rumex conglomeratus*	41 43
Ramularia pratensis var. *pratensis*	*Rumex crispus* ssp. *crispus*	41 42 43 44
Ramularia pratensis var. *pratensis*	*Rumex crispus* ssp. *uliginosus*	46

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia pratensis var. *pratensis*	*Rumex hydrolapathum*	41
Ramularia pratensis var. *pratensis*	*Rumex maritimus*	42
Ramularia pratensis var. *pratensis*	*Rumex obtusifolius*	35 41 42 43 44 45 46 47 48 49 50 51 52
Ramularia pratensis var. *pratensis*	*Rumex sanguineus* var. *viridis*	42 43 45 46 50 52
Ramularia pratensis var. *pratensis*	*Rumex* sp.	50
Ramularia pratensis var. *pratensis*	*Rumex* × *dufftii*	44 48 50 51
Ramularia pratensis var. *pratensis*	*Rumex* × *pratensis*	44 48
Ramularia primulae	*Primula veris*	43 44 49 50 51
Ramularia primulae	*Primula vulgaris*	41 42 43 44 45 46 48 49 52
Ramularia primulae	*Primula* × *polyantha*	47 51
Ramularia purpurascens	*Petasites pyrenaicus*	42 43 44 45 46 47 48 49 50
Ramularia rhabdospora	*Plantago lanceolata*	35 41 42 43 46 47 49 50 51
Ramularia rosea	*Salix cinerea* ssp. *oleifolia*	46
Ramularia rubella	*Rumex alpinus*	42
Ramularia rubella	*Rumex conglomeratus*	41 42 43 44 46
Ramularia rubella	*Rumex crispus* ssp. *crispus*	42 43 44 46 48 49 51 52
Ramularia rubella	*Rumex crispus* ssp.*littoreus*	49
Ramularia rubella	*Rumex crispus* ssp. *uliginosus*	46 48
Ramularia rubella	*Rumex obtusifolius*	35 41 42 43 44 45 46 47 48 49 50 51 52
Ramularia rubella	*Rumex sanguineus* var. *sanguineus*	42 43
Ramularia rubella	*Rumex sanguineus* var. *viridis*	35 41 42 43 44 45 46 47 48 51
Ramularia rubella	*Rumex* sp.	35 46 48 49 51
Ramularia rubella	*Rumex* × dufftii	42 43 44 47 48 50 51
Ramularia rubella	*Rumex* × pratensis	41 42 43 44
Ramularia rufibasis	*Myrica gale*	46 49 52
Ramularia rufomaculans	*Persicaria hydropiper*	46
Ramularia sambucina	*Sambucus nigra*	42 43 44 46 50
Ramularia scolopendrii	*Asplenium scolopendrium*	35 42 43 46

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia septata	*Galanthus elwesii*	42
Ramularia septata	*Galanthus nivalis*	42 43 46 47
Ramularia septata	*Galanthus plicatus*	42
Ramularia silvestris	*Dipsacus fullonum*	42
Ramularia simplex	*Ranunculus acris*	43 46
Ramularia simplex	*Ranunculus repens*	42 43 45 46 47 48 49 50 51 52
Ramularia sphaeroidea	*Lotus corniculatus*	41 49 51
Ramularia sphaeroidea	*Lotus pedunculatus*	44 45 47 48 49 52
Ramularia sphaeroidea	*Lotus pedunculatus* var. *pedunculatus*	35 42 43 44 46
Ramularia sphaeroidea	*Lotus pedunculatus* var. *vestitus*	46
Ramularia succisae	*Succisa pratensis*	42 46 51
Ramularia tanaceti	*Leucanthemum vulgare*	43
Ramularia triboutiana	*Centaurea nigra*	41 42 43 44 46 49 50 52
Ramularia tricherae	*Knautia arvensis*	43
Ramularia ulmariae	*Filipendula ulmaria*	41 46 50 51
Ramularia urticae	*Urtica dioica*	35 41 42 43 44 45 46 47 48 49 50 51 52
Ramularia valerianae var. *centranthi*	*Centranthus ruber*	42 43 44 45 46 48 49 50 52
Ramularia valerianae var. *valerianae*	*Valeriana officinalis*	41 42 43 44 46
Ramularia vallisumbrosae	*Narcissus bicolor*	46
Ramularia vallisumbrosae	*Narcissus hispanicus*	46
Ramularia vallisumbrosae	*Narcissus poeticus*	46
Ramularia vallisumbrosae	*Narcissus pseudonarcissus*	46 47 48
Ramularia vallisumbrosae	*Narcissus* × *incomparabilis*	46
Ramularia veronicae	*Veronica agrestis*	42
Ramularia veronicae	*Veronica arvensis*	42 43
Ramularia veronicae	*Veronica persica*	42 43 44 46
Ramularia winteri	*Ononis repens*	41 44 46

Host (Stace 2019)	**White Mould**	**Distribution**
Adoxa moschatellina	*Ramularia adoxae*	35 43 46 47 51
Ajuga reptans	*Ramularia ajugae*	41 42 46 49 51 52
Alchemilla mollis	*Ramularia aplospora*	42 43 44 46 47 48 49
Angelica sylvestris	*Ramularia archangelicae*	46
Anthriscus sylvestris	*Ramularia chaerophylli*	46
Arctium lappa	*Ramularia abscondita*	43
Arctium minus	*Ramularia abscondita*	42 43 50 52
Armoracia rusticana	*Ramularia armoraciae*	49 51 52
Asplenium ruta-muraria	*Ramularia asplenii*	42 43 46 47 51
Asplenium scolopendrium	*Ramularia scolopendrii*	35 42 43 46
Barbarea intermedia	*Ramularia armoraciae*	46
Beta sp.	*Ramularia beticola*	47
Beta vulgaris ssp. *cicla* var. *cicla*	*Ramularia beticola*	42 49
Beta vulgaris ssp. *cicla* var. *flavescens*	*Ramularia beticola*	43 46 47
Beta vulgaris ssp. *maritima*	*Ramularia beticola*	51
Beta vulgaris ssp. *vulgaris*	*Ramularia beticola*	43 49
Bistorta officinalis	*Ramularia bistortae*	42 43 45 46 49
Caltha palustris	*Ramularia calthae*	43 45 46 49 52
Cardamine flexuosa	*Ramularia cardamines*	46 47
Cardamine pratensis	*Ramularia cardamines*	50
Cardamine sp.	*Ramularia cardamines*	49 52
Carduus nutans	*Ramularia cynarae*	43
Centaurea nigra	*Ramularia triboutiana*	41 42 43 44 46 49 50 52
Centranthus ruber	*Ramularia valerianae* var. *centranthi*	42 43 44 45 46 48 49 50 52
Cerastium fontanum ssp. *vulgare*	*Ramularia alborosella*	35 42 46 52
Cerastium glomeratum	*Ramularia alborosella*	46
Chamaenerion angustifolium	*Ramularia chamaenerii*	50
Circaea lutetiana	*Ramularia caduca*	35 41 42 43 44 45 46 47 48 49 50 51 52
Cirsium arvense	*Ramularia cynarae*	42 43 49
Cirsium dissectum	*Ramularia cynarae*	43
Cirsium heterophyllum	*Ramularia cynarae*	42 43
Cirsium rivulare	*Ramularia cynarae*	43
Cirsium vulgare	*Ramularia cynarae*	51
Coleosporium tussilaginis on *Petasites japonicas*	*Ramularia coleosporii*	42
Cynara cardunculus var. *cardunculus*	*Ramularia cynarae*	42
Cynara cardunculus var. *scolymus*	*Ramularia cynarae*	42 43
Cynoglossum officinale	*Ramularia cynoglossi*	46

Host (Stace 2019)	**White Mould**	**Distribution**
Digitalis purpurea	*Ramularia digitalis*	35 41 42 43 44 45 46 47 48 49 50 51 52
Dipsacus fullonum	*Ramularia silvestris*	42
Doronicum pardalianches	*Ramularia doronici*	42 43 44 46 49
Doronicum plantagineum	*Ramularia doronici*	46
Epilobium hirsutum	*Ramularia epilobiana*	35 43 47 49
Epilobium montanum	*Ramularia epilobiana*	41 49
Filipendula ulmaria	*Ramularia ulmariae*	41 46 50 51
Fragaria sp.	*Ramularia grevilleana* var. *grevilleana*	51
Galanthus elwesii	*Ramularia septata*	42
Galanthus nivalis	*Ramularia septata*	42 43 46 47
Galanthus plicatus	*Ramularia septata*	42
Galega officinalis	*Ramularia galegae*	43
Galeopsis bifida	*Ramularia lamii* var. *lamii*	43 46 51
Galeopsis tetrahit	*Ramularia lamii* var. *lamii*	42 43
Geranium robertianium	*Ramularia geranii* var. *geranii*	50
Geum × *intermedium*	*Ramularia gei*	43
Geum macrophyllum	*Ramularia gei*	46
Geum rivale	*Ramularia gei*	50 52
Geum urbanum	*Ramularia gei*	35 42 43 44 45 46 47 48 49 50 51 52
Glechoma hederacea	*Ramularia glechomatis*	42 43 44 45 46 47 49 50 51
Helleborus viridis	*Ramularia hellebore*	46
Helminthotheca echioides	*Ramularia inaequalis*	42 43 44 45 49
Helosciadium nodiflorum	*Ramularia heraclei*	46
Heracleum sphondylium	*Ramularia heraclei*	35 41 42 43 45 46 48 49 50 51 52
Hesperis matronalis	*Ramularia armoraciae*	42 43
Holcus lanatus	*Ramularia holci-lanati*	46
Hordeum distichon	*Ramularia collo-cygni*	35 41 42 45 46
Hypochaeris radicata	*Ramularia inaequalis*	46
Indet fungus on *Petasites hybridus*	*Ramularia coleosporii*	41
Inula conyzae	*Ramularia cupulariae*	43
Jacobaea aquatica	*Ramularia filaris*	46
Jacobaea vulgaris	*Ramularia filaris*	46 49 51
Knautia arvensis	*Ramularia tricherae*	43
Lamiastrum galeobdolon	*Ramularia lamii* var. *lamii*	43
Lamium album	*Ramularia lamii* var. *lamii*	41 42 43 46 49 51 52
Lamium hybridum	*Ramularia lamii* var. *lamii*	46

Host (Stace 2019)	**White Mould**	**Distribution**
Lamium purpureum	*Ramularia lamii* var. *lamii*	42 47 49
Lapsana communis ssp. *Communis*	*Ramularia lampsanae*	35 42 43 44 45 46 47 48 49 51 52
Lathyrus latifolius	*Ramularia deusta* var. *deusta*	46
Lathyrus linifolius	*Ramularia deusta* var. *deusta*	51
Lathyrus odoratus	*Ramularia deusta* var. *alba*	42 43 46
*Lathyrus odoratus"*Juliet'	*Ramularia deusta* var. *alba*	43
Lathyrus odoratus 'Leamington'	*Ramularia deusta* var. *alba*	44
Lathyrus odoratus 'Miss Wilmott'	*Ramularia deusta* var. *alba*	43
Lathyrus odoratus 'White Ensyn'	*Ramularia deusta* var. *alba*	
Lathyrus odoratus 'Winston Churchill'	*Ramularia deusta* var. *alba*	44
Lathyrus pratensis	*Ramularia deusta* var. *deusta*	44
Leucanthemum vulgare	*Ramularia tanaceti*	43
Levisticum officinale	*Ramularia heraclei*	42
Linaria vulgaris	*Ramularia linariae*	43
Lotus corniculatus	*Ramularia sphaeroidea*	41 49 51
Lotus pedunculatus	*Ramularia sphaeroidea*	44 45 47 48 49 52
Lotus pedunculatus var. *pedunculatus*	*Ramularia sphaeroidea*	35 42 43 44 46
Lotus pedunculatus var. *vestitus*	*Ramularia sphaeroidea*	46
Lycopus europaeus	*Ramularia lamii* var. *lamii*	42
Lysimachia nummularia	*Ramularia lysimachiae*	42 43 44 47
Mentha spicata	*Ramularia lamii* var. *lamii*	43
Miyagia pseudosphaeria on *Sonchus arvensis*	*Ramularia coleosporii* ?	46
Moehringia trinervia	*Ramularia moehringiae*	42 46
Myosotis sylvatica	*Ramularia cerinthes*	43 46
Myrica gale	*Ramularia rufibasis*	46 49 52
Narcissus bicolor	*Ramularia vallisumbrosae*	46
Narcissus hispanicus	*Ramularia vallisumbrosae*	46
Narcissus × incomparabilis	*Ramularia vallisumbrosae*	46
Narcissus poeticus	*Ramularia vallisumbrosae*	46
Narcissus pseudonarcissus	*Ramularia vallisumbrosae*	46 47 48
Onobrychis viciifolia	*Ramularia onobrychidis*	41
Ononis repens	*Ramularia winteri*	41 44 46
Parietaria judaica	*Ramularia parietariae*	35 41 42 44 46 49 50 51 52
Persicaria hydropiper	*Ramularia rufomaculans*	46
Petasites hybridus	*Ramularia major*	35 41 42 43 44 47 49 50
Petasites pyrenaicus	*Ramularia purpurascens*	42 43 44 45 46 47 48 49 50
Picris hieracioides ssp. *hieracioides*	*Ramularia inaequalis*	43

Host (Stace 2019)	**White Mould**	**Distribution**
Plantago lanceolata	*Ramularia rhabdospora*	35 41 42 43 46 47 49 50 51
Plantago major	*Ramularia kriegeriana*	49 51
Potentilla reptans	*Ramularia grevilleana* var. *grevilleana*	50
Potentilla sp.	*Ramularia grevilleana* var. *grevilleana*	50
Primula × *polyantha*	*Ramularia primulae*	47 51
Primula × *polyantha* 'Gold Lace'	*Ramularia interstitialis*	42
Primula veris	*Ramularia interstitialis*	46
Primula veris	*Ramularia primulae*	43 44 49 50 51
Primula vulgaris	*Ramularia interstitialis*	41 42 43 44 45 46 48 49
Primula vulgaris	*Ramularia primulae*	41 42 43 44 45 46 48 49 52
Ranunculis auricomus	*Ramularia didyma* var. *didyma*	43
Ranunculus acris	*Ramularia acris*	46
Ranunculus acris	*Ramularia didyma* var. *didyma*	46 51
Ranunculus acris	*Ramularia simplex*	43 46
Ranunculus acris ?	*Ramularia acris*	49 51
Ranunculus repens	*Ramularia didyma* var. *didyma*	35 41 43 44 45 46 48 49 50 51 52
Ranunculus repens	*Ramularia simplex*	42 43 45 46 47 48 49 50 51 52
Rheum × *rhabarbarum*	*Ramularia pratensis* var. *pratensis*	42 43 44 46 47 50
Rumex acetosa ssp. *acetosa*	*Ramularia pratensis* var. *pratensis*	35 42 43 45 46 48 49 52
Rumex acetosella	*Ramularia pratensis* var. *pratensis*	48 51
Rumex alpinus	*Ramularia rubella*	42
Rumex conglomeratus	*Ramularia pratensis* var. *pratensis*	41 43
Rumex conglomeratus	*Ramularia rubella*	41 42 43 44 46
Rumex crispus ssp. *crispus*	*Ramularia pratensis* var. *pratensis*	41 42 43 44
Rumex crispus ssp. *crispus*	*Ramularia rubella*	42 43 44 46 48 49 51 52
Rumex crispus ssp. *uliginosus*	*Ramularia pratensis* var. *pratensis*	46
Rumex crispus ssp. *uliginosus*	*Ramularia rubella*	46 48
Rumex crispus ssp.*littoreus*	*Ramularia rubella*	49
Rumex × *dufftii*	*Ramularia pratensis* var. *pratensis*	44 48 50 51
Rumex × *dufftii*	*Ramularia rubella*	42 43 44 47 48 50 51

Host (Stace 2019)	**White Mould**	**Distribution**
Rumex hydrolapathum	*Ramularia pratensis* var. *pratensis*	41
Rumex maritimus	*Ramularia pratensis* var. *pratensis*	42
Rumex obtusifolius	*Ramularia pratensis* var. *pratensis*	35 41 42 43 44 45 46 47 48 49 50 51 52
Rumex obtusifolius	*Ramularia rubella*	35 41 42 43 44 45 46 47 48 49 50 51 52
Rumex × *pratensis*	*Ramularia pratensis* var. *pratensis*	44 48
Rumex × *pratensis*	*Ramularia rubella*	41 42 43 44
Rumex sanguineus var. *sanguineus*	*Ramularia rubella*	42 43
Rumex sanguineus var. *viridis*	*Ramularia pratensis* var. *pratensis*	42 43 45 46 50 52
Rumex sanguineus var. *viridis*	*Ramularia rubella*	35 41 42 43 44 45 46 47 48 51
Rumex sp.	*Ramularia pratensis* var. *pratensis*	50
Rumex sp.	*Ramularia rubella*	35 46 48 49 51
Salix cinerea ssp. *oleifolia*	*Ramularia rosea*	46
Sambucus nigra	*Ramularia sambucina*	42 43 44 46 50
Scrophularia auriculata	*Ramularia carneola*	43 44 47 49
Scrophularia nodosa	*Ramularia carneola*	35 41 42 43 44 46 48 49 51 52
Silene dioica	*Ramularia didymarioides*	42 43 46
Silene dioica	*Ramularia lychnicola*	50 51 52
Silene latifolia var. *alba*	*Ramularia didymarioides*	51
Stachys arvensis	*Ramularia lamii* var. *minor*	42
Stachys palustris	*Ramularia bresadolae*	42
Stachys sylvatica	*Ramularia lamii* var. *lamii*	46 49 50
Stellaria holostea	*Ramularia episphaeria*	44
Succisa pratensis	*Ramularia succisae*	42 46 51
Taraxacum sp.	*Ramularia inaequalis*	41 42 43 45 46 48 49 51
Trifolium medium	*Phacellium trifolii*	46
Urtica dioica	*Ramularia urticae*	35 41 42 43 44 45 46 47 48 49 50 51 52
Valeriana officinalis	*Ramularia valerianae* var. *valerianae*	41 42 43 44 46
Verbascum thapsus	*Ramularia digitalis*	42 43
Veronica agrestis	*Ramularia veronicae*	42
Veronica arvensis	*Ramularia veronicae*	42 43

Host (Stace 2019)	**White Mould**	**Distribution**
Veronica chamaedrys	*Ramularia chamaedryos*	35 42 43 44 45 46 48 51
Veronica chamaedrys	*Ramularia coccinea*	46
Veronica montana	*Ramularia chamaedryos* ?	45 48
Veronica montana	*Ramularia coccinea*	44
Veronica persica	*Ramularia veronicae*	42 43 44 46
Viola arvensis	*Ramularia agrestis* var. *agrestis*	46
Viola arvensis	*Ramularia agrestis* var. *deflectens*	46
Viola odorata	*Ramularia lactea*	43 49
Viola riviniana	*Ramularia lactea*	35 42 43 44 45 46 48 49 50 51 52
Viola riviniana purpurea group	*Ramularia lactea*	43
Viola × wittrockiana	*Ramularia agrestis* var. *agrestis*	46

The following table summarises the numbers of White Mould species so far recorded from each Welsh vice-county in the column headed “WM spp.” Only those vice-counties in bold type have been intensively studied and only Cardiganshire has a significant number of records from other than the year 2020. A total of 61 species of White Mould recorded from this latter vice-county on 89 host taxa must be one of the largest known for any British or Irish vice-county. It exceeds the total species list for the whole of Ireland and is only slightly less than the total for Scotland. The total of vascular plants for each vice-county is taken from the BSBI database in December 2019.

Vice-county	**WM spp**	**WM x Hosts**	**Total Vascular Plants**
35 Monmouthshire	21	24	1800
41 Glamorgan	26	33	2086
42 Breconshire	**47**	**76**	**1568**
43 Radnorshire	**48**	**85**	**1302**
44 Carmarthenshire	**30**	**46**	**1682**
45 Pembrokeshire	22	28	1433
46 Cardiganshire	**61**	**90**	**1776**
47 Montgomeryshire	26	29	1319
48 Merionethshire	22	30	1400
49 Caernarvonshire	**39**	**51**	**1813**
50 Denbighshire	26	34	1617
51 Flintshire	**36**	**45**	**1554**
52 Anglesey	26	30	1412

Appendix 1: Re-assignations of names

Most of the names below to the left are among those used in both the old and new FRDBI and other British literature, and that we have equated in the species accounts above and in the census catalogues presented here to the names to the right. They include synonyms, misidentifications and confusions, and are simply listed here to help the reader who may otherwise be puzzled by their usage. A few entries also help explain why some species that might have been expected in the accounts here have been omitted.

Didymaria linariae ➔ *Ramularia linariae*
Erostrotheca multiformis ➔ *Ramularia deusta*
Mycosphaerella fragariae in part ➔ *Ramularia grevilleana* or *Ramularia brunnea*
Passalora montana ➔ *Phaeoramularia punctiformis*, *Ramularia chamaenerii* or *Ramularia epilobiana*
Phacellium alborosellum on *Stellaria graminea* ➔ *Ramularia episphaeria*
Phacellium episphaerium ➔ *Ramularia episphaeria*
Phacellium mespili ➔ *Phacellium sorbi*
Phacellium rufibasis ➔ *Ramularia rufibasis*
Ramularia acris on *Ranunculus acris* ➔ *Ramularia didyma* or *Ramularia simplex*
Ramularia aequivoca ➔ *Ramularia didyma*
Ramularia alba ➔ *Ramularia deusta* var. *alba*
Ramularia anagallidis ➔ *Ramularia beccabungae*
Ramularia angelicae ➔ *Ramularia archangelicae*
Ramularia anthrisci ➔ *Ramularia chaerophylli*
Ramularia arenariae ➔ *Ramularia moehringiae*
Ramularia ari ➔ *Spermosporina aricola*
Ramularia arvensis ➔ *Ramularia grevilleana*
Ramularia barbareae ➔ *Ramularia armoraciae*
Ramularia brunnea on *Fragaria* ➔ *Mycosphaerella fragariae* or *Ramularia grevilleana*
Ramularia bryoniae ➔ *Colletotrichum*
Ramularia calcea on *Ajuga* ➔ *Ramularia ajugae*
Ramularia calcea on *Glechoma* ➔ *Ramularia glechomatis*
Ramularia calcea on *Hedera* ➔ *Cercospora hedericola*
Ramularia cardui ➔ *Ramularia cynarae*
Ramularia centauriae on *Centaurea nigra* ➔ *Ramularia triboutiana*
Ramularia centranthi ➔ *Ramularia valerianae* var. *centranthi*
Ramularia cicutae ➔ *Ramularia heraclei*
Ramularia circaeae ➔ *Ramularia caduca*
Ramularia cirsii ➔ *Ramularia cynarae*
Ramularia cochleariae ➔ *Ramularia armoraciae*
Ramularia coriandri ➔ *Ramularia heraclei*
Ramularia cryptostegiae ➔ not a *Ramularia*
Ramularia destructans ➔ *Cylindrocarpon destructans*
Ramularia dispar ➔ *Mycovelosiella perfoliata*
Ramularia dubia ➔ *Passalora dubia*
Ramularia epilobii-palustris ➔ *Passalora montana*
Ramularia exilis ➔ *Ramularia lamii* var. *lamii*
Ramularia filaris on *Helminthotheca echioides* ➔ *Ramularia inaequalis*

Ramularia filaris on *Arctium* ➔ *Ramularia abscondita*
Ramularia filaris var. *lappae* ➔ *Ramularia abscondita*
Ramularia haplospora ➔ *Ramularia aplospora*
Ramularia holci-lanati on *Phalaris arundinacea* ➔ *Ramularia pusilla*
Ramularia hypochaeridis ➔ *Ramularia inaequalis*
Ramularia knautiae on *Knautia arvensis* ➔ *Ramularia tricherae*
Ramularia knautiae on *Scabiosa caucasica* ➔ *Ramularia bosniaca*
Ramularia knautiae on *Succisa pratensis* ➔ *Ramularia succisae*
Ramularia kriegeriana on *Silene dioica* ➔ *Ramularia didymarioides* or *Ramularia lychnicola*
Ramularia lamiicola ➔ *Ramularia lamii*
Ramularia ludoviciana ➔ not *Ramularia* (Braun)
Ramularia lychnidicola on *Campanula glomerata* ➔ *Ramularia macrospora*
Ramularia lysimachiarum ➔ *Ramularia lysimachiae*
Ramularia macrospora on *Jacobaea aquatica* ➔ *Ramularia filaris*
Ramularia macrocarpa on *Campanula* ➔ unclear (Braun)
Ramularia magnusiana on *Trientalis* ➔ *Spermosporina magnusiana*
Ramularia meliloti ➔ *Ramularia medicaginis*
Ramularia menthicola ➔ *Ramularia lamii* var. *lamii*
Ramularia montana on *Chamaenerion* ➔ *Ramularia chamaenerii*
Ramularia montana on *Epilobium* ➔ *Ramularia epilobiana* or *Passalora montana*
Ramularia myosotidis ➔ *Ramularia cerinthes*
Ramularia nymphaearum ➔ *Colletotrichum nymphaeae*
Ramularia ovata ➔ *Neoovularia ovata*
Ramularia pastinacae ➔ *Ramularia heraclei*
Ramularia peltigericola ➔ *Hawksworthiana peltigericola*
Ramularia petuniae ➔ *Cladosporium* cf. *cladosporioides*
Ramularia picridis ➔ *Ramularia inaequalis*
Ramularia plantaginis on *Plantago major*, *Plantago media* ➔ *Ramularia kriegeriana*
Ramularia plantaginis on *Plantago lanceolata* ➔ *Ramularia rhabdospora*
Ramularia pruinosa ➔ *Ramularia filaris*
Ramularia punctiformis ➔ *Phaeoramularia punctiformis*
Ramularia purpurascens on *Petasites albus*, *Petasites hybridus* ➔ *Ramularia major*
Ramularia pygmaea ➔ *Entylomella pygmaea*
Ramularia ranunculi ➔ *Ramularia acris*, *Ramularia didyma* or *Ramularia simplex*
Ramularia rhei on *Rheum* ➔ *Ramularia pratensis*
Ramularia rhei on *Rhus* ➔ *Cercosporella* sp. or *Pseudocercospora* sp.
Ramularia scelerata on *Ranunculus sceleratus* ➔ *Entylomella*
Ramularia scrophulariae ➔ *Ramularia carneola*
Ramularia senecionis ➔ *Ramularia filaris*
Ramularia sonchi-oleracei ➔ *Spermosporina sonchi-oleracei*
Ramularia spiraeae on *Flipendula ulmaria* ➔ *Ramularia ulmariae*
Ramularia stachydis ➔ *Ramularia lamii* var. *lamii*
Ramularia superflua ➔ *Ramularia urticae*
Ramularia sylvestris ➔ *Ramularia silvestris*
Ramularia taraxaci ➔ *Ramularia inaequalis*
Ramularia tulasnei ➔ *Ramularia grevilleana*
Ramularia variabilis ➔ *Ramularia digitalis*
Ramularia veronicae on *Veronica chamaedrys* ➔ *Ramularia coccinea*
Ramularia violae ➔ *Ramularia lactea*

The following list is a modified version of the list above that should help the reader trace external records and references from the names employed in the species accounts and census catalogues here. The species names employed in this book are to the left. They might be equated to the names listed to the right.

Phacellium sorbi ➔ *Phacellium mespili*
Ramularia abscondita ➔ *Ramularia filaris* on *Arctium*, *Ramularia filaris* var. *lappae*
Ramularia acris ➔ *Ramularia ranunculi*
Ramularia ajugae ➔ *Ramularia calcea* on *Ajuga*
Ramularia aplospora ➔ *Ramularia haplospora*
Ramularia archangelicae ➔ *Ramularia angelicae*
Ramularia armoraciae ➔ *Ramularia barbareae*, *Ramularia cochleariae*
Ramularia beccabungae ➔ *Ramularia anagallidis*
Ramularia bosniaca ➔ *Ramularia knautiae* on *Scabiosa caucasica*
Ramularia brunnea ➔ *Mycosphaerella fragariae* in part
Ramularia caduca ➔ *Ramularia circaeae*
Ramularia carneola ➔ *Ramularia scrophulariae*
Ramularia cerinthes ➔ *Ramularia myosotidis*
Ramularia chaerophylli ➔ *Ramularia anthrisci*
Ramularia chamaenerii ➔ *Passalora montana. Ramularia montana* on *Chamaenerion*
Ramularia coccinea ➔ *Ramularia veronicae* on *Veronica chamaedrys*
Ramularia cynarae ➔ *Ramularia cardui, Ramularia cirsii*
Ramularia deusta ➔ *Erostrotheca multiformis*, *Ramularia alba*
Ramularia deusta var. *alba* ➔ *Ramularia alba*
Ramularia didyma ➔ *Ramularia acris* on *Ranunculus acris*, *Ramularia aequivoca*, *Ramularia ranunculi*
Ramularia didymarioides ➔ *Ramularia kriegeriana* on *Silene dioica*
Ramularia digitalis ➔ *Ramularia variabilis*
Ramularia epilobiana ➔ *Passalora montana*, *Ramularia montana* on *Epilobium*
Ramularia episphaeria ➔ *Phacellium alborosellum* on *Stellaria graminea*, *Phacellium episphaerium*
Ramularia filaris ➔ *Ramularia macrospora* on *Jacobaea aquatica*, *Ramularia pruinosa*, *Ramularia senecionis*
Ramularia glechomatis ➔ *Ramularia calcea* on *Glechoma*
Ramularia grevilleana ➔ *Ramularia arvensis*, *Ramularia brunnea* on *Fragaria*, *Ramularia tulasnei*, *Mycosphaerella fragariae* in part
Ramularia heraclei ➔ *Ramularia cicutae*, *Ramularia coriandri*, *Ramularia pastinacae*
Ramularia inaequalis ➔ *Ramularia filaris* on *Helminthotheca echioides*, *Ramularia hypochaeridis*, *Ramularia picridis*, *Ramularia taraxaci*
Ramularia kriegeriana ➔ *Ramularia plantaginis* on *Plantago major*, *Plantago media*
Ramularia lactea ➔ *Ramularia violae*
Ramularia lamii ➔ *Ramularia exilis*, *Ramularia lamiicola, Ramularia menthicola*, *Ramularia stachydis*
Ramularia lamii var. *lamii* ➔ *Ramularia exilis*, *Ramularia menthicola*, *Ramularia stachydis*
Ramularia linariae ➔ *Didymaria linariae*
Ramularia lychnicola ➔ *Ramularia kriegeriana* on *Silene dioica*
Ramularia lysimachiae ➔ *Ramularia lysimachiarum*
Ramularia macrospora ➔ *Ramularia lychnidicola* on *Campanula glomerata*

Ramularia major ➔ *Ramularia purpurascens* on *Petasites albus*, *Petasites hybridus*
Ramularia medicaginis ➔ *Ramularia meliloti*
Ramularia moehringiae ➔ *Ramularia arenariae*
Ramularia pratensis ➔ *Ramularia rhei* on *Rheum*
Ramularia pusilla ➔ *Ramularia holci-lanati* on *Phalaris arundinacea*
Ramularia rhabdospora ➔ *Ramularia plantaginis* on *Plantago lanceolata*
Ramularia rufibasis ➔ *Phacellium rufibasis*
Ramularia silvestris ➔ *Ramularia sylvestris*
Ramularia simplex ➔ *Ramularia acris* on *Ranunculus acris*, *Ramularia ranunculi*
Ramularia succisae ➔ *Ramularia knautiae* on *Succisa pratensis*
Ramularia triboutiana ➔ *Ramularia centauriae* on *Centaurea nigra*
Ramularia tricherae ➔ *Ramularia knautiae* on *Knautia arvensis*
Ramularia ulmariae ➔ *Ramularia spiraeae* on *Flipendula ulmaria*
Ramularia urticae ➔ *Ramularia superflua*
Ramularia valerianae var. *centranthi* ➔ *Ramularia centranthi*

Appendix 2 White Mould taxa and their hosts recorded from Britain and Ireland by country or geographical region

The tables below are included as a guide to what has been recorded from the countries of Britain and the island of Ireland and should not be used for making reliable determinations. The first is listed alphabetically by fungus species and the second (p116) by host species They are essentially a summary of our records for Wales and an attempt at an interpretation and updating of those of the British Mycological Society's old and new Fungal Records Databases of Britain and Ireland, other public databases such as those of the Northern Ireland Fungus Group and the National Biodiversity Network, and those by various other authors and recorders for the rest of Britain and Ireland, eg. Aron (2005), Braun (1998), Dennis (1986 & 1995), Ing (2020) and Moore (1959). Records have also been contributed by individuals acknowledged in the introduction above. Please note that we recognise that this is not a complete and accurate checklist for Britain and Ireland but is the best we have been able to achieve from the above sources.

Key to tables

W – Wales; E – England; S – Scotland; I – the island of Ireland. If more than one *Ramularia* occurs on a host, a single asterisk after the fungus name indicates under which species in the accounts above we provide the most full list of diagnostic characters.

White Mould	**Host** (Stace 2019)	**Distribution**
Phacellium carneum	*Lathyrus pratensis*	E S
Phacellium sorbi	*Sorbus aucuparia*	E
Phacellium trifolii	*Trifolium medium*	W
Ramularia abscondita	*Arctium lappa*	W E
Ramularia abscondita	*Arctium minus*	W E I
Ramularia abscondita	*Arctium* sp.	E I
Ramularia acris	*Ranunculus acris*	W E
Ramularia adoxae	*Adoxa moschatellina*	W E
Ramularia agrestis var. *agrestis**	*Viola arvensis*	W E
Ramularia agrestis var. *agrestis**	*Viola tricolor*	E S
Ramularia agrestis var. *agrestis**	*Viola* × *wittrockiana*	W E I
Ramularia agrestis var. *deflectens**	*Viola arvensis*	W E
Ramularia agrestis var. *deflectens**	*Viola* × *wittrockiana*	E
Ramularia agrimoniae	*Agrimonia eupatoria*	E
Ramularia agrimoniae	*Agrimonia* sp.	E
Ramularia ajugae	*Ajuga reptans*	W E S I
Ramularia alborosella	*Cerastium fontanum* ssp. *vulgare*	W E I
Ramularia alborosella	*Cerastium glomeratum*	W
Ramularia alborosella	*Cerastium* sp.	E S I
Ramularia alismatis	*Alisma plantago-aquatica*	E I
Ramularia alnicola	*Alnus glutinosa*	E
Ramularia alpina	*Alchemilla alpina*	S I
Ramularia aplospora	*Alchemilla mollis*	W E S
Ramularia aplospora	*Aphanes arvensis*	E

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia archangelicae	*Angelica sylvestris*	W E S I
Ramularia armoraciae	*Armoracia rusticana*	W E S
Ramularia armoraciae	*Barbarea intermedia*	W
Ramularia armoraciae	*Barbarea verna*	E
Ramularia armoraciae	*Cochlearia officinalis*	S I
Ramularia armoraciae	*Hesperis matronalis*	W
Ramularia aromatica	*Acorus calamus*	E
Ramularia asplenii	*Asplenium ruta-muraria*	W
Ramularia asteris	*Tripolium pannonicum*	E S
Ramularia atropae	*Atropa belladonna*	E
Ramularia beccabungae	*Veronica anagallis-aquatica*	E S I
Ramularia beccabungae	*Veronica beccabunga*	E
Ramularia bellunensis	*Argyranthemum frutescens*	E
Ramularia bellunensis	*Tanacetum parthenium*	E
Ramularia berberidis	*Berberis asiatica*	E
Ramularia beticola	*Beta* sp.	W E
Ramularia beticola	*Beta vulgaris*	E
Ramularia beticola	*Beta vulgaris* ssp. *cicla* var. *cicla*	W E
Ramularia beticola	*Beta vulgaris* ssp. *cicla* var. *flavescens*	W E
Ramularia beticola	*Beta vulgaris* ssp. *maritima*	W I
Ramularia beticola	*Beta vulgaris* ssp. *vulgaris*	W E I
Ramularia bistortae	*Bistorta officinalis*	W E S I
Ramularia bosniaca	*Scabiosa caucasica*	E
Ramularia bresadolae	*Stachys palustris*	W
Ramularia brunnea	*Tussilago farfara*	E
Ramularia caduca	*Circaea lutetiana*	W E S I
Ramularia calcea	*Symphytum officinale*	E
Ramularia calcea	*Symphytum* sp.	E
Ramularia calcea	*Symphytum* × *uplandicum*	E
Ramularia calthae	*Caltha palustris*	W E S I
Ramularia campanulae-latifoliae	*Campanula latifolia*	S
Ramularia cardamines	*Cardamine amara*	E
Ramularia cardamines	*Cardamine flexuosa*	W E
Ramularia cardamines	*Cardamine hirsuta*	S
Ramularia cardamines	*Cardamine pratensis*	W
Ramularia cardamines	*Cardamine* sp.	W E I
Ramularia carneola	*Scrophularia auriculata*	W E I
Ramularia carneola	*Scrophularia nodosa*	W E S I
Ramularia carneola	*Scrophularia vernalis*	E
Ramularia carneola	*Verbascum nigrum*	E
Ramularia cerinthes	*Myosotis arvensis*	E
Ramularia cerinthes	*Myosotis sylvatica*	W E
Ramularia chaerophylli	*Anthriscus sylvestris*	W E
Ramularia chaerophylli	*Chaerophyllum temulum*	E

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia chaerophylli	*Torilis japonica*	E
*Ramularia chamaedryos**	*Veronica chamaedrys*	W E
Ramularia chamaenerii	*Chamaenerion angustifolium*	W E S
Ramularia coccinea	*Veronica austriaca*	E
Ramularia coccinea	*Veronica chamaedrys*	W E I
Ramularia coccinea	*Veronica montana*	W
Ramularia coleosporii	*Coleosporium tussilaginis* & indet fungus on *Petasites hybridus*	W
Ramularia coleosporii	*Coleosporium tussilaginis* on *Petasites japonicus*	W
Ramularia coleosporii	*Tussilago farfara*	E
Ramularia coleosporii ?	*Miyagia pseudosphaeria* on *Sonchus arvensis*	W
Ramularia collo-cygni	*Hordeum vulgare* (incl. *H. distichon*)	W E S I
Ramularia crassiuscula	*Aconitum* × *cammarum*	S
Ramularia cupulariae	*Inula conyzae*	W E
Ramularia cupulariae	*Pulicaria dysenterica*	E I
Ramularia cynarae	*Carduus crispus*	E
Ramularia cynarae	*Carduus nutans*	W E
Ramularia cynarae	*Carduus* sp.	E
Ramularia cynarae	*Carduus tenuiflorus*	E
Ramularia cynarae	*Cirsium arvense*	W E
Ramularia cynarae	*Cirsium dissectum*	W
Ramularia cynarae	*Cirsium heterophyllum*	W
Ramularia cynarae	*Cirsium rivulare*	W
Ramularia cynarae	*Cirsium vulgare*	W E I
Ramularia cynarae	*Cynara cardunculus*	E I
Ramularia cynarae	*Cynara cardunculus* var. *cardunculus*	W
Ramularia cynarae	*Cynara cardunculus* var. *scolymus*	W E I
Ramularia cynarae	*Onopordum acanthium*	E
Ramularia cynoglossi	*Cynoglossum officinale*	W E
Ramularia deusta var. *alba**	*Lathyrus odoratus*	W E S
Ramularia deusta var. *alba**	*Lathyrus odoratus* 'Juliet'	W
Ramularia deusta var. *alba**	*Lathyrus odoratus* 'Leamington'	W
Ramularia deusta var. *alba**	*Lathyrus odoratus* 'Miss Wilmott'	W
Ramularia deusta var. *alba**	*Lathyrus odoratus* 'White Ensyn'	W
Ramularia deusta var. *alba**	*Lathyrus odoratus* 'Winston Churchill'	W
Ramularia deusta var. *deusta**	*Lathyrus latifolius* var. *latifolius*	W E

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia deusta var. *deusta**	*Lathyrus latifolius* var. *alba*	E
Ramularia deusta var. *deusta**	*Lathyrus linifolius*	W I
Ramularia deusta var. *deusta**	*Lathyrus niger*	E I
Ramularia deusta var. *deusta**	*Lathyrus palustris*	E
Ramularia deusta var. *deusta**	*Lathyrus pratensis*	W S I
Ramularia deusta var. *deusta**	*Lathyrus sylvestris*	E
Ramularia didyma var. *didyma**	*Ranunculus auricomus*	W E
Ramularia didyma var. *didyma**	*Ranunculus acris*	E
Ramularia didyma var. *didyma**	*Ranunculus repens*	W E S I
*Ramularia didymarioides**	*Silene dioica*	W E
*Ramularia didymarioides**	*Silene flos-cuculi*	S
*Ramularia didymarioides**	*Silene latifolia* ssp. *alba*	W E
Ramularia digitalis	*Digitalis purpurea*	W E S I
Ramularia digitalis	*Verbascum densiflorum*	E
Ramularia digitalis	*Verbascum thapsus*	W
Ramularia doronici	*Doronicum columnae*	S
Ramularia doronici	*Doronicum pardalianches*	W E S
Ramularia doronici	*Doronicum plantagineum*	W
Ramularia epilobiana	*Epilobium hirsutum*	W E S I
Ramularia epilobiana	*Epilobium montanum*	W
Ramularia epilobiana	*Epilobium* sp.	E
Ramularia epilobiana	*Epilobium tetragonum*	E
Ramularia episphaeria	*Stellaria graminea*	E
Ramularia episphaeria	*Stellaria holostea*	W E
Ramularia episphaeria	*Stellaria nemorum*	E
*Ramularia fatsiae***	*Fatsia japonica*	E
Ramularia filaris	*Jacobaea aquatica*	W E I
Ramularia filaris	*Jacobaea vulgaris*	W E S I
Ramularia filaris	*Senecio vulgaris*	E
Ramularia galegae	*Galega officinalis*	W E
Ramularia gei	*Geum* × *intermedium*	W
Ramularia gei	*Geum macrophyllum*	W
Ramularia gei	*Geum rivale*	W E S
Ramularia gei	*Geum urbanum*	W E S
Ramularia geranii var. *erodii*	*Erodium cicutarium*	E
Ramularia geranii var. *erodii*	*Erodium* sp.	S
Ramularia geranii var. *geranii*	*Geranium dissectum*	E
Ramularia geranii var. *geranii*	*Geranium molle*	E S
Ramularia geranii var. *geranii*	*Geranium phaeum*	E
Ramularia geranii var. *geranii*	*Geranium pratense*	E
Ramularia geranii var. *geranii*	*Geranium pusillum*	E
Ramularia geranii var. *geranii*	*Geranium pyrenaicum*	E I
Ramularia geranii var. *geranii*	*Geranium robertianum*	W E
Ramularia geranii var. *geranii*	*Geranium* sp.	S
Ramularia glechomatis	*Glechoma hederacea*	W E S I

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia grevilleana var. *grevilleana*	*Fragaria ananassa*	E S I
Ramularia grevilleana var. *grevilleana*	*Fragaria* sp.	W
Ramularia grevilleana var. *grevilleana*	*Fragaria vesca*	E I
Ramularia grevilleana var. *grevilleana*	*Potentilla anserina*	E
Ramularia grevilleana var. *grevilleana*	*Potentilla reptans*	W E
Ramularia grevilleana var. *grevilleana*	*Potentilla* sp.	W E I
Ramularia hellebori	*Helleborus foetidus*	E
Ramularia hellebori	*Helleborus* sp.	E
Ramularia hellebori	*Helleborus viridis*	W E
Ramularia heraclei	*Apium graveolens*	E
Ramularia heraclei	*Cicuta virosa*	E I
Ramularia heraclei	*Coriandrum sativum*	E
Ramularia heraclei	*Helosciadium nodiflorum*	W
Ramularia heraclei	*Heracleum sphondylium*	W E S I
Ramularia heraclei	*Levisticum officinale*	W E
Ramularia heraclei	*Pastinaca sativa*	E
Ramularia holci-lanati	*Holcus lanatus*	W S
Ramularia inaequalis	*Helminthotheca echioides*	W E S
Ramularia inaequalis	*Hypochaeris radicata*	W E S I
Ramularia inaequalis	*Picris hieracioides*	W E
Ramularia inaequalis	*Scorzoneroides autumnalis*	E
Ramularia inaequalis	*Taraxacum* sp.	W E S I
*Ramularia interstitialis**	*Primula elatior*	E
*Ramularia interstitialis**	*Primula* × *polyantha* 'Gold Lace'	W
*Ramularia interstitialis**	*Primula veris*	W E
*Ramularia interstitialis**	*Primula vulgaris*	W E S I
Ramularia keithii	*Malva moschata*	E
Ramularia keithii	*Malva* sp.	E
Ramularia kriegeriana	*Plantago major*	W E I
Ramularia kriegeriana	*Plantago media*	E
Ramularia lactea	*Viola canina*	E I
Ramularia lactea	*Viola hirta*	E
Ramularia lactea	*Viola odorata*	W E
Ramularia lactea	*Viola palustris*	E
Ramularia lactea	*Viola reichenbachiana*	E S I
Ramularia lactea	*Viola riviniana*	W E S I
Ramularia lactea	*Viola riviniana purpurea* group	W
Ramularia lactea	*Viola* sp.	E S I

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia lamii var. *lamii*	*Betonica macrantha*	E
Ramularia lamii var. *lamii*	*Galeopsis bifida*	W
Ramularia lamii var. *lamii*	*Galeopsis tetrahit*	W
Ramularia lamii var. *lamii*	*Lamiastrum galeobdolon*	W E
Ramularia lamii var. *lamii*	*Lamium album*	W E S
Ramularia lamii var. *lamii*	*Lamium hybridum*	W
Ramularia lamii var. *lamii*	*Lamium purpureum*	W E
Ramularia lamii var. *lamii*	*Lycopus europaeus*	W E
Ramularia lamii var. *lamii*	*Mentha aquatica*	E S I
Ramularia lamii var. *lamii*	*Mentha arvensis*	E
Ramularia lamii var. *lamii*	*Mentha spicata*	W
Ramularia lamii var. *lamii*	*Stachys sylvatica*	W E S
Ramularia lamii var. *minor*	*Prunella vulgaris*	E
Ramularia lamii var. *minor*	*Stachys arvensis*	W
Ramularia lampsanae	*Lapsana communis* ssp. *communis*	W E S I
Ramularia linariae	*Linaria vulgaris*	W E
Ramularia lychnicola	*Silene dioica*	W E S
Ramularia lychnicola	*Silene flos-cuculi*	E
Ramularia lychnicola	*Silene latifolia* ssp. *alba*	E
Ramularia lysimachiae	*Lysimachia nemorum*	E
Ramularia lysimachiae	*Lysimachia nummularia*	W E
Ramularia lysimachiae	*Lysimachia vulgaris*	E S
Ramularia macrospora	*Campanula glomerata*	E
Ramularia macrospora	*Campanula persicifolia*	I
Ramularia macrospora	*Campanula rapunculoides*	E?
Ramularia major	*Petasites albus*	E
Ramularia major	*Petasites hybridus*	W E I
Ramularia medicaginis	*Melilotus altissimus*	E
Ramularia medicaginis	*Melilotus officinalis*	E
Ramularia medicaginis	*Melilotus* sp.	E
Ramularia moehringiae	*Moehringia trinervia*	W E S
Ramularia obducens	*Pedicularis palustris*	S I
Ramularia obducens	*Pedicularis* sp.	S
Ramularia onobrychidis	*Onobrychis viciifolia*	W E
Ramularia parietariae	*Parietaria judaica*	W E I
Ramularia pratensis var. *pratensis*	*Rheum officinale*	I
Ramularia pratensis var. *pratensis*	*Rheum* sp.	E S
Ramularia pratensis var. *pratensis*	*Rheum* × *rhabarbarum*	W E
Ramularia pratensis var. *pratensis**	*Rumex acetosa* ssp. *acetosa*	W E S I
Ramularia pratensis var. *pratensis**	*Rumex acetosella*	W S

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia pratensis var. *pratensis**	*Rumex conglomeratus*	W
Ramularia pratensis var. *pratensis**	*Rumex crispus* ssp. *crispus*	W S
Ramularia pratensis var. *pratensis**	*Rumex crispus* ssp. *uliginosus*	W
Ramularia pratensis var. *pratensis**	*Rumex* × *dufftii*	W
Ramularia pratensis var. *pratensis**	*Rumex hydrolapathum*	W
Ramularia pratensis var. *pratensis**	*Rumex maritimus*	W
Ramularia pratensis var. *pratensis**	*Rumex obtusifolius*	W E S
Ramularia pratensis var. *pratensis**	*Rumex* × *pratensis*	W
Ramularia pratensis var. *pratensis**	*Rumex sanguineus* var. *viridis*	W
Ramularia pratensis var. *pratensis**	*Rumex* sp.	W E S I
Ramularia primulae	*Primula juliae*	E
Ramularia primulae	*Primula* × *polyantha*	W E
Ramularia primulae	*Primula veris*	W E
Ramularia primulae	*Primula vulgaris*	W E S I
Ramularia purpurascens	*Petasites pyrenaicus*	W E S I
Ramularia pusilla	*Alopecurus pratensis*	E
Ramularia pusilla	*Cynosurus cristatus*	I
Ramularia pusilla	*Phalaris arundinacea*	S
Ramularia pusilla	*Poa humilis*	S
Ramularia rhabdospora	*Plantago lanceolata*	W E S I
Ramularia rigidula	*Polygonum aviculare*	E
Ramularia rollandii	*Iris* sp.	E
Ramularia rosea	*Salix caprea*	E
Ramularia rosea	*Salix cinerea* ssp. *oleifolia*	W
Ramularia rosea	*Salix* sp.	E
Ramularia rosea	*Salix triandra*	E
Ramularia rosea	*Salix viminalis*	E?
Ramularia rubella	*Rumex acetosa* ssp. *acetosa*	E S
Ramularia rubella	*Rumex acetosella*	S
Ramularia rubella	*Rumex alpinus*	W
Ramularia rubella	*Rumex conglomeratus*	W E S
Ramularia rubella	*Rumex crispus* ssp. *crispus*	W E S I
Ramularia rubella	*Rumex crispus* ssp. *littoreus*	W
Ramularia rubella	*Rumex crispus* ssp. *uliginosus*	W
Ramularia rubella	*Rumex* × *dufftii*	W
Ramularia rubella	*Rumex maritimus*	E

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia rubella	*Rumex obtusifolius*	W E S I
Ramularia rubella	*Rumex palustris*	E
Ramularia rubella	*Rumex* × *pratensis*	W I
Ramularia rubella	*Rumex sanguineus* var. *sanguineus*	W
Ramularia rubella	*Rumex sanguineus* var. *viridis*	W E
Ramularia rubella	*Rumex* sp.	W E I
Ramularia rufibasis	*Myrica gale*	W E S I
Ramularia rufomaculans	*Persicaria hydropiper*	W
Ramularia sambucina	*Sambucus nigra*	W E I
Ramularia schulzeri	*Lotus corniculatus*	E S
Ramularia schulzeri	*Lotus pedunculatus*	E
Ramularia scolopendrii	*Asplenium scolopendrium*	W E I
Ramularia septata	*Galanthus elwesii*	W E
Ramularia septata	*Galanthus nivalis*	W E
Ramularia septata	*Galanthus plicatus*	W
Ramularia silvestris	*Dipsacus fullonum*	W E
Ramularia silvestris	*Dipsacus pilosus*	E
Ramularia simplex	*Ranunculus acris*	W E S
Ramularia simplex	*Ranunculus repens*	W E
Ramularia simplex	*Ranunculus* sp.	E
*Ramularia sphaeroidea**	*Lotus corniculatus*	W E I
*Ramularia sphaeroidea**	*Lotus pedunculatus*	W E S I
*Ramularia sphaeroidea**	*Lotus pedunculatus* var. *pedunculatus*	W
*Ramularia sphaeroidea**	*Lotus pedunculatus* var. *vestitus*	W
Ramularia spiraeae	*Spiraea* sp.	E I
Ramularia succisae	*Succisa pratensis*	W E S I
Ramularia tanaceti	*Leucanthemum vulgare*	W
Ramularia tanaceti	*Tanacetum vulgare*	E
Ramularia triboutiana	*Centaurea nigra*	W E S
Ramularia triboutiana	*Centaurea scabiosa*	E
Ramularia tricherae	*Knautia arvensis*	W E S I
Ramularia ulmariae	*Filipendula ulmaria*	W E S I
Ramularia urticae	*Urtica dioica*	W E S I
Ramularia valerianae var. *centranthi*	*Centranthus ruber*	W E I
Ramularia valerianae var. *valeriana*	*Valeriana dioica*	E
Ramularia valerianae var. *valeriana*	*Valeriana officinalis*	W E S I
Ramularia vallisumbrosae	*Narcissus bicolor*	W
Ramularia vallisumbrosae	*Narcissus hispanicus*	W
Ramularia vallisumbrosae	*Narcissus* × *incomparabilis*	W
Ramularia vallisumbrosae	*Narcissus poeticus*	W

White Mould	**Host** (Stace 2019)	**Distribution**
Ramularia vallisumbrosae	*Narcissus pseudonarcissus*	W E
Ramularia vallisumbrosae	*Narcissus* sp.	E S I
Ramularia veronicae	*Veronica agrestis*	W
Ramularia veronicae	*Veronica arvensis*	W E
Ramularia veronicae	*Veronica montana*	W E
Ramularia veronicae	*Veronica persica*	W E
Ramularia winteri	*Ononis repens*	W E S I
Ramularia winteri	*Ononis* sp.	E S
Ramularia xanthii	*Xanthium* sp.	E

White Mould taxa and their hosts listed alphabetically by host species (see p108 for explanation of symbols):

Host (Stace 2019)	**White Mould**	**Distribution**
Aconitum × *cammarum*	*Ramularia crassiuscula*	S
Acorus calamus	*Ramularia aromatica*	E
Adoxa moschatellina	*Ramularia adoxae*	W E
Agrimonia eupatoria	*Ramularia agrimoniae*	E
Agrimonia sp.	*Ramularia agrimoniae*	E
Ajuga reptans	*Ramularia ajugae*	W E S I
Alchemilla alpina	*Ramularia alpina*	S I
Alchemilla mollis	*Ramularia aplospora*	W E S
Alisma plantago-aquatica	*Ramularia alismatis*	E I
Alnus glutinosa	*Ramularia alnicola*	E
Alopecurus pratensis	*Ramularia pusilla*	E
Angelica sylvestris	*Ramularia archangelicae*	W E S I
Anthriscus sylvestris	*Ramularia chaerophylli*	W E
Aphanes arvensis	*Ramularia aplospora*	E
Apium graveolens	*Ramularia heraclei*	E
Arctium lappa	*Ramularia abscondita*	W E
Arctium minus	*Ramularia abscondita*	W E I
Arctium sp.	*Ramularia abscondita*	E I
Argyranthemum frutescens	*Ramularia bellunensis*	E
Armoracia rusticana	*Ramularia armoraciae*	W E S
Asplenium ruta-muraria	*Ramularia asplenii*	W
Asplenium scolopendrium	*Ramularia scolopendrii*	W E I
Atropa belladonna	*Ramularia atropae*	E
Barbarea intermedia	*Ramularia armoraciae*	W
Barbarea verna	*Ramularia armoraciae*	E
Berberis asiatica	*Ramularia berberidis*	E
Beta sp.	*Ramularia beticola*	W E
Beta vulgaris	*Ramularia beticola*	E
Beta vulgaris ssp. *cicla* var. *cicla*	*Ramularia beticola*	W E

Host (Stace 2019)	**White Mould**	**Distribution**
Beta vulgaris ssp. *cicla* var. *flavescens*	*Ramularia beticola*	W E
Beta vulgaris ssp. *maritima*	*Ramularia beticola*	W I
Beta vulgaris ssp. *vulgaris*	*Ramularia beticola*	W E I
Betonica macrantha	*Ramularia lamii* var. *lamii*	E
Bistorta officinalis	*Ramularia bistortae*	W E S I
Caltha palustris	*Ramularia calthae*	W E S I
Campanula glomerata	*Ramularia macrospora*	E
Campanula latifolia	*Ramularia campanulae-latifoliae*	S
Campanula persicifolia	*Ramularia macrospora*	I
Campanula rapunculoides	*Ramularia macrospora*	E?
Cardamine amara	*Ramularia cardamines*	E
Cardamine flexuosa	*Ramularia cardamines*	W E
Cardamine hirsuta	*Ramularia cardamines*	S
Cardamine pratensis	*Ramularia cardamines*	W
Cardamine sp.	*Ramularia cardamines*	W E I
Carduus crispus	*Ramularia cynarae*	E
Carduus nutans	*Ramularia cynarae*	W E
Carduus sp.	*Ramularia cynarae*	E
Carduus tenuiflorus	*Ramularia cynarae*	E
Centaurea nigra	*Ramularia triboutiana*	W E S
Centaurea scabiosa	*Ramularia triboutiana*	E
Centranthus ruber	*Ramularia valerianae* var. *centranthi*	W E I
Cerastium fontanum ssp. *vulgare*	*Ramularia alborosella*	W E I
Cerastium glomeratum	*Ramularia alborosella*	W
Cerastium sp.	*Ramularia alborosella*	E S I
Chaerophyllum temulum	*Ramularia chaerophylli*	E
Chamaenerion angustifolium	*Ramularia chamaenerii*	W E S
Cicuta virosa	*Ramularia heraclei*	E I
Circaea lutetiana	*Ramularia caduca*	W E S I
Cirsium arvense	*Ramularia cynarae*	W E
Cirsium dissectum	*Ramularia cynarae*	W
Cirsium heterophyllum	*Ramularia cynarae*	W
Cirsium rivulare	*Ramularia cynarae*	W
Cirsium vulgare	*Ramularia cynarae*	W E I
Cochlearia officinalis	*Ramularia armoraciae*	S I
Coleosporium tussilaginis & indet fungus on *Petasites hybridus*	*Ramularia coleosporii*	W
Coleosporium tussilaginis on *Petasites japonicas*	*Ramularia coleosporii*	W
Coriandrum sativum	*Ramularia heraclei*	E
Cynara cardunculus	*Ramularia cynarae*	E I
Cynara cardunculus var. *cardunculus*	*Ramularia cynarae*	W

Host (Stace 2019)	**White Mould**	**Distribution**
Cynara cardunculus var. *scolymus*	*Ramularia cynarae*	W E I
Cynoglossum officinale	*Ramularia cynoglossi*	W E
Cynosurus cristatus	*Ramularia pusilla*	I
Digitalis purpurea	*Ramularia digitalis*	W E S I
Dipsacus fullonum	*Ramularia silvestris*	W E
Dipsacus pilosus	*Ramularia silvestris*	E
Doronicum columnae	*Ramularia doronici*	S
Doronicum pardalianches	*Ramularia doronici*	W E S
Doronicum plantagineum	*Ramularia doronici*	W
Epilobium hirsutum	*Ramularia epilobiana*	W E S I
Epilobium montanum	*Ramularia epilobiana*	W
Epilobium sp.	*Ramularia epilobiana*	E
Epilobium tetragonum	*Ramularia epilobiana*	E
Erodium cicutarium	*Ramularia geranii* var. *erodii*	E
Erodium sp.	*Ramularia geranii* var. *erodii*	S
Fatsia japonica	*Ramularia fatsiae***	E
Filipendula ulmaria	*Ramularia ulmariae*	W E S I
Fragaria ananassa	*Ramularia grevilleana* var. *grevilleana*	E S I
Fragaria sp.	*Ramularia grevilleana* var. *grevilleana*	W
Fragaria vesca	*Ramularia grevilleana* var. *grevilleana*	E I
Galanthus elwesii	*Ramularia septata*	W E
Galanthus nivalis	*Ramularia septata*	W E
Galanthus plicatus	*Ramularia septata*	W
Galega officinalis	*Ramularia galegae*	W E
Galeopsis bifida	*Ramularia lamii* var. *lamii*	W
Galeopsis tetrahit	*Ramularia lamii* var. *lamii*	W
Geranium dissectum	*Ramularia geranii* var. *geranii*	E
Geranium molle	*Ramularia geranii* var. *geranii*	E S
Geranium phaeum	*Ramularia geranii* var. *geranii*	E
Geranium pratense	*Ramularia geranii* var. *geranii*	E
Geranium pusillum	*Ramularia geranii* var. *geranii*	E
Geranium pyrenaicum	*Ramularia geranii* var. *geranii*	E I
Geranium robertianum	*Ramularia geranii* var. *geranii*	W E
Geranium sp.	*Ramularia geranii* var. *geranii*	S
Geum × *intermedium*	*Ramularia gei*	W
Geum macrophyllum	*Ramularia gei*	W
Geum rivale	*Ramularia gei*	W E S
Geum urbanum	*Ramularia gei*	W E S
Glechoma hederacea	*Ramularia glechomatis*	W E S I
Helleborus foetidus	*Ramularia hellebori*	E
Helleborus sp.	*Ramularia hellebori*	E
Helleborus viridis	*Ramularia hellebori*	W E

Host (Stace 2019)	**White Mould**	**Distribution**
Helminthotheca echioides	*Ramularia inaequalis*	W E S
Helosciadium nodiflorum	*Ramularia heraclei*	W
Heracleum sphondylium	*Ramularia heraclei*	W E S I
Hesperis matronalis	*Ramularia armoraciae*	W
Holcus lanatus	*Ramularia holci-lanati*	W S
Hordeum vulgare (incl. *H. distichon*)	*Ramularia collo-cygni*	W E S I
Hypochaeris radicata	*Ramularia inaequalis*	W E S I
Inula conyzae	*Ramularia cupulariae*	W E
Iris sp.	*Ramularia rollandii*	E
Jacobaea aquatica	*Ramularia filaris*	W E I
Jacobaea vulgaris	*Ramularia filaris*	W E S I
Knautia arvensis	*Ramularia tricherae*	W E S I
Lamiastrum galeobdolon	*Ramularia lamii* var. *lamii*	W E
Lamium album	*Ramularia lamii* var. *lamii*	W E S
Lamium hybridum	*Ramularia lamii* var. *lamii*	W
Lamium purpureum	*Ramularia lamii* var. *lamii*	W E
Lapsana communis ssp. *communis*	*Ramularia lampsanae*	W E S I
Lathyrus latifolius var. *alba*	*Ramularia deusta* var. *deusta**	E
Lathyrus latifolius var. *latifolius*	*Ramularia deusta* var. *deusta**	W E
Lathyrus linifolius	*Ramularia deusta* var. *deusta**	W I
Lathyrus niger	*Ramularia deusta* var. *deusta**	E I
Lathyrus odoratus	*Ramularia deusta* var. *alba**	W E S
Lathyrus odoratus 'Juliet'	*Ramularia deusta* var. *alba**	W
Lathyrus odoratus 'Leamington'	*Ramularia deusta* var. *alba**	W
Lathyrus odoratus 'Miss Wilmott'	*Ramularia deusta* var. *alba**	W
Lathyrus odoratus 'White Ensyn'	*Ramularia deusta* var. *alba**	W
Lathyrus odoratus 'Winston Churchill'	*Ramularia deusta* var. *alba**	W
Lathyrus palustris	*Ramularia deusta* var. *deusta**	E
Lathyrus pratensis	*Phacellium carneum*	E S
Lathyrus pratensis	*Ramularia deusta* var. *deusta**	W S I
Lathyrus sylvestris	*Ramularia deusta* var. *deusta**	E
Leucanthemum vulgare	*Ramularia tanaceti*	W
Levisticum officinale	*Ramularia heraclei*	W E
Linaria vulgaris	*Ramularia linariae*	W E
Lotus corniculatus	*Ramularia schulzeri*	E S
Lotus corniculatus	*Ramularia sphaeroidea**	W E I
Lotus pedunculatus	*Ramularia schulzeri*	E
Lotus pedunculatus	*Ramularia sphaeroidea**	W E S I
Lotus pedunculatus var. *pedunculatus*	*Ramularia sphaeroidea**	W
Lotus pedunculatus var. *vestitus*	*Ramularia sphaeroidea**	W
Lycopus europaeus	*Ramularia lamii* var. *lamii*	W E
Lysimachia nemorum	*Ramularia lysimachiae*	E

Host (Stace 2019)	**White Mould**	**Distribution**
Lysimachia nummularia	*Ramularia lysimachiae*	W E
Lysimachia vulgaris	*Ramularia lysimachiae*	E S
Malva moschata	*Ramularia keithii*	E
Malva sp.	*Ramularia keithii*	E
Melilotus altissimus	*Ramularia medicaginis*	E
Melilotus officinalis	*Ramularia medicaginis*	E
Melilotus sp.	*Ramularia medicaginis*	E
Mentha aquatica	*Ramularia lamii* var. *lamii*	E S I
Mentha arvensis	*Ramularia lamii* var. *lamii*	E
Mentha spicata	*Ramularia lamii* var. *lamii*	W
Miyagia pseudosphaeria on *Sonchus arvensis*	*Ramularia coleosporii* ?	W
Moehringia trinervia	*Ramularia moehringiae*	W E S
Myosotis arvensis	*Ramularia cerinthes*	E
Myosotis sylvatica	*Ramularia cerinthes*	W E
Myrica gale	*Ramularia rufibasis*	W E S I
Narcissus bicolor	*Ramularia vallisumbrosae*	W
Narcissus hispanicus	*Ramularia vallisumbrosae*	W
Narcissus × *incomparabilis*	*Ramularia vallisumbrosae*	W
Narcissus poeticus	*Ramularia vallisumbrosae*	W
Narcissus pseudonarcissus	*Ramularia vallisumbrosae*	W E
Narcissus sp.	*Ramularia vallisumbrosae*	E S I
Onobrychis viciifolia	*Ramularia onobrychidis*	W E
Ononis repens	*Ramularia winteri*	W E S I
Ononis sp.	*Ramularia winteri*	E S
Onopordum acanthium	*Ramularia cynarae*	E
Parietaria judaica	*Ramularia parietariae*	W E I
Pastinaca sativa	*Ramularia heraclei*	E
Pedicularis palustris	*Ramularia obducens*	S I
Pedicularis sp.	*Ramularia obducens*	S
Persicaria hydropiper	*Ramularia rufomaculans*	W
Petasites albus	*Ramularia major*	E
Petasites hybridus	*Ramularia major*	W E I
Petasites pyrenaicus	*Ramularia purpurascens*	W E S I
Phalaris arundinacea	*Ramularia pusilla*	S
Picris hieracioides	*Ramularia inaequalis*	W E
Plantago lanceolata	*Ramularia rhabdospora*	W E S I
Plantago major	*Ramularia kriegeriana*	W E I
Plantago media	*Ramularia kriegeriana*	E
Poa humilis	*Ramularia pusilla*	S
Polygonum aviculare	*Ramularia rigidula*	E
Potentilla anserina	*Ramularia grevilleana* var. *grevilleana*	E
Potentilla reptans	*Ramularia grevilleana* var. *grevilleana*	W E
Potentilla sp.	*Ramularia grevilleana* var. *grevilleana*	W E I

Host (Stace 2019)	**White Mould**	**Distribution**
Primula elatior	*Ramularia interstitialis**	E
Primula juliae	*Ramularia primulae*	E
Primula × *polyantha*	*Ramularia primulae*	W E
Primula × *polyantha* 'Gold Lace'	*Ramularia interstitialis**	W
Primula veris	*Ramularia interstitialis**	W E
Primula veris	*Ramularia primulae*	W E
Primula vulgaris	*Ramularia interstitialis**	W E S I
Primula vulgaris	*Ramularia primulae*	W E S I
Prunella vulgaris	*Ramularia lamii* var. *minor*	E
Pulicaria dysenterica	*Ramularia cupulariae*	E I
Ranunculus acris	*Ramularia simplex*	W E S
Ranunculus acris	*Ramularia acris*	W E
Ranunculus acris	*Ramularia didyma* var. *didyma**	E
Ranunculus auricomus	*Ramularia didyma* var. *didyma**	W E
Ranunculus repens	*Ramularia didyma* var. *didyma**	W E S I
Ranunculus repens	*Ramularia simplex*	W E
Ranunculus sp.	*Ramularia simplex*	E
Rheum officinale	*Ramularia pratensis* var. *pratensis*	I
Rheum sp.	*Ramularia pratensis* var. *pratensis*	E S
Rheum × *rhabarbarum*	*Ramularia pratensis* var. *pratensis*	W E
Rumex acetosa ssp. *acetosa*	*Ramularia pratensis* var. *pratensis**	W E S I
Rumex acetosa ssp. *acetosa*	*Ramularia rubella*	E S
Rumex acetosella	*Ramularia pratensis* var. *pratensis**	W S
Rumex acetosella	*Ramularia rubella*	S
Rumex alpinus	*Ramularia rubella*	W
Rumex conglomeratus	*Ramularia pratensis* var. *pratensis**	W
Rumex conglomeratus	*Ramularia rubella*	W E S
Rumex crispus ssp. *crispus*	*Ramularia pratensis* var. *pratensis**	W S
Rumex crispus ssp. *crispus*	*Ramularia rubella*	W E S I
Rumex crispus ssp. *littoreus*	*Ramularia rubella*	W
Rumex crispus ssp. *uliginosus*	*Ramularia pratensis* var. *pratensis**	W
Rumex crispus ssp. *uliginosus*	*Ramularia rubella*	W
Rumex × *dufftii*	*Ramularia pratensis* var. *pratensis**	W
Rumex × *dufftii*	*Ramularia rubella*	W
Rumex hydrolapathum	*Ramularia pratensis* var. *pratensis**	W

Host (Stace 2019)	**White Mould**	**Distribution**
Rumex maritimus	*Ramularia pratensis* var. *pratensis**	W
Rumex maritimus	*Ramularia rubella*	E
Rumex obtusifolius	*Ramularia pratensis* var. *pratensis**	W E S
Rumex obtusifolius	*Ramularia rubella*	W E S I
Rumex palustris	*Ramularia rubella*	E
Rumex × *pratensis*	*Ramularia pratensis* var. *pratensis**	W
Rumex × *pratensis*	*Ramularia rubella*	W I
Rumex sanguineus var. *sanguineus*	*Ramularia rubella*	W
Rumex sanguineus var. *viridis*	*Ramularia pratensis* var. *pratensis**	W
Rumex sanguineus var. *viridis*	*Ramularia rubella*	W E
Rumex sp.	*Ramularia pratensis* var. *pratensis**	W E S I
Rumex sp.	*Ramularia rubella*	W E I
Salix caprea	*Ramularia rosea*	E
Salix cinerea ssp. *oleifolia*	*Ramularia rosea*	W
Salix sp.	*Ramularia rosea*	E
Salix triandra	*Ramularia rosea*	E
Salix viminalis	*Ramularia rosea*	E?
Sambucus nigra	*Ramularia sambucina*	W E I
Scabiosa caucasica	*Ramularia bosniaca*	E
Scorzoneroides autumnalis	*Ramularia inaequalis*	E
Scrophularia auriculata	*Ramularia carneola*	W E I
Scrophularia nodosa	*Ramularia carneola*	W E S I
Scrophularia vernalis	*Ramularia carneola*	E
Senecio vulgaris	*Ramularia filaris*	E
Silene dioica	*Ramularia didymarioides**	W E
Silene dioica	*Ramularia lychnicola*	W E S
Silene flos-cuculi	*Ramularia didymarioides**	S
Silene flos-cuculi	*Ramularia lychnicola*	E
Silene latifolia ssp. *alba*	*Ramularia didymarioides**	W E
Silene latifolia ssp. *alba*	*Ramularia lychnicola*	E
Sorbus aucuparia	*Phacellium sorbi*	E
Spiraea sp.	*Ramularia spiraeae*	E I
Stachys arvensis	*Ramularia lamii* var. *minor*	W
Stachys palustris	*Ramularia bresadolae*	W
Stachys sylvatica	*Ramularia lamii* var. *lamii*	W E S
Stellaria graminea	*Ramularia episphaeria*	E
Stellaria holostea	*Ramularia episphaeria*	W E
Stellaria nemorum	*Ramularia episphaeria*	E
Succisa pratensis	*Ramularia succisae*	W E S I
Symphytum officinale	*Ramularia calcea*	E

Host (Stace 2019)	**White Mould**	**Distribution**
Symphytum sp.	*Ramularia calcea*	E
Symphytum × *uplandicum*	*Ramularia calcea*	E
Tanacetum parthenium	*Ramularia bellunensis*	E
Tanacetum vulgare	*Ramularia tanaceti*	E
Taraxacum sp.	*Ramularia inaequalis*	W E S I
Torilis japonica	*Ramularia chaerophylli*	E
Trifolium medium	*Phacellium trifolii*	W
Tripolium pannonicum	*Ramularia asteris*	E S
Tussilago farfara	*Ramularia brunnea*	E
Tussilago farfara	*Ramularia coleosporii*	E
Urtica dioica	*Ramularia urticae*	W E S I
Valeriana dioica	*Ramularia valerianae* var. *valeriana*	E
Valeriana officinalis	*Ramularia valerianae* var. *valeriana*	W E S I
Verbascum densiflorum	*Ramularia digitalis*	E
Verbascum nigrum	*Ramularia carneola*	E
Verbascum thapsus	*Ramularia digitalis*	W
Veronica agrestis	*Ramularia veronicae*	W
Veronica anagallis-aquatica	*Ramularia beccabungae*	E S I
Veronica arvensis	*Ramularia veronicae*	W E
Veronica austriaca	*Ramularia coccinea*	E
Veronica beccabunga	*Ramularia beccabungae*	E
Veronica chamaedrys	*Ramularia chamaedryos**	W E
Veronica chamaedrys	*Ramularia coccinea*	W E I
Veronica montana	*Ramularia coccinea*	W
Veronica montana	*Ramularia veronicae*	W E
Veronica persica	*Ramularia veronicae*	W E
Viola arvensis	*Ramularia agrestis* var. *agrestis**	W E
Viola arvensis	*Ramularia agrestis* var. *deflectens**	W E
Viola canina	*Ramularia lactea*	E I
Viola hirta	*Ramularia lactea*	E
Viola odorata	*Ramularia lactea*	W E
Viola palustris	*Ramularia lactea*	E
Viola reichenbachiana	*Ramularia lactea*	E S I
Viola riviniana	*Ramularia lactea*	W E S I
Viola riviniana purpurea group	*Ramularia lactea*	W
Viola sp.	*Ramularia lactea*	E S I
Viola tricolor	*Ramularia agrestis* var. *agrestis**	E S
Viola × *wittrockiana*	*Ramularia agrestis* var. *agrestis**	W E I
Viola × *wittrockiana*	*Ramularia agrestis* var. *deflectens**	E
Xanthium sp.	*Ramularia xanthii*	E

Glossary

The definitions provided here refer strictly to usage of the terms in this book.

amphiphyllous	on both surfaces of a leaf
anamorph	the asexual stage reproducing by means of conidia
aseptate	lacking cross walls (septa), as in conidia
caespitulum (pl. caespituli)	cluster of conidiophores
colony	the mass of conidiophores and conidia, becoming visible on the surface of the host
conidium (pl. conidia)	asexual spore formed singly or in chains at the apex and sides of the conidiophore
cuticle	waxy layer covering the epidermis on the surface of the host
endophyte	living within the host tissues, sometimes without showing symptoms
epidermis	the outermost layer of cells on the organs of the host
epiphyllous	on the upper surface of a leaf
fusiform	cigar-shaped
heterothallic	when sexual reproduction requires, or benefits from, the conjugation of separate individuals
hypha (pl. hyphae)	the filament of the fungus
hypophyllous	on the lower surface of a leaf
mycelium	a mass of hyphae
septate	with cross-walls, as in hyphae or conidia
septum (pl. septa)	internal cross walls dividing a hypha or sporangium into cells
stomata	small pores in the host surface tissues allowing passage of gases
synnema (pl. synnemata)	conidiophores fused into a column
teleomorph	the sexual stage reproducing by means of ascospores produced in asci

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Searching for White Moulds

Since over a dozen species of White Mould occur on weeds of arable fields they can be profitable places to search. A reduction in arable farming in Wales and the widespread use of herbicides has resulted in once common weeds becoming rare to the point of extinction before we have any idea of the fungi they support. Agri-environment schemes pay for unsprayed margins (see image below left of a field margin where Burdock supported *Ramularia abscondita*), or they fund crops to feed seed-eating birds (below right) where *Veronica* spp. Speedwells held a large population of *R. veronicae*.

Where Swedes are grown as winter feed for stock and the farm is, or has recently been managed on organic principles, the fields often support a rich weed flora. The field below in North Brecs held a large population of *Stachys arvensis* Field Woundwort on which grew *Ramularia lamii* var. *minor*, only known elsewhere in Europe on this host from a garden nearby and in Portugal.

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