A Global Overview of Diversity and Phylogeny of the Rust Genus *Uromyces*

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Abstract: *Uromyces* is the second-largest plant pathogenic rust genus, is responsible for numerous diseases, and has major effects on both agricultural and non-agricultural plants. The genus is generally characterized by its unicellular teliospores that help to characterize it and distinguish it from another important rust genus, *Puccinia*. In this study, a global overview of the diversity and distribution of *Uromyces* is presented based on both online and offline resources. The information obtained was analyzed for numerical and graphical summaries to provide the diversity and distribution of the genus by country and continent. Besides this, broad taxonomical aspects, a brief life cycle, and other comparative aspects on diversity and distribution were also provided. In addition, a phylogenetic analysis based on the ITS and nLSU DNA sequence data available in GenBank and published literature was performed to examine the intergeneric relationships of *Uromyces*. The results obtained revealed that the rust genus is found distributed over 150 countries, territories, and occupancies of the world on around 647 plant genera belonging to 95 plant families. Phylogenetic studies based on LSU and ITS sequence data revealed that *Uromyces* species are polyphyletic and require more DNA-based analyses for a better understanding of their taxonomic placement.

Keywords: phylogeny; *Pucciniomycotina*; rust fungi; taxonomy; *Uromyces*

1. Introduction

*Uromyces* (Link) Unger, a genus of rust fungi, was proposed by Unger (1833). The genus contains several important plant pathogens, parasitizes in both monocots and dicots throughout the world, and affects a range of crops, causing a varying amount of yield loss annually, with losses being very severe in many cases. This genus shares synonymy with numerous genera of fungi such as *Altemyces* Bubák., *Capitularia* Rabenh., *Coeomurus* Gray., *Dichlamys* Syd. & P. Syd., *Groveola* Syd., *Haplopyxis* Syd. & P. Syd., *Haplotelium* Syd., *Hypodermium* subgen. *Uromyces* Link., *Klebahnia* Arthur., *Nielsenia* Syd., *Poliotelium* Syd.,
Poliotelium Syd., Pucciniola L. Marchand., Teleutospora Arthur & Bisby., Telospora Arthur., Trochodium Syd. & P. Syd., and Uromycopsis Arthur. Hypodermium subgen. Uromyces Link 1816 has been considered the Basionym of this genus [1]. Uromyces is the second largest genus of rust fungus after Puccinia in the family Pucciniaceae, which contains more than 1568 epithets and more than 800 reported species [1–5]. This genus produces unicellular teliospores that help to characterize it and distinguish it from another important rust genus, Puccinia.

Species of Uromyces occur on a wide variety of plant hosts around the world. The most important ones are caused by Uromyces spp. that cause infections and damage to various agricultural crops such as alfalfa or lucerne rust (Uromyces straitus J. Schröt.), bean rust (Uromyces appendiculatus (Pers.) Unger), beet rust (Uromyces betae (Pers.) Tul.), carnation rust (Uromyces dianthi (Pers.) Niessl), chickpea rust (Uromyces ciceris-aerietinus Jacz.), clover rust (Uromyces trofolii-repentis Liro), and pea rust (Uromyces pisi (DC.) G.H. Otth.) [2]. The Uromyces species was recorded on the host plants belonging to the families Asteraceae, Euphorbiaceae, Fabaceae, Liliaceae, Loranthaceae, and Poaceae, and among these, Loranthaceae is known to be the most affected. However, the known distribution of most Uromyces species on Loranthaceae is restricted to Mexico and Central and South America [6].

The present manuscript is focused on providing a global overview of the diversity and distribution of the genus Uromyces. Based on the combined ITS and LSU DNA sequence data available in GenBank and published literature, phylogenetic analyses were performed to examine the intergeneric relationships of Uromyces. In addition, broad taxonomical aspects, a brief life cycle, and other comparative aspects of its diversity and distribution are also provided.

2. Taxonomy of the Genus Uromyces

The genus Uromyces belongs to the phylum Basidiomycota, the second-largest [7] phylum after Ascomycota in the kingdom Fungi; both phyla are considered higher fungi and share 97% of all fungal species [3,8–11]. Taxonomically, Uromyces contains rusts under the class Pucciniomycetes and order Pucciniales. Based on telial morphology, the spermogonial and aecial type, basidiospores, and uredinial characteristics, 13 rust families were proposed by Cummins and Hiratsuka [2]. However, Aime [12] and Aime and McTaggart [5] proposed several changes in basal systematics of rust fungi based on molecular studies along with morphological characteristics. This resulted in the introduction of many new families and the transmission of many genera and species. The Wijayawardene et al. [3] included 21 genera with Uromyces and 4961 species in the rust family Pucciniaceae. The recent higher-level classification for rust fungi provided recently by Aime and McTaggart [5] proposed the inclusion of 23 genera (including Uromyces) and 9 likely belonging to the family Pucciniaceae. The genus Uromyces was described by Unger in 1833 with Uromyces appendiculatus Pers. as the type species of the genus. Uredopsis appendiculatus Pers. was considered as a basionym for the type species, now regarded as Uromyces appendiculatus (Pers.) Link 1816. The detailed taxonomy of the genus Uromyces is described as follows:

- Uromyces (Link) Unger, Exanth. Pflanzen (Wien): 277 (1833):
  - Algomyces Bubák, Annln K.K. naturh. Hofmus. Wien 28 (1–2): 190 (1914);
  - Capitularia Rabenh., Bot. Ztg. 9 (25): 449 (1851);
  - Coeomurus Gray, Nat. Arr. Brit. Pl. (London) 1: 541 (1821);
  - Dichlamys Syd. & P. Syd., Annlsmycol. 17(2/6): 105 (1920), (1919);
  - Groveola Syd., Annlsmycol. 19 (3–4): 173 (1921);
  - Haplopoxys Syd. & P. Syd., Annlsmycol. 17 (2/6): 105 (1920), (1919);
  - Haplotelium Syd., Annlsmycol. 20 (3/4): 124 (1922);
  - Hypodermium subgen. Uromyces Link, Mag. Gesell. naturf. Freunde, Berlin 8: 28 (1816), (1815);
  - Klebalonia Arthur, Rézult. Sci. Congr. Bot. Wien 1905: 345 (1906);
  - Mapea Pat., Bull. Soc. Mycol. Fr. 22: 46 (1906);
  - Nielsenia Syd., Annlsmycol. 19 (3–4): 171 (1921);
= Nigredo (Pers.) Roussel, Fl. Calvados, Edn 2: 47 (1806);
= Peridipes Buriticá & J.F. Hennen, Revta Acad. Colomb. Cienc. Exact. Fís. Nat. 19 (no. 72): 50 (1994);
= Poliotelium Syd., Annlsmycol. 20 (3/4): 124 (1922);
= Puccinella Fuckel, Jb. nassau. Ver. Naturk. 15: 18 (1860);
= Puccinola L. Marchand, Bijdr. Natuurk. Wetensch. 4: 47 (1829);
= Rubigo (Pers.) Roussel, Fl. Calvados, Edn 2: 46 (1806);
= Teleutospora Arthur & Bisby, Bull. Torrey bot. Club 48: 38 (1921);
= Telospora Arthur, Résult. Sci. Congr. Bot. Wien 1905: 346 (1906);
= Trichobasis Lév., in Orbigny, Dict. Univ. Hist. Nat. 12: 785 (1849);
= Trochodium Syd. & P. Syd., Annlsmycol. 17(2/6): 106 (1919);
= Uredo Pers., Syn. meth. fung. (Göttingen) 1: 214 (1801);
= Uromycopsis Arthur, Résult. Sci. Congr. Bot. Wien 1905: 345 (1906).

Classification:
Puccinaceae, Pucciniales, Pucciniomycetes, Pucciniomycotina, Basidiomycota, Fungi

Type of species:
Uromyces appendiculatus Pers., Observ. Mycol. (Lipsiae) 1: 17 (1796).

The characteristic one-celled teliospores of the genus Uromyces distinguish it from Puccinia, which has two-celled teliospores. Spermogonia subepidermal, Group V (type 4). Aecia subepidermal, erumpent, Aecidium-type (with peridium and catenuate, mostly verrucose aeciospores) or Uredo-type (with mostly echinulate aeciospores borne singly on pedicels). Uredinia, mostly the Uredo type, is subepidermal and erumpent and consists of echinulate urediniospores with various pores, borne singly on pedicels. Telia are subepidermal, erumpent, or remains covered by the epidermis with pedicellate, one-celled teliospores borne singly on pedicels with a mostly pigmented wall. Basidia is external in nature. The species of Uromyces produce macrocyclic and heteroecious modes of the life cycle, as well as many endocyclic, microcyclic, or autoecious species [2,5].

The phylogenetic analyses of different DNA loci revealed that Uromyces, along with the genus Puccinia in the family Puccinaceae, is not monophyletic [5]. The generic name of Uromyces was recommended to be protected over Uredo [13]. Uredo betae, as one of the initially included species of this genus when described in 1801 by Persoon, is now considered a synonym of Uromyces beticola. Since Uromyces appendiculatus and U. beticola are regarded as congeneric, Uromyces and Uredo are synonyms. Previously, the name Uredo was used in cases where sexual morph was lacking and the species could not be described in the "correct" sexually typified genus. The reason why the name Uromyces was protected over Uredo is due to two major reasons: Uredo belongs to many different rust genera, and secondly, Uromyces is a commonly used generic name. The generic name Uromyces was already conserved over Coemurus Link ex Gray 1821 and Pucciniola L. Marchand 1829 [13].

3. Biology, Pathogenicity, and Life Cycle of Uromyces

Rusts represent one of the largest groups of plant pathogens and have historically posed a major threat to farmers around the world. These diversified fungi are obligate biotrophic parasites distributed in all geographical areas on a wide range of wild and cultivated plants. The two major plant groups, cereals and legumes, suffer the most from rust infections [14]. The genus Uromyces consists of a number of plant pathogens responsible for many harmful plant diseases.

3.1. Disease Symptoms of Uromyces

Uromyces, as a pathogen, affects major hosts such as alfalfa (Medicago sativa), bean (Phaseolus vulgaris), carnation (Dianthus caryophyllus), chickpea (Cicer arietinum), clover (Trifolium sp.), and pea (Pisum sativum) belonging to plant families, Fabaceae and Poaceae [2,15]. The rust diseases caused by Uromyces spp. are characterized by numerous small, rust-like orange/yellow or brown pustules formed on infected plant tissues. Uromyces, as a plant pathogen, kills the diseased plant cells and forms a light yellow halo around diseased
pustules. Dark brown to black-brown telia are usually formed by the rust fungi during infection. The severity of the disease causes a loss of photosynthetic area in infected plants, resulting in a reduction in overall plant performance. Since rust disease is affected by low temperatures and heavy rain in spring and autumn, this can affect the severity of the disease. The rust diseases caused by *Uromyces* are generally autoecious (one plant host) and macrocyclic (produce five spore stages in the life cycle) in nature [2]. The appearance of rust disease symptoms varies in different hosts. A single species of *Uromyces* can infect multiple hosts and cause variable symptoms. The rust on pea (*Pisum sativum*) caused by *Uromyces pisi* and *Uromyces viciae-fabae* produce minute, whitish, slightly raised spots that enlarge and rupture the epidermis to produce reddish-brown, irregular pustules on the stems, pods and lower surface of leaves. Initially, the pustules contain abundant powdery urediniospores, but eventually, they turn dark brown to black as overwintering teliospores are produced [16]. Similarly, *Uromyces viciae-fabae* is also reported to cause lentil rust with disease symptoms of circular yellowish-white pycnidia and aecial cups on leaflets, which later become oval to circular, brown uredial pustules; and dark brown to black, elongated telia [17]. Such variability in disease symptoms caused by different *Uromyces* species can also be observed in other crops (Figure 1).

![Image of Rust Disease Symptoms](image1.png)

**Figure 1.** Disease symptoms of species of *Uromyces*. (A,B) *Uromycesambiens* on *Buxus wallichiana*; (C–E) *Uromyces fabae* on *Pisum sativum*; (F,G) *Uromyces geranii* on *Geranium* sp.; (H,I) *Uromyces trifolii* on *Trifolium* sp. Scale bar: A–I = 1 mm.
3.2. Life Cycle

The species of rust genus *Uromyces* are generally macrocyclic in nature, i.e., exhibit all five spore forms known in *Pucciniales*. In addition, these fungi exhibit an autoecious life cycle, meaning that all spore forms are produced on a single host. However, the endocyclic or microcyclic nature with a heteroecious mode of the life cycle was observed in some species of *Uromyces* [2,5]. The general life cycle process of *Uromyces* spp. involves the germination of diploid teliospores in the spring with a metabasidium after overwintering on plant debris. The metabasidium produces four haploid basidiospores after meiosis. These basidiospores with two different mating types germinate and start infection by producing different infection structures on the surface of the host plant. Once an infection is established, the production of pycnia containing pycniospores of two mating types and receptive hyphae takes place. After, the spermatization of pycniospores of pycnia of different mating types and subsequent dikaryotization takes place in aecial primordia, along with a subsequent exchange.

After the aecium is fully developed, the mature aeciospores infect the host surface by germinating and producing infection structures. Eventually, this infection leads to the production of uredia with urediospores. With the repeated infection of the host plant, these urediospores are produced in large quantities during the summer. Surprisingly, urediospores can disseminate thousands of kilometers with the help of the wind. When suitable hosts are found, these spores differentiate into telia, which ultimately produce unicellular diploid teliospores in the winter [17,18]. A general life cycle of the rust genus *Uromyces* is presented in Figure 2 below.

![Figure 2. A general life cycle of rust genus Uromyces.](image)

3.3. The Rusts as Classical Biocontrol Agents

*Uromyces* is the causal agent of rust disease on numerous agricultural, horticultural, and forest plantations. Rust fungi of this genus are considered a major economic threat due to possible yield losses from reduced production. Rust diseases on pea, beans, lentils, polyhouse flower crops, clover, and many more are some of the hosts infected by this genus. In addition to their identity as the causative agent of rust, the *Uromyces* species also shows potential for the biological control of various phytopathogenic fungi, weeds, etc.
The biology and effectiveness of *Uromyces heliotropii* were studied by Hasan and Aracil [19], where they found the rust to effectively control an annual weed heliotrope (*Heliotropium europaeum* L.).

They evaluated the biocontrol potential of the rust in a greenhouse and field inoculation experiments and observed that the rust rapidly killed infected plants and reduced or prevented seed production. Similarly, Anderson et al. [20] conducted a study to evaluate the potential of three rusts naturally infecting Chilean needle grass (*Nassella neesiana*) in Argentina, *Uromyces pencanus*, *Puccinia graminella*, and *P. nassellae*, as biocontrol agents. They found *U. pencanus* to be most effective due to the damage it inflicts on its host in the field. A list of species of *Uromyces* studied as biocontrol agents is given in Table 1.

| Species of *Uromyces* | Target Organism (Plants) | Reference |
|------------------------|--------------------------|-----------|
| *Uromyces rumicis*     | *Rumex crispus*          | [21]      |
| *Uromyces galegae*     | *Galega officinalis*     | [22]      |
| *Uromyces heliotropii* | *Heliotropium europaeum* | [19]      |
| *Uromyces pencanus*    | *Nassella neesiana*      | [20,23–25]|
| *Uromyces pisi-sativi* | *Cytisus scoparius*      | [26]      |
| *Uromyces pisi-sativi* | *Chamaecytisus palmensis*| [26]      |
| *Uromyces pisi-sativi* | *Lupinus polyphyllus*    | [26]      |

Rust fungi as biocontrol agents are mainly studied in their use against plant weeds. The biocontrol ability of some species of *Puccinia* was investigated, such as as *P. abrupta* var. *parthenicola* on different growth stages of *Parthenium hysterophorus* [27,28], *Puccinia arachtaeae* on *Cardiospermum grandiflorum* [29], *Puccinia komarovi* var. *glanduliferae* on *Impatiens glandulifera* [30], and *Prospodium transformans* on *Tecoma stans* var. *stans* [31]. A number of studies on *Uromyces* species have been carried out by a number of researchers (see Table 1), but the assessment of species from other rust genera has not yet been well established. Furthermore, the broad aspects of the rust fungi as biocontrol agents based on biochemical and molecular approaches still need to be explored.

4. Data Collection and Molecular Analysis

4.1. Data Collection and Compilation

This paper was compiled based on the information obtained from an extensive search of peer-reviewed publications, field guides, monographs, books, conference proceedings, project reports, and other offline and online resources. This information was updated as recently as December 2020. The information obtained was compiled firstly as a table depicting names of species of *Uromyces*, their hosts along with the family, the locality of occurrence, and the reference of scientific publication. The scientific names of the hosts and fungi were then cross-verified for scientific entities. The host name given in the original citation was sometimes changed to be consistent with the current taxonomy based on The Plant List (http://www.theplantlist.org; accessed on 20 April 2022). The names of rust fungi genus/species as reported in the cited publications were replaced by currently accepted names according to the websites MycoBank (www.mycobank.org; accessed on 20 April 2022) and Species Fungorum (www.speciesfungorum.org; accessed on 20 April 2022). Fungal Databases, US National Fungus Collections, ARS, USDA, an important online source of plant pathogens and their hosts, was also noted during the compilation [32]. An attempt was made to summarize all available literature on diversity and distribution of *Uromyces* spp.; only the most appropriate references were included in this study.

4.2. Analyses of Collected Data

After inserting the collected data into the primary database as a table, they were analyzed for numerical and graphical summaries. First, the information was analyzed by providing a comparative representation of the diversity and distribution of rust fungi.
(Uromyces) by country and continent. Thereafter, distribution patterns based on substrate types (herb, shrub, and tree) were constructed to understand the host preference of these rust fungi. In addition, the data of the host family were also presented. The publication indices of Uromyces spp. in terms of year, decade, and era are analyzed and presented in this paper. In addition, the references in other languages are translated into English so that the scientific community can understand them easily.

4.3. Molecular Data Analyzing

DNA sequence data of Uromyces species from the LSU and ITS rDNA were downloaded from GenBank and through earlier published literature. A checklist of molecular studies on Uromyces sp. along with the name of isolate and references were also prepared and presented in Table 2. The relevant publications on molecular analyses were also consulted [5,12,33,34]. Individual nucleotide sequences of LSU and ITS were aligned distinctly using MAFFT 7 (http://mafft.cbrc.jp/alignment/server/; accessed on 1 April 2022) [35], followed by manual checking and editing where necessary in BioEdit v. 7.0.9 [36]. The sequences of taxa containing poorly aligned portions, incomplete data, missing sequence data, and gaps were trimmed. The ITS and LSU sequences alignment was converted to NEXUS format (.nxs) using ClustalX 2.1 (http://www.clustal.org/clustal2/; accessed on 1 April 2022) for Phylogenetic Analysis Using PAUP (PAUP) analysis. The aligned LSU and ITS single-gene datasets and a concatenated dataset of LSU and ITS genes were analyzed with PAUP 4.0b10 [37]. These datasets were run after completing the program output tree in the Bootstrap.tre file. Maximum Likelihood bootstrap values greater than 60% are considered good bootstrap supports and are given above each node. Phylogenetic trees are visualized using the FigTree v1.4.0 program [38] and reorganized in Microsoft power point.

Table 2. GenBank and voucher/culture collection accession numbers of Uromyces species included in the phylogenetic study.

| Taxa                        | Isolate Name      | GenBank Accession No. | References |
|-----------------------------|-------------------|-----------------------|------------|
|                             |                   | ITS                   | LSU        |            |
| Uromyces acetosae           | DAOM 159824       | HQ317557              | HQ317557   | [39]      |
| Uromyces acuminatus         | DUC506            | -                     | KC570451   | [40]      |
|                             | CT-V080623-3      | GU109282              | -          | [41]      |
| Uromyces aemulus            | HSZ0345           | AF511081              | AF511081   | [42]      |
|                              | 2020-6-28-0005    | MT136509              | -          | Unpublished |
| Uromyces alopecuri          | DAOM 234714       | HM131363              | HM131363   | [44]      |
| Uromyces alyxiae            | BPI 871816        | -                     | KY764186   | Unpublished |
| Uromyces anthyllidis        | EB19              | FJ468411              | -          | [45]      |
| Uromyces ari-triphylli      | BPI 871111        | DQ354529              | DQ354528   | [12]      |
| Uromyces betae              | BPI910289         | KY764187              | -          | Unpublished |
| Uromyces beticola           | PDD:101534        | KX985757              | KX985757   | [46]      |
| Uromyces bicicis-sempervirens | GZU 10-94         | -                     | DQ917714   | Unpublished |
| Uromyces chenopodii-fruticosi | K(M)107793     | -                     | MT053261   | [47]      |
| Uromyces ciceris-arietini   | BPI 879192        | FJ468398              | GU058030   | [48]      |
|                             |                   | -                     | GQ914998   | [49]      |
| Uromyces clignyi            | DAOM 192217       | HM131364              | -          | [44]      |
| Taxa                   | Isolate Name | GenBank Accession No. | References |
|-----------------------|--------------|-----------------------|------------|
| **Uromyces coloradensis** | DAOM 181557  | HQ317565              | [39]       |
|                       | DAOM187619   | HQ317564              | [39]       |
| **Uromyces coronatus** | BPI 910293   | -                     | KY764191   |
|                       |              |                       | Unpublished|
| **Uromyces dactyldis** | PRC692       | KM667950              | [50]       |
|                       | TUB 14997    | -                     | DQ917745   |
| **Uromyces dianthi**   | BPI 141961   | -                     | KY764192   |
| **Uromyces dolicholi** | DAOM 116149  | HQ317563              | [39]       |
|                       | TUB 14997    | -                     | DQ917745   |
| **Uromyces durus**     | DAOM 116149  | HQ317563              | -          |
|                       | TUB 14997    | -                     | DQ917745   |
| **Uromyces eragrostidis** | BPI004474  | -                     | KY75113    |
| **Uromyces erythronii** | DE-soo-43285 | MH205917 MH205917    | [52]       |
| **Uromyces euphorbiae** | F425         | AF180158              | -          |
| **Uromyces ficariae**  | WM 1398      | -                     | AF426204   |
| **Uromyces gageae**    | HMJAU:8558   | MG742207 MG742207     | [54]       |
|                       | U242         | DQ250133 DQ250133     | [55]       |
| **Uromyces gerani**    | BRIP 60100   | -                     | KX999898   |
| **Uromyces gladioli**  | -            | -                     | GU936633   |
| **Uromyces graminicola** | URO 3       | KR264705              | -          |
| **Uromyces halstedii** | U1673        | MG905913              | -          |
|                       | UB:22382     | KR821137              | -          |
|                       | UB:22875     | KR821138              | -          |
| **Uromyces hawksworthii** | UB:22875   | -                     | NG059990   |
| **Uromyces hedysari-obsca** | DAOM 189699 | HQ317573              | -          |
|                       | DAOM 223015  | -                     | HQ317572   |
| **Uromyces ixiae**     | RSA191       | -                     | DQ917738   |
|                       | RSA8         | -                     | DQ917739   |
| **Uromyces japonicus** | TNS:F:61987  | LC203759 LC203759     | [51]       |
| **Uromyces jonesii**   | DAOM 137431  | HQ317559 HQ317559     | Unpublished|
| **Uromyces junctic**   | GZU 11-98    | -                     | AF426203   |
| **Uromyces klotzschianus** | BA91        | MF044015              | -          |
|                       | BA92         | MF044016              | -          |
|                       | BA93         | -                     | MF044017   |
| **Uromyces lespedeae-procumbentis** | BPI 910294   | KY764193              | -          |
|                       |             |                       | Unpublished|
| **Uromyces lonandracearum** | BRIP:59022 | -                     | KM249862   |
| **Uromyces lupini**    | DAOM 233961  | HQ317570 HQ317570     | [39]       |
| **Uromyces magnusii**  | PDD:94487    | KX985755              | -          |
| **Uromyces minor**     | MVA50000151  | MK045314              | -          |
|                       |              |                       | Unpublished|
| **Uromyces musae**     | DAOM 192221  | HQ317556              | -          |
|                       |              |                       | [39]       |
| Taxa               | Isolate Name | GenBank Accession No. | References |
|-------------------|--------------|-----------------------|------------|
|                   |              | ITS                   | LSU        |            |
| Uromyces muscari  | DAOM 75626   | HQ317552              | HQ317552   | [39]       |
| Uromyces neotropicalis | MCA2533 | -                     | DQ021885   | [63]       |
| Uromyces novissimus | R20        | -                     | EU851147   | [57]       |
| Uromyces orientalis | BRIP 60934 | KX999899              | -          | [56]       |
| Uromyces otaviensis | NA 305   | -                     | DQ917715   | [43]       |
| Uromyces peglerae  | BPI 843311  | -                     | KY575116   | Unpublished |
| Uromyces pisic-sativa | BRIP 60151 | -                     | KX999000   | [56]       |
| Uromyces plurivarius | 070P06138145 | KP313731             | -          | [64]       |
|                   |              | RK44                  | JQ312671   | [65]       |
| Uromyces polygoni-avicularis | DAOM 181565 | -                     | HQ317558   | [39]       |
| Uromyces probus     | BPI 893209  | KF690686              | KF690686   | [66]       |
| Uromyces rebeccae   | FDWSRU 15-022 | MN386999             | MN386999   | [47]       |
| Uromyces reichertii | 6421       | AF511084              | AF511084   | [42]       |
| Uromyces rumicis    | PDD93529    | KX985763              | -          | [46]       |
|                   | BPI 910298  | -                     | KY764197   | Unpublished |
| Uromyces salsoiae  | FDWSRU 05-090 | MN381162             | MN381162   | [47]       |
| Uromyces saccocola | BRIP:57517  | KF609686              | KF609686   | [67]       |
| Uromyces scutellatus | E328     | AF180200              | AF180200   | [53]       |
| Uromyces setariae-italic | BPI 863744 | KY575068              | -          | Unpublished |
| Uromyces setariae-italic | BPI 863750 | -                     | KY575069   | Unpublished |
| Uromyces socius     | BPI 910302  | -                     | KY764200   | Unpublished |
| Uromyces sporobolica| DAOM 114294 | HQ317560              | HQ317560   | [39]       |
| Uromyces striatus   | U-675       | HQ412651              | -          | [68]       |
|                   | DAOM 240966 | HQ317512              | -          | [39]       |
| Uromyces striolatus | E405       | AF180201              | AF180201   | [53]       |
| Uromyces strobianthes | BPI 893253 | -                     | KY798375   | Unpublished |
| Uromyces tenuicutis | BRIP 60012 | -                     | KX999904   | [56]       |
|                   | NZ11 PDD-99990 | JQ777025             | -          | Unpublished |
| Uromyces transversalis | CA1124 | JQ776984              | -          | Unpublished |
|                   | PUR:N16743  | -                     | MF374730   | [69]       |
| Uromyces trifolii  | R217        | EU014070              | -          | [70]       |
|                   | BRIP 57653  | -                     | KX999905   | [56]       |
| Uromyces vicie-fabae | TSH_R6320 | AB115665              | -          | [71]       |
|                   | WM 1365     | -                     | AF426199   | [33]       |
| Uromyces vignae    | H92019      | AB115731              | -          | [72]       |
|                   | H50721      | AB115726              | -          |            |
| Uromyces wedeliae  | BRIP 60213  | -                     | KX999906   | [56]       |
|                   | BRIP 60213  | -                     | KX999906   | [56]       |
5. Distribution, Diversity, and Molecular Data Analysis of *Uromyces*

5.1. Phylogenetic Analyses

In the phylogenetic results, *Uromyces* were separated into two complexes in both ITS and LSU sequence data. Both complexes of ITS and LSU share many similar sequences. The incomplete sequences were mostly found in the *Uromyces* sequence dataset, e.g., ITS1 and LSU1, ITS1, 5.8S complete, and ITS partial or 28S partially. Approximately 50% of the sequences had up to 300 nucleotides, while the remaining sequences had up to 800 nucleotides. Incomplete sequences can result in two complexes in a single genus. Therefore, complete gene sequences from ITS and LSU are needed to analyze these complex clades (Figures 3 and 4).

![Phylogram generated from PAUP analysis of Uromyces species of ITS sequences.](image-url)

Figure 3. Phylogram generated from PAUP analysis of *Uromyces* species of ITS sequences. The scale bar indicates 70 changes and outgroup *Gymnosporangium przewalskii* BJFCR01859_NR154073. Bootstrap values of MP > 60% are given above branches, and 72 sequences are included in the phylogenetic analyses. The best maximum parsimony (MP) dataset consists of 394 total characters, of which 164 were constant, 156 parsimony-informative, and 74 parsimony-non-informative. The parsimony analysis of the data matrix showed a thousand equally parsimonious trees with a length of 917 steps in the first tree (CI = 0.408, RI = 0.702, RC = 0.286, HI = 0.592).
Figure 4. Phylogram generated from PAUP analysis of *Uromyces* species of LSU sequences. The scale bars indicate 60 changes and outgroup *Gymnosporangium przewalskii* BJFCR01859_NG06067. Bootstrap values of MP equal to or greater than 60% are given above branches, and 58 sequences are included in the phylogenetic analyses. The best maximum parsimony (MP) dataset consists of 873 total characters, of which 600 were constant, 125 parsimony-informative, and 148 parsimony-non-informative. The parsimony analysis of the data matrix showed 1000 equally parsimonious trees with a length of 625 steps in the first tree (CI = 0.550, RI = 0.708, RC = 0.389, HI = 0.450).

5.2. Morphological Diversity and Distribution

The results compiled on diversity and distribution revealed that the rust genus *Uromyces* comprised a total of 1500 species that occurred worldwide as obligate parasitic fungi on vascular plants [3,4]. After combing through the different online databases [1,32,73], a total of 988 species were included in this paper. Similar to all fungi, its distribution shows great variations in different parts of the world. The tremendously changing climates across the world lead to diversified flora, resulting in a wide diversity and distribution of rust fungi. With regard to global diversity, it is pertinent to note here that *Uromyces* varies in diversity.
among countries and continents. These rust fungi generally show a macrocyclic nature and autoecious mode of the life cycle [2,5], which confirms their morphological diversity on specific hosts in particular regions. The broad host range in microcyclic and heteroecious life cycles was also found in Uromyces species.

The genus Uromyces predominantly showed its great diversity in North America in comparison to other continents. Almost 834 (30%) species are described here, which is the highest among all continents. The diversity of the genus is known in other continents of the world as follows: Asia, with 633 (23%) species described; Europe, with 622 (23%) species; North America, with 321 (12%) species; Africa, with 313 (11%) described species; and Australia, with 32 (1%) species described. The genus appears to be well-represented in North American, Asian, and European counties. After dispersal by various modes, such as wind, water, or insect vectors, the propagules of rust fungi germinate and infect plant tissues of specific hosts. Entry of these pathogens takes place either by natural openings such as lenticels and stomata or by wounds or injuries caused by various physical agents [74].

Human anthropogenic activities also play an important role in the global distribution of these organisms. So far, Uromyces species have been found on every land on earth except Antarctica. To understand the distribution of the Uromyces species, we analyzed their distributions across continents and terrestrial ecoregions. More than 150 countries and territories or occupancies showed the distribution of this rust genus. Although only 73 sequences of ITS and nLSU Uromyces species were identified based on molecular characteristics, respectively, the majority of the species are still identified morphologically. This may impact the number and distribution pattern of the Uromyces species as molecular-based research on the rust fungi progress. In comparison to all continents, the highest distribution of 834 species of Uromyces was recorded over 66 regions of different countries and dependencies of North America. The distribution pattern observed in other continents was observed as follows: 633 species in 26 countries and dependencies of Asia; 622 species in 33 countries and dependencies of Europe; 321 species in 17 countries and dependencies of South America; 313 species in 27 countries and dependencies of Africa; and 37 species in 3 countries, islands, or dependencies of Oceania. The array of this global distribution of Uromyces species reveals their vast diversity and justifies its position as the second-largest genus of rust fungi (Figures 5 and 6).

Figure 5. Heat map to show the global distribution and species richness of Uromyces spp.
5.3. Distribution Patterns of Rust Fungi (Uromyces) by Substrate Types

Figure 6. Heat maps to show the continental distribution and species richness of Uromyces spp.

Distribution: America, Kazakhstan, India, Brazil, Syria, México, Russia, Cyprus, Ecuador, Uzbekistan, New Guinea, Cape Province, Algeria, Tunisia, Japan, Norway, China, Uganda, Hawaií, Argentina, Canada, Siberia, France, South Africa, Sri Lanka, Ethiopia, Colombia, Romania, Costa Rica, Israel, Chile, Switzerland, Ivory Coast, Uganda, Turkey, Kenya, Morocco, Britain, New Zealand, Malaysia, Philippines, Iran, Greece, Madagascar, Romania, Australia, Yunnan, Tajikistan, Pakistan, Zimbabwe, Myanmar, Namibia, Costa Rica, Taiwán, Nepal, Italy, Cuba, Afghanistan, Egypt, Iraq, Peru, Tibet, Croatia, Sudan, Ecuador, Jamaica, Sweden, Bolivia, Spain, Austria, Tunisia, Kenya, Norway, Kansas, Peru, Poland, and Venezuela.

5.3. Distribution Patterns of Rust Fungi (Uromyces) by Substrate Types

Uromyces, being the second-largest rust genus after Puccinia, contains a number of important plant pathogens. The species of Uromyces attacks nearly all categories of plants and causes great damage to both plant and their products. Uromyces is a genus of rust fungi that infects both monocots and dicots throughout the world. Analyses of the available literature on host diversity of Uromyces revealed that a total of 647 plant genera belonging to 95 plant families were found to be infected by these rust fungi. Uromyces is particularly reported in plant families such as Amaranthaceae, Apiaceae, Asparagaceae, Asteraceae, Caryophyllaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Iridaceae, Poaceae, and Rubiaceae. The highest occurrences of Uromyces spp. were observed in Poaceae and Fabaceae, with 105 and 103 infected host genera, respectively. A number of other families that have an infection in up to 50 plant genera have also been observed, including Acanthaceae, Asparagaceae, Asteraceae, Caprifoliaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Liliaceae, Loranthaceae, Oleaceae, Poaceae, and Polygonaceae. A study on the diversity and distribution of Uromyces in India by Gautam and Avasthi [75] revealed that nearly 180 plant species belonging to
85 genera and 32 families were found to be infected with *Uromyces* spp. Among all families, *Fabaceae* and *Poaceae* were found to be the most infected with different species of *Uromyces*. A family-wise comparison of the genera of infected host plants is shown in Figure 7.

**Figure 7.** Family-wise comparison of genera of infected host plants.

### 5.4. Global Host Range of *Uromyces* Species

The host range of *Uromyces* species showed their occurrence in 647 plant genera of 95 plant families. They are reported to be infected by various species of *Uromyces*, such as: *Abrus*, *Abulon*, *Acacia*, *Acalypha*, *Acantholimon*, *Acanthophyllum*, *Acetosa*, *Achyranthes*, *Aciandra*, *Acorus*, *Aconitum*, *Actinostemon*, *Adenostyles*, *Aegopogon*, *Aellenia*, *Aluropod* *Agropyron*, *Agrostis*, *Aira*, *Albizzia*, *Albuca*, *Alhagi*, *Allium*, *Aloe*, *Alopecurus*, *Alysicarpus*, *Andropogon*, *Atriplex*, *Arthrocnemum*, *Anabasis*, *Atriplex* *Avenella*, *Avenula*, *Babiana*, *Baeonia*, *Balanus*, *Bassia*, *Bauhinia*, *Beneckmania*, *Bellevalia*, *Beloerone*, *Benedicella*, *Beta*, *Bidens*, *Blainvillea*, *Bokssiera*, *Bolboschoenus*, *Boltonia*, *Bonairea*, *Bonairea*, *Bongardia*, *Bororia*, *Bothriochloa*, *Bouvardia*, *Brachiaria*, *Bradburya*, *Brida*, *Brodiea*, *Brounus*, *Bryzopyrum*, *Buphonia*, *Buphonna*, *Buplorestia*, *Buplorestia*, *Buxus*, *Cacalia*, *Caffraria*, *Caesalpinia*, *Cactus*, *Canavalia*, *Capparis*, *Caragana*, *Caryophyllum*, *Cassia*, *Caulerpa*, *Centropogon*, *Centrolepis*, *Ceratophyllum*, *Ceratophyllum*, *Cerato*
Caccinia, Cachrys, Cajanus, Calamagrostis, Calandra, Callicarpa, Callisia, Calopogonum, Caltha, Calycotome, Caryophyllus, Catenopsis, Camelina, Campylothecia, Capilaria, Capillipedium, Caragana, Carex, Cassia, Caucaulus, Cayaponia, Celosia, Celtis, Centropogon, Centrosema, Cerastium, Cercotropis, Ceratocephalum, Centaurea, Chamamecystis, Chamaleon, Chasmanthe, Chenopodium, Chesneya, Chilologlottis, Chionodoxa, Chloris, Chlorophyllum, Chorizanthe, Cicer, Cicutaria, Cinamopteris, Circus, Cissus, Cladosachys, Cladrastis, Claytonia, Cleome, Clinacopteris, Clitoria, Clutia, Cnidoscolus, Cnidocactus, Colliecum, Collomia, Cologania, Colutea, Combretum, Commelina, Commphorida, Convolvulus, Corallodorus, Cordia, Coronilla, Cosmos, Crepis, Crocosmia, Crocus, Crotalaria, Cruckshanksia, Cucubalus, Cucumis, Cucurbita, Cupania, Cypripedium, Cyttisus, Dactylis, Dactylotetum, Dalbergia, Danthonia, Deeringia, Destroseris, Deschampsia, Desmodium, Desmostachya, Dianthus, Dichanthium, Dichromena, Dicrateria, Dierama, Digitaria, Diodia, Dipcaeli, Dipogon, Discaria, Distichlis, Dodecatheon, Dolicholus, Dolichos, Doronicum, Dorycnium, Dorycnopsis, Dorystaechis, Doyera, Dracaena, Drimia, Echinocereus, Edelweissia, Ehretia, Ehrharta, Eleocharis, Emex, Emmerheriza, Enarega, Endymion, Enyssiphon, Epicampe, Eregrostis, Eremopogon, Eremopyrum, Erichloa, Eriogonum, Eriophyllum, Eriosema, Erioaspernum, Eruca, Eriotheca, Fatoua, Fernula, Ferula, Festuca, Ficaria, Figimbristylis, Flemingia, Fleurya, Floscopia, Friesia, Fritillaria, Gagea, Galactia, Galega, Galinsoga, Galium, Galphimia, Gantlum, Gaudichaudia, Gaura, Gayophyllum, Geissorhiza, Genista, Gentiana, Geranium, Gilliesia, Gladiolus, Glaux, Glyceria, Glycyrrhiza, Gnaphalium, Gomphrena, Goossypium, Gouania, Grindelia, Guizotia, Gurania, Gypsophila, Habrochloa, Haenanthus, Halenia, Halimodendron, Halochloa, Haloxylon, Hardenbergia, Hedysarum, Helianthus, Helichrysum, Helictotrichon, Heliospilus, Heliotropium, Helleborus, Helminthia, Hemarthria, Heracleum, Hesperantha, Heterantha, Heteromorpha, Hetropogon, Hewittia, Hibiscus, Hippocrepis, Hippomarathrum, Holcus, Homogyne, Honckenya, Hookera, Hordeum, Hossackia, Houstonia, Hyacinthoides, Hyacinthus, Hydrocotyle, Hymenocarpus, Hypparrhenia, Hypericum, Hypoestes, Hypoxis, Hyspela, Indigofera, Inga, Ipomoea, Irisine, Isatia, Ixia, Jacobinia, Jacobincum, Jasminum, Jatropha, Jaumea, Junci, Juniperus, Justicia, Kalidium, Karroochoa, Kochia, Koelera, Krameria, Krasseninnikovia, Kummerowia, Kyllinga, Lablab, Laburnum, Lachenalia, Lantana, Lapeirousia, Lasiacis, Lasiocorys, Lathyurus, Ledenergina, Leersia, Lentibotris, Lens, Leonotis, Leontice, Leopoldia, leptochloa, Leucanthemella, Ledebeschna, Leptocorys, Liguularia, Lilium, Limonium, Loddia, Loeselia, Lomandra, Loranthus, Lotus, Lupinus, Laza, Lychnis, Lygeum, Lysiachia, Manickia, Maianthemum, Mallotus, Manettia, Manihot, Massonia, Mattiastrum, Medicago, Melobesia, Melandrium, Melanophyllum, Melanura, Melaspadoria, Medica, Melilotus, Melothria, Menyanthes, Mercurialis, Merremia, Messerschmiedia, Microcloa, Microlepidea, Microtis, Miersia, Mikania, Milium, Milla, Minimus, Minuartia, Mosea, Moehringia, Monandria, Monocymbium, Montanoa, Moraea, Mucuna, Muehlenbeckia, Muhlenbergia, Multimun, Muricauda, Musa, Muscari, Myosotis, Myrsine, Nassauvia, Nassella, Noaea, Nothothecium, Nymphoides, Ocimum, Odontonema, Oenothera, Oenothera, Olsynium, Onagra, Onobrychis, Oenonis, Ophiophriza, Oreoporus, Ormosia, Orthothalium, Orthopanus, Orobus, Orthosiphon, Orzyathus, Oryza, Oxytropis, Pachylophus, Panicum, Panicaria, Paspalum, Paspalum, Passiflora, Pavonia, Petroska, Peltandra, Pennisetum, Pentace, Pentaschis, Peplis, Peracarpa, Perymenium, Petrorhagia, Peschiosima, Peucedanum, Phaca, Phacelurus, Phalaris, Phaselus, Phleum, Phlogacanthus, Phlox, Phoradendron, Phragnites, Phrygianthus, Phthiriusa, Phytolithus, Phuteuma, Piptanthus, Pissum, Pittosporum, Plantago, Poa, Poinsettia, Poiretia, Poitea, Polemannia, Polemonium, Pollia, Polycnemum, Polygala, Polygonon, Polygnum, Polytris, Polycarya, Pontederia, Poza, Prangos, Pratia, Primula, Priina, Pseudarthria, Pseudantherum, Pseudoarea, Psychotria, Pteranthis, Pulicaria, Quinquisalum, Ranunculus, Rapanea, Ratibida, Rhincanthus, Rhinopetalum, Rhynchospora, Rhynchosia, Ribes, Roepera, Romulea, Rosa, Rottboellia, Ruibackia, Ruellia, Runex, Rythodispersa, Sabinea, Salicornia, Salmea, Salpichroa, Salso, Saprium, Saururus, Scaveola, Schismus, Schizachyrium, Schizellenua, Scilla, Scirpus, Scleranthus, Scleria, Sclerophyla, Sclerophylia, Secale, Secamone, Serigera, Sedum, Seligeria, Selysia, Senecio, Sesbania, Sesel, Seslea, Setaria, Sigesbeckia, Silene, Silphium, Simethis, Simphacymus, Simphacymus, Sisyrinchium, Sium, Smilacina, Smilax, Snowdenia, Solanum, Solaria,
Solidago, Sophora, Sorghum, Sparaxis, Sparganium, Spartina, Sparganium, Spermacoce, Sphaeralcea, Sphenostylis, Sporobolus, Sprengelia, Stenorrhynchus, Stipa, Strobilanthes, Strumaria, Struthanthus, Stylochaeton, Sueda, Swainsona, Teramnus, Tessaria, Tetraena, Tetragonolobus, Thalictrum, Thapsia, Thelymitra, Thymella, Thermopsis, Thyrsacanthus, Tithymalus, Tournefortia, Toona, Tradescantia, Tragus, Triadenium, Trianopsis, Tribolium, Trichocline, Tricholaena, Trichoneura, Trichosanthes, Tricoryne, Trifolium, Trigonella, Tripogandra, Tripogon, Tripsacum, Trisetum, Triteleia, Tritonia, Trochomeriopsis Tulipa, Tylosema, Ulex, Urtaria, Urginea, Urochloa, Valerianella, Veratrum, Verbascum, Veronica, Vicia, Vigna, Vilfa, Viola, Viscaria, Viscum, Vitis, Vossia, Vulpius, Watsonia, Wedelia, Willbranda, Wulffia, Zantedeschia, Zebrina, Zexmenia, Zigadenus, Zizania, Zizaniopsis, and Zygophyllum. This compiled information depicts the broad host range of these rust fungi. The association of Uromyces species with some host plants is given in Figure 8, while detailed information on the diversity, host range, and distribution of Uromyces species is summarized in Table 3.

Figure 8. Occurrence of Uromyces species with some host plants. (A–G) Uromyces fabae on Pisum sativum (pea). (A) Aecia; (B,C) Uredia; (D) Telia; (E) Aeciospores; (F) Urediospores; (G) Teliospores; (H–J) Uromyces gerani on Geranium sp.; (H,J) Uredia; (J) Urediospores; (K–N) Uromyces rumicis on Rumex sp.; (K,L) Uredia; (M) Urediospores; (N) Teliospores; (O–R) Uromycesviciae-fabae on Vicia faba; (O–Q) Different rust sorus on natural host; (R) Aecia; (S) Urediospores and Teliospores; (T–W) Uromyces trifoli on Trifolium sp.; (T–V) Uredia and Telia; (W) Teliospores. Scale bars: C, I, L, Q, R, U, V = 1 mm; D = 0.5 mm; E, F, G, J, M, N, S, W = 20 µm.
Table 3. Diversity, host range, and distribution of species of *Uromyces*.

| Species                        | Host                                                                 | Locality                                                                 | Reference |
|--------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|-----------|
| *Uromyces abbreviatus* Arthur  | *Psoralea purshii* and *P. physodes*                                | California, Idaho (Western USA), Nevada, and Washington (USA)           | [76–78]   |
| *Uromyces acantholimonis* Syd. & P. Syd. | *Acantholimon libanoticum*                                           | Afghanistan, Iran, Israel, Kazakhstan, Pakistan, and Turkey              | [79–81]   |
| *Uromyces acutatus* J. Schröt.  | *Acetosa pratensis*, *Rumex acetosa*, *R. acetosella*, *R. acetoselloides*, *R. alpestris*, and *R. scutatus* | Bulgaria, Czech Republic, China, Czechoslovakia, Finland, Germany, Iceland, México, Norway, Poland, Portugal, Romania, Spain, Sweden, Russia, Taiwan, Turkey, and the United Kingdom | [80,82–84] |
| *Uromyces acuminatus* Arthur    | *Dalbergia sissoo*                                                  | India, Pakistan                                                          | [85,86]   |
| *Uromyces acutatus* Fuckel      | *Aconitum apetalum*, *A. barbatum*, *A. carmichaelii*, *A. delavayi*, *A. delavayi*, *A. lycocotonum*, *A. macrorhynchum*, *A. monticola*, *A. umbrosum*, and *A. volubile* | China and Japan                                                          | [87–91]   |
| *Uromyces acutit-lycoctoni* (DC.) G. Winter | *Aconitum apetalum*                                               | California, Finland, Romania, and Spain                                 | [78,92]   |
| *Uromyces acori* T.S. Ramakr. & Rangaswami | *Acorus calamus*                                                  | India, China, Japan, and Thailand                                        | [93–99]   |
| *Uromyces actinostemonis* H.S. Jacks. & Holw. | *Actinostemon concolor*                                           | Brazil                                                                   | [100–103] |
| *Uromyces acuminatus* Arthur    | *Arearia lateriflora*, *Collomia linearis*, *Dodecatheon pulchellum*, *Honkenya peploides*, *Lysimachia ciliata*, *Maianthemum canadense*, *Phlox glaberrima*, *P. pilosa*, *Polemonium reptans*, *Smilacina stellate*, *Spartina alterniflora*, *S. alterniflora*, *S. cynosuroides*, *S. graciis*, *S. patens*, and *S. pectinata* | Alberta, Bulgaria, California, Canada, Colorado, Delaware, Florida, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Montana, New Hampshire, New Jersey, New York, North America, North Dakota, Nova Scotia, Ontario, Quebec, Rhode Island, Saskatchewan, Wisconsin, and Wyoming | [41,104] |
| *Uromyces acutatus* Fuckel      | *Gagea bohemia* and *G. villosa*                                   | Germany                                                                  | [105]     |
| *Uromyces adelphicus* Syd.      | *Milium trichopodium*                                               | Syria                                                                    | [106]     |
| *Uromyces aceiidiiformis* (F. Strauss) C.C. Rees | *Fritillaria palatidiflora*, *F. pinetica*, *F. ussuriensis*, *Lilium bulbiferum*, and *L. candidum* | China, Greece, Germany, Norway, Sweden, and the United Kingdom          | [91,105,107–109] |
| *Uromyces aegopogonis* Dietel & Holw. | *Aegopogon chenchroides*, *A. geminiflorus*, *A. gracilis*, and *A. tenellus* | México                                                                   | [106,110] |
| Species                               | Host                                      | Locality                                                                 | Reference       |
|---------------------------------------|-------------------------------------------|---------------------------------------------------------------------------|-----------------|
| Uromyces aeluropodinus Tranzschel     | Aeluropus littoralis                      | Ukraine                                                                   | [111]           |
| Uromyces aeluropodis-repentis Nattrass| Aeluropus repens                          | Cyprus, Turkey, and Ukraine                                               | [80,106]        |
| Uromyces aemulus Arthur               | Allium acuminatum, A. brevistylum, A. brandegei, A. douglasii, A. gooddingii, A. tolmiei, and A. validum | Arizona, California, Colorado, Canada, Idaho, Nevada, Utah, Oregon, Washington, and Wyoming | [112-116]       |
| Uromyces affinis G. Winter            | Alstroemeria aurantiaca, A. caryophyllaea, A. inodora, A. isabellana, A. nemorosa, Curculigo scorzonerifolius, Hypoxis decumbens, H. erecta, and H. hirsuta | Brazil, Colombia, Dominica, Dominican Republic, Florida, Missouri, Mississippi, and Puerto Rico | [102,117-125]   |
| Uromyces agnatus Arthur               | Jatropha stimulosa                        | Florida                                                                   | [112]           |
| Uromyces agropyri Barclay             | Agropyron sp.                             | India                                                                     | [126]           |
| Uromyces agrostidis (Gonz. Frag.) A.L. Guyot | Agrostis capillaris and Ranunculus repens | Europe                                                                    | [39]            |
| Uromyces aimeae Berndt                | Cucurbitaceae                             | Ecuador                                                                   | [127]           |
| Uromyces ainae-flexuosa Ferd. & Winge | Aira flexuosa, Averella flexuosa, Deschampsia beringensis, Deschampsia flexuosa, and Lerchenfeldia flexuosa | Bulgaria, Czech Republic, Czechoslovakia, Denmark, Finland, Germany, Poland, and Russia | [82,83,106,128-135] |
| Uromyces albidum Kirgizb.             | Acanthophyllum pungens                   | Uzbekistan                                                                | [106]           |
| Uromyces albiziae Henn.               | Albitzia procrea                          | Indonesia                                                                 | [136]           |
| Uromyces albucal Kalchrbr. & Cooke   | Albuca altissima, A. aurea, A. minor, A. canadensis, A. juncefolia, and A. wakefeldii | Kenya, Malawi, South Africa                                              | [137-142]       |
| Uromyces albus (Clinton) Dietel & Holw. | Vicia americana and V. linearis       | California and Nebraska                                                  | [78,143]        |
| Uromyces algeriensis P. Syd. & Syd.   | Scilla obtusifolia and Scilla sp.        | Algeria, Cyprus, and Tunisia                                              | [144,145]       |
| Uromyces allagi Szemb.                | Allagi camelorum and A. sparsifolium      | Russia and Uzbekistan                                                    | [146]           |
| Uromyces allii-monomathi Y. Harada    | Allium monanthum                         | Japan                                                                     | [147]           |
| Uromyces allii-sibirici Gjærøm        | Allium sibiricum                         | Norway                                                                    | [148,149]       |
| Uromyces allii-victorialis Liou & Y.C. Wang | Allium fistulosum, A. macrostemon, and A. victorialis | China                                                                    | [90]            |
| Uromyces aloes (Cooke) Magnus         | Aloe spp.                                | India, Japan, and South Africa                                           | [43,133,139,150-154] |
| Species                          | Host                                      | Locality                                      | Reference       |
|---------------------------------|-------------------------------------------|-----------------------------------------------|-----------------|
| *Uromyces alopecuri* Seym.      | *Alopecurus aequalis, A. amurensis, A. arundinaceus, A. arundinaceus, A. geniculatus, A. japonicas, A. pratensis, Ramunculus sceleratus, R. sieboldii, and R. vernyi* | China, Colorado, Japan, Iowa, Minnesota, Nebraska, Texas, Turkey, and Wyoming | [80,92,96,155,156] |
| *Uromyces alpestris* Tranzschel  | *Euphorbia cyпарissas*                     | Bulgaria, Germany, Spain, and Switzerland      | [82,157–160]    |
| *Uromyces alsinis* Tranzschel    | *Minuartia hamata and M. meyeri*          | Turkey                                        | [80,161]        |
| *Uromyces alstroemeriae* (Dietel) Henn. | *Alstroemeria revoluta, A. aurantiaca, A. caryophyllae, A. inodora, A. ligthu, A. isabellana, A. nemorosa, and A. subrosulacea* | America, Argentina, Brazil, and Chile         | [143,162–167]   |
| *Uromyces alysicarpi* Wakef. & Hansf. | *Allysarcus glumaceus, A. monilifer, A. vaginalis, and A. violaceus* | India, Malawi, Uganda, South Africa, and Zambia | [138,139,141,168–172] |
| *Uromyces alyxiae* Arthur       | *Allyxia oliviformis*                      | Hawaii                                        | [173–176]       |
| *Uromyces ambiens* Cooke        | *Buxus sempervirens and B. wallichiana*   | India and Pakistan                            | [177,178]       |
| *Uromyces ambiguus* (DC) Lév.   | *Allium ampeloprasum, A. angulosum, A. atroviolaceum, A. babingtonii, A. descendens, A. fistulosum, A. rotundum, A. schoenoprasum, A. sibiricum, A. urinum, A. vinule, and A. voldsteinii* | Bulgaria, Finland, Germany, Greece, Japan, Poland, Romania, Ukraine, and the United Kingdom | [82,105,133,135,145,179] |
| *Uromyces americanus* Specg.    | *Cicuta bulbifera, Hydrocotyle bonariensis, H. umbellata, Oenanthe sarmentosa, Scirpus americanus, S. acutis, S. californicus, S. lacustris, S. olneyi, S. validum, Sium cicatilum, and Sium suive* | Alabama, Argentina, Canada, California, Delaware, Indiana, Nebraska, Puerto Rico, Texas, Uruguay, Virgin Islands, West Indies, and Wisconsin | [180–185] |
| *Uromyces amoenus* Syd. & P. Syd. | *Anaphalis alplica, A. busua, A. contorta, A. margaritacea, and Gnaphalia margaritacea* | Canada, California, China, Idaho, Japan, Michigan, Montana, Nepal, Oregon, Russia, South Dakota, and Washington | [79,94,186–190] |
| *Uromyces amphidynus* Syd. & P. Syd. | *Glyceria acutiflora, G. borealis, G. fluitans, and G. septentrinalis* | America, Indiana, New Jersey, Rhode Island, and Wisconsin | [79,191–193] |
| *Uromyces amphilophis-insculptae* T.S. Ramakr., Sriniv. & Sundaram | *Amphilophis insculpta* | India | [194] |
| *Uromyces amurensis* Kom.       | *Maackia amurensis, M. floribunda, M. hupehensis, M. tashiroi, and M. reticulata* | China, Japan, Korea, and Russia               | [92,94,96,108,109] |
Table 3. Cont.

| Species                      | Host                                                                 | Locality                                           | Reference                                                                 |
|------------------------------|----------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------|
| Uromyces anabasis Kazenas    | Anabasis aphylla                                                     | China, Cyprus, Greece, Iraq, Israel, Spain, and Turkey | [195]                                                                    |
| Uromyces anagyridis Roum.    | Anagris foetida, A. mongolicus, A. nanus, Piptanthus concolor, and P. nepalensis | Alabama, Arkansas, Bolivia, Carolina, Chile, China, Cyprus, Greece, Iraq, Israel, Spain, Florida, India, Indiana, Illinois, Jersey, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New North Georgia, New York, Ohio, Tennessee, Texas, and Virginia | [80,81,96,108,109,196–198]                                                   |
| Uromyces andropogonis Tracy  | Andropogon eliottii, A. emersus, A. glomeratus, A. perforatus, A. ternarius, A. saccharoides, A. virginicus, Sorghum halepense, Viola papilionacea, V. pedata, V. pedata, V. striata, and V. tricolor | Barbados, Cuba, Ethiopia, Guatemala, India, Kenya, Malawi, Mauritius, Mexico, New Guinea, Pakistan, Philippines, Uganda, Sierra Leone, Sudan, Tunisia, and West Indies | [85,87,88,122,139,168,171,172,201,206–209]                                      |
| Uromyces andropogonis-annulati Syd., P. Syd. & E.J. Butler | Andropogon annulatus, A. abyssinicus, A. brevifoliis, A. brevifolius, A. hirtflorus, A. ischaemum, A. longipes, A. multinervis, A. pilosellus, A. platypellia, A. schottii, Bothriochloa insculpta, B. ischaemum, B. pertusa, Cymbopogon giganteus, Dichanthium annulatum, D. aristatum, D. caricosum, D. nodosum, Erythrea abyssinica, Hemarthria altissima, Hyparrhenia harba, Monocymbium ceresiforme, and Themeda triandra | Barbados, Cuba, Ethiopia, Guatemala, India, Kenya, Malawi, Mauritius, Mexico, New Guinea, Pakistan, Philippines, Uganda, Sierra Leone, Sudan, Tunisia, and West Indies | [85,87,88,122,139,168,171,172,201,206–209]                                      |
| Uromyces anguriae H.S. Jacks. & Holw. | Anguria warmingiana, Gurania pycocephala, Helmontia cardiophylla, and Willbrandia verticillata | Brazil and French Guiana | [127,210–212] |
| Uromyces anomatheca Cooke    | Anomatheca cruenta                                                  | South Africa                                      | [123,138,169,213]                                                        |
| Uromyces anotidis Petch      | Anotis richardiana                                                  | Sri Lanka                                          | [214]                                                                    |
| Uromyces anotidis-monospermatis T.S. Ramakr. & Sundaram | Anotis monosperma                                                   | India                                              | [215]                                                                    |
| Uromyces anthacanthi H.S. Jacks. | Anthacanthus spinosus                                              | Puerto Rico, Virgin Islands, and West Indies      | [125,184,216–218]                                                        |
| Uromyces anthemophilus Vestergr. | Bauhinia longifolia and Bauhinia sp.                               | Mato Grosso                                       | [102,219]                                                                |
| Uromyces antholyzae Syd. & P. Syd. | Antholyza abyssinica                                               | Ethiopia and South Africa                          | [138,142,169]                                                            |
| Species                          | Host                                                      | Locality                                                                 | Reference |
|---------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|-----------|
| Uromyces anthyllidis (Grev.) J. Schröt. | Anagyris spp., Astragalus spp., Benedictella spp., Coronilla spp., Dorycnium spp., Hedysarum spp., Hippoprepis spp., Lathurus spp., Lotus spp., Lupinus spp., Medicago spp., Ononis spp., Trifolium spp., Trigonella spp., and Vicia spp. | Algeria, Armenia, Austria, Belarus, Bulgaria, Cyprus, France, Germany, Greece, Hungary, Iran, Itlay, Kyrgyzstan, Libya, Morocco, Palestine, Poland, Portugal, Romania, Spain, Switzerland, Syria, Tunisia, Turkey, Ukraine, Ukraine, and Yugoslavia | [81,220–222] |
| Uromyces antiguanus Cummins      | Desmodium orbiculare and Desmodium sp.                   | Guatemala (USA) and México                                               | [171,172,223–225] |
| Uromyces antioquiensis Mayor     | Rhynchospora polyphylla and R. nervosa                   | Colombia                                                                 | [119,226,227] |
| Uromyces apiosporus Hazsl.       | Primula minima and Primula suffrutescens                 | Austria, Bulgaria, Germany, Poland, Romania, and California              | [78,82,135,230,231] |
| Uromyces appludae Syd., P. Syd. & E.J. Butler | Apluda mutica, Indigofera linifolia, and I. cordifolia | India, Guinea, Pakistan, and Philippines                                | [85,208,232,233] |
| Uromyces appendiculatus Gassner  | Passiflora foetida and Cayaponia sp.                     | Brazil, India, and Uruguay (USA)                                         | [127,211,212,234] |
| Uromyces appendiculatus (Pers.) Link | Amphicarpaea spp., Cajanus sp., Dolichos spp., Lablab sp., Phaseolus spp., and Vigna spp. | Worldwide                                                                | [92,195,235–238] |
| Uromyces appendiculatus var. azukicola Hirata | Phaseolus angularis                                      | Japan                                                                    | [239]     |
| Uromyces aquiriensis Berndt      | Cucurbitaceae                                            | Acre (Israel)                                                           | [127]     |
| Uromyces araucanus Dietel & Neger | Senecio oitites                                         | La Araucania (Chile)                                                    | [162,240] |
| Uromyces archerianus Arthur & Fromme | Chloris elegans                                          | Africa, China, Kenya, Malawi, and México (USA)                          | [108–110,171,172,241–245] |
| Uromyces arenariae Tranzschel    | Arenaria graminea, A. gypsophiloides, and A. serpyllifolia | Armenia, Romania, and Turkey                                            | [80,161,246] |
| Uromyces arenariae-grandiflorae Mayor | Arenaria saponarioides                                    | Turkey                                                                  | [80]      |
| Uromyces argaeus Maire           | Rumex tuberosus                                          | Asia                                                                    | [247]     |
| Uromyces argutus F. Kern         | Spartina alterniflora and S. glabra                      | Florida                                                                 | [106,242,248] |
| Uromyces argyrolobii Doidge      | Argyrolobium amplexicaule and Sesbania sp.               | KwaZulu-Natal and Zimbabwe (South Africa)                               | [138,249,250] |
### Table 3. Cont.

| Species                                      | Host                                                                 | Locality                                                                                           | Reference                  |
|-----------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------|
| *Uromyces ari-triphylli* (Schwein.) Seeler    | *Arisaema* spp., *Peltandra virginica*, and *Zantedeschia* sp.       | Britain, California, Canada, Florida, Indiana, Illinois, Iowa, Minnesota, Mississippi, México, Washington, and Virginia | [185,187,251–256]          |
| *Uromyces arizonicus* Tracy & Galloway       | *Eriogonum racemosum*                                                | Arizona (USA)                                                                                      | [257]                      |
| *Uromyces armeriicola* Spec.                 | *Armeria chilensis*                                                  | North, Central, and South America, and West Indies                                                | [120,125,258–265]          |
| *Uromyces asclepiadis* Cooke                 | *Asclepias* spp.                                                     | Argentina, Brazil, Bolivia, Colombia, Cuba, California, Florida, Maine, Peru, Puerto Rico, México, and Texas | [100,118,123,124,262,266]   |
| *Uromyces asperulae* McAlpine               | *Asperula conferta* and *A. oligantha*                              | Australia                                                                                         | [267,268]                  |
| *Uromyces aspiliae* H.S. Jacks. & Holw.     | *Aspilia phyllostachya*, *Aspilia* sp., and *Wedelia saltensis*     | Argentina and Rio de Janeiro (Brazil)                                                             | [102,210,269]              |
| *Uromyces aspiliellus* Vienn. -Bourg.        | *Aspilia latifolia*                                                  | Ivory Coast                                                                                        | [102,210,269]              |
| *Uromyces aspiliicola* Cummins              | *Aspilia aspifolia*, *A. africana*, *A. kotschyi*, *Guizota* sp., and *Wedelia* sp. | Malawi, Sudan, Tanzania, and Uganda                                                               | [168,271–275]              |
| *Uromyces astragali-alopecuri* Gjaerum       | *Astragalus alopecurus*                                              | Turkey                                                                                             | [276]                      |
| *Uromyces astragali-atropilosuli* Gjaerum    | *Astragalus atropilosulus var. bequaertii*                           | Kenya                                                                                             | [276]                      |
| *Uromyces astragalicola* Henn.               | *Astragalus adsurgens*                                               | North Dakota and Utah                                                                               | [277,278]                  |
| *Uromyces astragali-pseudoutrigeris* Gjaerum | *Astragalus pseudoutriger*                                           | Turkey                                                                                             | [276]                      |
| *Uromyces atlanticus* Guyot & Malençon      | *Hippocrepis scabra*                                                 | Morocco                                                                                            | [279]                      |
| *Uromyces atriplicis* McAlpine               | *Atriplex confertifolia*, *A. paludosa*, *A. semibaccata*, and *A. vesicaria* | Australia, Britain, and Colorado                                                                   | [280–282]                  |
| *Uromyces atropidis* Tranzschel              | *Atropidis distantis*                                                | Turkey                                                                                             | [161]                      |
| *Uromyces aureus* Dietel & Holw.            | *Allium trinulatum*, *A. validum*, *Allium* sp., and *Chlorogalum pomeridianum* | California and Washington (USA)                                                                   | [78,186,187]               |
| *Uromyces auriculae* (Magnus) A. Buchheim   | *Primula auricula*                                                  | Austria and Germany                                                                                 | [160,283]                  |
| *Uromyces azorellae* Cooke                  | *Pozoa trifoliata* and *Schizolematrifoliata latum*                  | New Zealand                                                                                        | [213,284]                  |
| *Uromyces babianae* Doidge                  | *Babiana disticha*                                                  | Western Cape Province (South Africa)                                                              | [249,285]                  |
| *Uromyces baccarinii* Syd. & P. Syd.        | *Wedelia* sp.                                                        | Eritrea                                                                                           | 1937 [286,287]             |
| Species                        | Host                                                                 | Locality                                                                 | Reference               |
|-------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------|
| *Uromyces badius* Syd.        | *Haemanthus coccineus*, *H. pumilio*, *H. rotundifolius*, and *H. sanguineus* | South Africa                                                              | [138,167,288]           |
| *Uromyces baemlerianus* Bubák | *Melilotus* spp.                                                      | Austria, Bulgaria, China, Czech Republic, Hungary, India, Israel, Japan, Poland, Spain, Romania, Turkey, and Ukraine | [81,82,96,289,290]      |
| *Uromyces bahiensis* Perd. Sánch. | *Loranthaceae*                                                        | Panama                                                                    | [15]                    |
| *Uromyces basellae* Syd. & P. Syd. | *Basella rubra*                                                       | Malaysia                                                                  | [15]                    |
| *Uromyces baumhiniæ* Henn.    | *Bauhinia bongardii*, *B. cujabensis*, *B. hiemalis*, *B. longiflora*, *B. pauletia*, and *B. ungulata* | Brazil and México                                                         | [102,291,292]           |
| *Uromyces baumhiniicola* Arthur | *Bauhinia chiorantha* and *B. pringlei*                              | México                                                                    | [291]                   |
| *Uromyces beckermopsis* E. Castell. | *Beckeropsis nubica*                                                 | Eritrea and Euthopia                                                     | [106,293,294]           |
| *Uromyces beckmanniae* H.S. Jacks. | *Beckmannia eruciformis* and *B. syzigachne*                  | Oregon                                                                   | [295]                   |
| *Uromyces behenis* (DC.) Unger  | *Silene* spp.                                                         | Worldwide                                                                | [296,297]               |
| *Uromyces belemensis* F.C. Albuq. & Figueiredo | *Ormosia nobilis*                                                   | Brazil                                                                   | [219,298]               |
| *Uromyces beloperones* G.F. Laundon | *Beloperone californica*, *B. purpusii*, and *Jacobinia mexicana* | Arizona, California, and México                                           | [116,218,299,300]       |
| *Uromyces bermudianus* Cummins | *Cyperus paniculatus*                                                 | Bermuda                                                                  | [224,233]               |
| *Uromyces betelii* Arthur     | *Silene verconcnda*                                                   | California                                                                | [301]                   |
| *Uromyces beticola* (Bellynck) Boerema, Loer. & Hamers | *Beta vulgaris*                                                      | Bulgaria, Israel, and Turkey                                              | [80–82,302]             |
| *Uromyces bicolor* Ellis      | *Allium* spp.                                                        | California, Idaho, Kansas, Massachusetts, Missouri, Montana, Maine, New York, Ohio, and Texas | [186,191,303–305]      |
| *Uromyces bidenticola* (Henn.) Arthur | *Bidens* spp. and *Cosmos caudatus*                                 | Africa, Asia, Central and South America, and the Southern United States | [96,121,306–310]       |
| *Uromyces bidentis* Lagerh.    | *Bidens* spp. and *Cosmos caudatus*                                 | Central and South America, Southern United States, and West Indies        | [118,119,152,184,264,311–313] |
| *Uromyces bisbyi* Savile       | *Eriogonum parvifolium*                                              | California                                                                | [314]                   |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| Uromyces blainvilleae Berk. | Blainvillea spp. | Brazil, China, India, Nigeria, Sri Lanka, and Tanzania | [152,195,210,315–317] |
| Uromyces blandus Syd. | Phragmites vulgaris | China and Philippines | [318,319] |
| Uromyces boissierea Vienn. Bourg. | Boissiera pumilio | Iran | [320] |
| Uromyces bolusii Massee | Aspalathus pachyloba | South Africa | [138,321,322] |
| Uromyces bonareae Henn. | Bomarea sp. | Brazil | [167,261,323] |
| Uromyces bonaerensis Spec. | Gomphrena elegans | Buenos Aires | [324] |
| Uromyces bonye-spet Bubá | Tritonia scillaris and Acidanthera pallida | Southern Africa | [325] |
| Uromyces bonaveriae P. Syd. | Bonavera securidaca and Securigera securidaca | Greece | [326,327] |
| Uromyces borenlueri Magnus | Hedysarum boreale, H. mackenzii, and Rumex arifolius | Canada and Finland | [328,329] |
| Uromyces borntmerullier Magnus | Bongardia chrysogonum and Leontice armeniaca | Cyprus, Iran, Iraq, Israel, and Turkey | [81,196,330] |
| Uromyces boseri Vienn. Bourg. | Trochomeriopsis diversifolia | Madagascar | [127,332] |
| Uromyces bothriochloae-intermediae Gorlenko | Bothriochloa intermedia | China | [108,109] |
| Uromyces bouvardiae Syd. & P. Syd. | Bouvardia spp. | Guatemala and México | [281,292,333] |
| Uromyces bradburyae H.S. Jacks. & Holw. | Bradburya pubescens, E. virginiana, Centrosema pubescens, and C. virginianum | Brazil | [101,102] |
| Uromyces brandzæ Sávul. | Lathyrus aureus, L. venetus, and Orobus vernus | Romania and Ukraine | [111,126,228] |
| Uromyces brassilianus Speg. | Senecio brasiliensis | Buenos Aires | [334] |
| Uromyces brasiensis Trotter | Jacquantia spp. | Brazil, China, and México | [102,335,336] |
| Uromyces bravensis Cummins | Sporobolus argutus and S. pyramidalis | The Dominican Republic and Texas | [171,172,337] |
| Uromyces bresadaleae Transchel | Euphorbia sp. | Itlay | [157] |
| Uromyces briandii Har. | Euphorbia sp. | Germany | [338] |
| Uromyces brizae Gäm., E. Müll. & Terrier | Briza media | France | [339] |
| Uromyces brodiaeae Ellis & Harkn | Brodiaea spp., Hookera lyacinthina, and Triteleia ixioides | California, Oregon, and Washington (USA) | [187,340] |
| Species                                      | Host                                      | Locality                   | Reference   |
|----------------------------------------------|-------------------------------------------|----------------------------|-------------|
| *Uromyces bromicola* Arthur & Holw.          | *Bromus coloratus* and *B. lithobius*     | Chile                      | [199]       |
| *Uromyces brominus* Gucevič                  | *Bromus riparius*                        | Ukraine and Russia         | [106,111]   |
| *Uromyces buforrestiae* Cummins              | *Buforestia imperforata*                 | Ghana                      | [341]       |
| *Uromyces bugranae* A.L. Guyot               | *Ononis columnae* and *O. striata*       | France, Switzerland        | [342]       |
| *Uromyces bulbinicola* Doidge                | *Bulbine bulbosa*                        | South Australia            | [249,343]   |
| *Uromyces bulbinus* Thüm.                    | *Bulbine sp.*                            | Australia and New Zealand  | [344]       |
| *Uromyces bunsteri* (Neger) H.S. Jacks. & Holw. | *Sisyrinchium cuspidatum*, *S. graminifolium*, and *Sisyrinchium sp.* | Chile                      | [166]       |
| *Uromyces bylianus* Doidge                   | *Liliaceae*                              | KwaZulu-Natal              | [249]       |
| *Uromyces cacaliae* (DC.) Unger              | *Adenostyles* spp. and *Cacalia* spp.    | Austria, Germany, Japan, Poland, Romania, Russia, and Switzerland | [92,135,159,160] |
| *Uromyces cacinniae* Jørst.                  | *Caccinia strigosa* and *Maatiastrum* sp.| Afghanistan and Iran       | [347,348]   |
| *Uromyces cachrydis* Har.                   | *Cachrys pterochnae*, *Hippomarathrum boissieri*, *H. crassilobum*, *H. siculum*, and *Prangos* sp. | Cyprus, Israel, Libya, Morocco, and Portugal | [81,349]   |
| *Uromyces caladii* (Schwein.) Farl.         | *Arisaema* spp., *Peltandra* spp., and *Muricauda dracontium* | Carolina, Georgia, Iowa, Minnesota, México, Missouri, Oklahoma, Texas, and West Virginia | [133,155,253,255] |
| *Uromyces calagrostidis* Uljan.              | *Calamagrostis arundinacea*              | The former Soviet Union    | [106]       |
| *Uromyces callicarpae* (Petch) Fujik. ex S. Ito | *Callicarpa* spp.                        | China, Japan, and Taiwan   | [94,96,97]  |
| *Uromyces callopoconii* Cummins              | *Callopoconium galactioides*              | Guatemala                  | [171,172,224,350] |
| *Uromyces callotheus* Syd.                   | *Urginea*                                | Sierra Leone               | [351]       |
| *Uromyces calycotomes* Güm. & Terrier        | *Calycotome spinosa*                     | France                     | [220]       |
| *Uromyces calystegiae* de Bary ex Fuckel     | *Convolvulus arvensis*                   | America, Australia, Italy, and Germany | [352]       |
| *Uromyces camphorosmae* (Castagne) Har.      | *Camphorosma monspeliaca*                | France                     | [353]       |
| *Uromyces cannavalei* J.M. Yen               | *Canavalia microcarpa*                   | China and Taiwan           | [97,108,109]|
| *Uromyces capensis* Doidge                   | *Oenothera biennis*                      | Western Cape Province      | [138]       |
| *Uromyces capitatus* Syd. & P. Syd.         | *Desmodium yunnanensis*                  | China, India, and Pakistan | [96,156,254–357] |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| *Uromyces caraganae* (Thüm.) Magnus | *Caragana arborescens* | Portugal | [358,359] |
| *Uromyces caraganicola* Henn. | *Caragana chamlagu* | Asia, Africa, and Europe | [358,359] |
| *Uromyces caricis-brunneae* Morim. | *Carex brunnnea* | Japan | [94] |
| *Uromyces caricis-dolichocarpae* Azbukina | *Carex dolichocarpa* | Sakhalin (Russia) | [364] |
| *Uromyces caricis-rafflesianae* Mayor | *Carex rafflesiana* | Philippines | [365] |
| *Uromyces caricis-schmidtii* Tomilin | *Carex schmidtii* | Khabarovsk | [297,366] |
| *Uromyces caricis-sempervirentis* E. Fisch. | *Carex sempervirens, C. sempervirens, C. stenophylla, Phyteuma betonicifolium, and P. orbiculare* | Austria, Europe, Germany, Poland, Romania, Switzerland, and Turkey | [43,80,160] |
| *Uromyces carnesus* (Nees) Har. | *Astragalus alpinus and Oxytropis campestris* | Finland and Wyoming | [329,367,368] |
| *Uromyces carpathicus* Namysl. | *Geranium phaeum* | Poland | [369,370] |
| *Uromyces carthagenensis* Speg. | *Manihot spp.* | Argentina, Brazil, and Uruguay | [371,372] |
| *Uromyces cassiae-mimosoidis* (Doidge) Doidge | *Cassia mimosoides and Chamaecrista mimosoides* | South Africa | [138,171,172,285] |
| *Uromyces castaneus* P. Syd. & Syd. | *Desmodium incanum, D. purpureum, and Desmodium sp.* | Argentina and Brazil | [171,269] |
| *Uromyces cayaponiae* Henn. | *Ipomoea sp.* | Santa Catarina | [127] |
| *Uromyces cecereus* Berndt & F.O. Freire | *Ipomoea sp.* | Brazil | [373] |
| *Uromyces cedrelae* (Henn.) Henn. | *Toona serrata* | Indonesia | [177,374] |
| *Uromyces celosiae* Dietel & Holw. | *Celosia latifolia* | Argentina, Brazil, Costa Rica, Cuba, Jamaica, and México | [167,263,269,308,375,376] |
| *Uromyces celtidis* Dietel | *Celtis sp.* | Brazil | [102,375] |
| *Uromyces censisiae* A.L. Goyot | *Ononis cenisia* | France | [342] |
| *Uromyces ceratocarpi* Syd. & P. Syd. | *Ceratocarpus arenarius* | China and Russia | [91,144] |
| *Uromyces cestricala* Speeg. | *Cestrum puteos and C. strigilatum* | Argentina and Bolivia | [334,377] |
| *Uromyces chaetobromi* Gjærum | *Chaetobromus dreganus and C. schraderi* | South Africa | [244,378] |
| *Uromyces chaetolimoniensis* Korbonsk. | *Chaetolimoni sodianum* | Tajikistan | [379] |
| *Uromyces charmelii* Liou | *Phyteuma charmelii* | France | [380] |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| **Uromyces chenopodii** J. Schröt | Chenopodium sp., Salsola spp., and Suaeda spp. | Around the world | [381] |
| **Uromyces chenopodii-fruticosi** (DC.) M. Abbasi & Aime | Suaeda maritima | England and Germany | [47] |
| **Uromyces chesneyae** Tranzschel & Erem. | Chesneya astragalina | Central Asia and Russia | [382,383] |
| **Uromyces chevalieri** A.L. Guyot | Drimia sp. | Chari and Tropical Africa | [384,385] |
| **Uromyces chilensis** Dietel & Neger | Lathyrus magellanicus and L. multiceps | Chile | [162,386] |
| **Uromyces chiovendae** Bacc. | Cissus sp. | Somalia | [287] |
| **Uromyces chloridis** Doidge | Chloris myriostachya, C. pilosa, and C. virgate | Uganda and South Africa | [138,249] |
| **Uromyces chlorogali** Dietel & Holw. | Chlorogalum pomeridianum | California and Washington (USA) | [186,187,387] |
| **Uromyces chorizanthis** Ellis & Harkn. | Chorizanthe pungens | California | [340,388] |
| **Uromyces christensenii** I. Anikster & I. Wahl | Muscari pareflorum and Hordeum bulbosum | Israel | [389,390] |
| **Uromyces chubutensis** Speg. | Poa chubutensis | Chubut | [391] |
| **Uromyces ciceris-arietini** (Grognot) Jacz. & G. Boyer | Cicer arietinum, Trigonella polycerata, and Vicia spp. | Brazil, India, Kenya, Libya, México, Morocco, and Pakistan | [81,221,357,392] |
| **Uromyces ciceris-soongaricae** S. Ahmad | Cicer songaricum | Pakistan | [393] |
| **Uromyces circinalis** Kalchbr. & Cooke | Scilla prasina | South Africa | [138] |
| **Uromyces circumscriptus** Neger | Loranthus spp., Struthanthus complexus, and Phrygianthus spp. | Argentina, Brazil, and Chile | [394] |
| **Uromyces ciserneanus** Speg. | Excoecaria biglandulosa var. serra and Sapium spp. | Argentina, Brazil, Paraguay, and Venezuela | [100,101,103,269,324] |
| **Uromyces cladomanes** Traverse | Vitis sp. | Somalia | [287] |
| **Uromyces cladastidis** Traverso | Cladastis shikokiana | Japan | [92] |
| **Uromyces clarus** H.S. Jacks. & Holw. | Iresine angustifolia, I. celosia and Iresine sp. | Bolivia, Brazil, Cuba, Venezuela, and West Indies | [167,263,376] |
| **Uromyces Claytonius** Dietel | Lathyrus spp. and Vicia spp. | Argentina, Chile, and Uruguay | [143,240,395] |
| **Uromyces claytoniae** Cooke & Peck | Claytonia caroliniana | Canada and New York | [104,185,396] |
| Species                  | Host                                                                 | Locality                                                                 | Reference                                                                 |
|-------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| *Uromyces clignyi* Pat. & Har. | Andropogon spp., Bothriochloa spp., Capillipedium sp., Cymbopogon sp., Dichanthium spp., Eremopogon sp., Exotheca sp., Hemarthria spp., Heteropogon sp., Monocymbium sp., Schizachyrium sp., Sorghum sp., and Themeda spp. | Uganda, Australia, Cameroon, China, Ethiopia, Ghana, Guatemala, India, Japan, Kenya, Mexico, Nepal, Nigeria, Pakistan, South Africa, Tanzania, Uganda, and Zambia | [110,152,171,172,243,244,356,397] |
| *Uromyces clignyioides* Gjaerum | Monocymbium cereiforme                                                | Zimbabwe                                                                  | [244]                                                                     |
| *Uromyces clitoriae* Arthur | *Clitoria mexicana*                                                    | México                                                                     | [172,398]                                                                 |
| *Uromyces clitoralis* Mitter | Argyrolobium flaccidum                                                | India                                                                     | [357,399]                                                                 |
| *Uromyces clivallis* Mitter | *Artemisia scoparia*                                                  | Kenya                                                                     | [400]                                                                     |
| *Uromyces cnidoscoli* G. Henn. | Cnidoscolus vitifolius and Jatropha sp.                              | Argentina and Brazil                                                       | [103,282,291]                                                             |
| *Uromyces cobresiae* Korbonsk. | Carex sp.                                                             | Uzbekistan                                                                 | [146]                                                                     |
| *Uromyces colchici* Massee  | Colchicum spectabile and C. bavaricum                                 | Great Britain and Turkey                                                  | [133,401,402]                                                             |
| *Uromyces collinus* J.F. Hennen & Cummins | Bauhinia sp.                                                            | México                                                                     | [133,292,403]                                                             |
| *Uromyces cologaniae* Arthur | Cologania spp. and Teramnus uncinatus                               | Costa Rica, Guatemala, México, Puerto Rico, and Venezuela                 | [259,281,306,310,398]                                                     |
| *Uromyces coloradensis* Ellis & Everh. | Astragalus sp. and Vicia sp.                                         | Arizona, California, Canada, Colorado, Iowa, Utah, Washington, and Wisconsin (USA) | [225,404]                                                                 |
| *Uromyces columbianus* Mayor | Melanthera sp.                                                        | Florida, West Indies, and Central and South America                       | [76,77,120,122,226,306]                                                   |
| *Uromyces coluteae* Arthur  | Colutea arborescens                                                  | Austria                                                                   | [299]                                                                     |
| *Uromyces comptus* Thaung   | Combretum                                                             | Myanmar                                                                    | [405]                                                                     |
| *Uromyces comedens* P. Syd. & Syd. | Jasminum pubescens                                                  | India and Dominican Republic                                              | [118,119,144,224,406]                                                    |
| *Uromyces commelinae* Cooke | Anischoleolype sp., Ancellina spp., Callisia spp., Commelina spp., Cyanotis spp., Pollia spp., Tradescantia sp., Tripogandra sp., and Zebrina sp. | Worldwide                                                                  | [222,407]                                                                 |
| *Uromyces compactus* Peck   | Aster spinosus, Boltonia diffusa, and Baccharis sp.                  | Arizona, México, and Texas                                                | [116,337,408,409]                                                        |
| *Uromyces comptus* P. Syd. & Syd. | Ipomoea bipinnatifida                                              | Namibia, South Africa, and Tanzania                                      | [126,138,165,384]                                                        |
| *Uromyces congoensis* Syd. & P. Syd. | Bauhinia sp.                                                          | The Democratic Republic of the Congo                                     | [410]                                                                     |
Table 3. Cont.

| Species                     | Host                              | Locality                                      | Reference                  |
|-----------------------------|-----------------------------------|-----------------------------------------------|----------------------------|
| *Uromyces conicus* Jørst.   | Cleome sp.                        | Bolivia                                       | [411]                      |
| *Uromyces coordinatus* Arthur | Euphorbia spp. and Tithymalus palmeri | California and Utah                         | [103,114,404,412]         |
| *Uromyces corallocarpi* W.T. Dale | Corallocarpus emetocatharticus and Dogerea emetocathartica | Trinidad and Tobago, México, and West Indies | [127,211,212,308]         |
| *Uromyces cordiae* Henn.    | Cordia sp.                        | Bolivia                                       | [413]                      |
| *Uromyces coronatus* Yoshin. | Heliotruchon milanjianum, Oryza sativa, Zizania spp., and Zizaniopsis sp. | China, Florida, Hong Kong, Japan, Korea, Taiwan, Thailand, and Uganda | [39,94–97,262,414]         |
| *Uromyces corollae* Vienn.-Bourg. | Coronilla rostrate and C. varia | Argentina                                      | [81,220]                   |
| *Uromyces costaricensis* Syd. | Lasiacis sp. and Panicum altissimum | Brazil, Colombia, Costa Rica, Florida, México, Puerto Rico, and Venezuela | [106,229,294]             |
| *Uromyces costeianus* Spec. | Sphaeralcea velutina               | Chile                                         | [386,416]                  |
| *Uromyces croci* Pass.      | Euphorbia sp.                     | Argentina, Chile, and Peru                    | [269,281,376,417]         |
| *Uromyces crotalariae-nitens* Salazar-Yepes & Buriticá | Crotalaria nitens | Colombia                                       | [423]                      |
| *Uromyces cruchetii* Mayor  | Borreria tenella                  | Argentina and Chile                           | [226]                      |
| *Uromyces cruckshanksiae* Cummins & Bonar | Cruckshanksia bustillosi, C. palma, Oreopolus glacialis, and O. palmae | Argentina and Chile             | [233,240,415]             |
| Species                     | Host                                                                 | Locality                                                                 | Reference                           |
|-----------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------|
| Uromyces cucubali Hirats. & Hashioka | Cucubalus baccifer | China, Japan, and Taiwan                                                    | [89,96,97]                          |
| Uromyces cucullatus Syd. & P. Syd. | Baltimora recta, Perymenium spp., Wedelia spp., and Zexmenia spp. | Cuba, Costa Rica, Guatemala, Mexico, and Panama                            | [124,281,398,424,425]              |
| Uromyces cucumivorus Berndt | Cucumis melo var. flexuosus                                           | Iraq                                                                      | [127]                               |
| Uromyces cuenodii Maire     | Silene eriocalycina                                                 | Iraq                                                                      | [196]                               |
| Uromyces cuspidatus G. Winter | Festuca spp., Melica laxiflora, Muhlenber gia spp., and Poa chubutensis | Argentina, Bolivia, and Chile                                              | [106,199,240]                      |
| Uromyces cyanotidis Cummins | Cyanotis capitata                                                  | Papua New Guinea                                                          | [233,426]                           |
| Uromyces cyathulae Henn.    | Cyathula globulifera                                               | Eritrea                                                                   | [287,427]                           |
| Uromyces cyperi Henn.       | Cyperus sp.                                                        | Eritrea                                                                   | [287,427]                           |
| Uromyces cypericola Gjærum  | Cyperus albostriatus and C. cyprioides                             | Kenya, South Africa, and Uganda                                           | [428,429]                           |
| Uromyces cyprius VIenn.-Bourg. | Rumex cyprius                                                        | Iran                                                                      | [430]                               |
| Uromyces cystopiformis Lagerh. | Centropogon sp. and Siphocampylus sp.                              | Costa Rica, Ecuador                                                       | [165,310,431]                      |
| Uromyces cytisi J. Schröt.  | Canna ra arborescens, Cytisus polytrichus, Genista aucheri, G. tinctoria, and Laburnum anagyroides | Russia, Ukraine, and Turkey                                               | [80,111,432]                       |
| Uromyces dactylidis G.H. Otth | Agrostis spp., Alopecurus spp., Anemone sp., Avenula sp., Dactylis spp., Festuca spp., Poa spp., Ranunculus spp., and Trisetum sp. | Arizona, Armenia, Australia, Bulgaria, Pakistan, Canada, China, Cheez Republic, Czechoslovakia, Denmark, Finland, Germany, Hungary, Japan, New Zealand, Norway, Oklahoma, Pennsylvania, Romania, Spain, Sweden, Switzerland, Ukraine, Virginia, Vermont, and other temperate regions of the world | [43,80,82,105,113,368,409,433–441] |
| Uromyces dactyloctenii Wakef. & Hansf. | Dactyloctenium aegyptium                                         | China, Japan, Kenya, Namibia, Samoa, Tanzania, Tonga, and Uganda         | [140,168,274,442,443]              |
| Uromyces dactyloticeniiola (Speg.) J.C. Lindq. | Dactyloctenium aegyptium                                         | Central Africa, the Philippines, and South America                      | [106]                               |
| Uromyces danthoniae McAlpine | Danthonia spp. and Rytidosperma spp.                              | Australia and New Zealand                                                 | [245,280,313]                      |
| Species                        | Host                                      | Locality                                                                 | Reference                                                                 |
|-------------------------------|-------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| *Uromyces decoratus* Syd. & P. Syd. | *Crotalaria* spp.                        | China, Costa Rica, Guinea, Ghana, India, Japan, Madagascar, Myanmar, Nigeria, Pakistan, Sri Lanka, Taiwan, Thailand, and Venezuela | [85,86,94,96,97,152,171,172,281,290,312,356,357,444,445]                     |
| *Uromyces deeringiae* Syd. & P. Syd. | *Cladostachys polysperma* and *Deeringia* spp. | China, Japan, India, Indonesia, Philippines, and Taiwan                    | [92,167,232,309,446,447]                                                  |
| *Uromyces delagoënsis* Bubák   | *Lapeirousia delagoënsis*                 | Mozambique                                                                | [249]                                                                    |
| *Uromyces dendroseridis* Keissl. | *Dendroseris micrantha*                  | Chile                                                                     | [240]                                                                    |
| *Uromyces densus* Arthur       | *Bidens pilosa*                          | Puerto Rico                                                               | [76,77]                                                                   |
| *Uromyces desmodii* Cooke     | *Desmodium canescens*                    | South Carolina and Brazil                                                 | [448]                                                                    |
| *Uromyces desmodicola* Jörgst. | *Desmodium albiflorum*                   | Brazil                                                                    | [102,171,449]                                                            |
| *Uromyces desmodii-leiocarpi* Henn. | *Desmodium leiocarpum*             | Brazil                                                                    | [171,450]                                                                |
| *Uromyces devoluensis* Gäum.   | *Senecio dornicum*                       | France                                                                    | [451]                                                                    |
| *Uromyces dianthi* (Pers.) Niessl | *Arearia leptocladis*, *Buonia* spp., *Cerastium brachypeetalum*, *Dianthus* spp., *Euphorbia* spp., *Gypsophila* spp., *Petrophaga* spp., *Silene* sp., *Vaccaria* sp., and *Vicia* sp. | Australia, Bermuda, Bolivia, Bulgaria, Brazil, California, Chile, Cuba, Germany, Japan, Kenya, Madagascar, New York, Poland, Romania, Spain, Thailand, Texas, Turkey, Ukraine, and Washington (USA) | [80,82,105,111,135,140,452] |
| *Uromyces dianthi-caryophylli* Monchot | *Dianthus* sp.                  | France                                                                    | [453]                                                                    |
| *Uromyces dichromenae* W.T. Dale | *Dichromena radicans*               | Jamaica, Trinidad and Tobago, and West Indies                             | [264,308]                                                                |
| *Uromyces dictyospermae* Ellis & Everh. ex Tranzschel | *Euphorbia* spp., *Jatropha* spp., and *Tithymalus* sp. | California, Florida, Minnesota, Montana, Oklahoma, and Washington (USA) | [103,157,187,254,262,278,388,454–456]                                    |
| *Uromyces didymae* Gapon.     | *Veronica polita*                       | Uzbekistan                                                                | [457]                                                                    |
| *Uromyces dieramatis* Doidge   | *Dierama* spp.                          | South Africa                                                              | [123,138,139,273,458]                                                   |
| *Uromyces dietelianus* Pazschke | *Bauhinia* spp.                        | Argentina, Brazil, and Uruguay                                            | [100,101,269,297]                                                       |
| *Uromyces digitariae-adscendentis* Y.C. Wang | *Digitaria* sp.                 | China and Taiwan                                                           | [96,97]                                                                   |
| *Uromyces dilucidus* Cummins   | *Sisyrinchium striatum*                 | Argentina                                                                 | [415,459]                                                                |
| Species                        | Host                    | Locality                        | Reference  |
|-------------------------------|-------------------------|---------------------------------|------------|
| *Uromyces diniensis* A.L. Guyot | *Ononis fruticosa*      | France                          | [460]      |
| *Uromyces dinteri* Mennicken, W. Maier & Oberw. | *Tetraena spp.*        | Namibia and Egypt                | [385]      |
| *Uromyces dipcadi* Gjaerum     | *Dipcadi viride*        | Kenya                           | [461,462]  |
| *Uromyces discariae* G. Cunn. | *Discaria toematou*     | New Zealand                      | [284,313,463] |
| *Uromyces dispersus* Hirats. f. | *Apios fortunei*       | Japan                           | [222]      |
| *Uromyces dobrenezii* Durrieu  | *Euphorbia stracheyi*   | Nepal                           | [464]      |
| *Uromyces doebbeleri* Berndt   | *Hypericum irazuense*   | Costa Rica                       | [310]      |
| *Uromyces dolichichii* Cooke   | *Dolichos axillaris*    | Brazil, China, Madagascar, Puerto Rico, Zimbabwe, and Uganda | [108,109,125,171,172,250,465] |
| *Uromyces dolicholi* Arthur    | *Cajanus spp.*, *Dolicholus spp.* and *Rhyncosia spp.* | Canada, China, Colombia, Costa Rica, Florida, India, Japan, Jamaica, Kenya, Panama, Puerto Rico, South Africa, Taiwan, Texas, Venezuela, and West Indies | [96,97,138,227,310,357,466–469] |
| *Uromyces dolichosporus* Dietel & Holw. | *Tournefortia spp.*   | Argentina, Brazil, Bolivia, Cuba, Ecuador, Jamaica, México, West Indies, and Venezuela | [100,101,263,269,308,375,456] |
| *Uromyces doricus* Maire       | *Silene spp.*           | Bulgaria and Greece             | [82,308,327,470] |
| *Uromyces dorystachadis* Gjaerum & Bahç. | *Dorystachas hastata* | Turkey                          | [471]      |
| *Uromyces drimiopsidis* Doidge  | *Drimiopsis maculata*   | South Africa                    | [138]      |
| *Uromyces dubiosus* Henn.      | *Lantana sp.*           | Goiás                           | [291]      |
| *Uromyces duvellieri* Maire     | *Anabasis aphylla*      | China                           | [91,96,472] |
| *Uromyces dusenii* Dietel & Neger | *Gilliesia graminea, G. monophylla, Miersia chilensis,* and *Ornithogalum biflorum* | Chile                           | [166,240,417] |
| *Uromyces echinodes* Kunze ex Henn. | *Asclepiadaceae*       | Suriname                        | [473]      |
| *Uromyces ecklonii* Bubák       | *Freesia refracta*      | Kenya and South Africa          | [138,140]  |
| *Uromyces eclipsis* Berndt      | *Zygophyllum morgana*   | South Africa                    | [234]      |
| *Uromyces edwardsiae* G. Cunn. | *Edwardsia spp.* and *Sophora spp.* | New Zealand                      | [284,463,474] |
| *Uromyces ehrhartae* McAlpine   | *Ehrhartia stipoides*   | Australia and New Zealand       | [106,280,313,474] |
Table 3. Cont.

| Species                                | Host                                      | Locality                                      | Reference                                |
|-----------------------------------------|-------------------------------------------|-----------------------------------------------|------------------------------------------|
| Uromyces ehrhartae-giganteae Doidge     | Ehrharta spp.                             | South Africa                                  | [138,249,378,429]                        |
| Uromyces elegans (Berk. & M.A. Curtis)  | Trifolium spp.                            | Florida, Kenya, Mississippi, Oklahoma,        | [168,261,455,475]                        |
|                                         |                                           | South Carolina, Texas, and Uganda             |                                          |
| Uromyces eleocharidis Arthur            | Eleocharis spp.                           | Iowa, Kansas, North and South Dakota, and     | [155,278,301,466,476]                    |
|                                         |                                           | Washington (USA)                              |                                          |
| Uromyces ellipticus Dietel & Neger      | Glycyrhiza astragalina                    | Chile                                         | [240,477]                                |
| Uromyces ellisionus Henn.               | Euphorbia marginata                       | Minnesota                                     | [277]                                    |
| Uromyces emmeorhizae Syd.               | Emmeorhiza umbellata                      | Venezuela                                     | [478]                                    |
| Uromyces epicampis Dietel & Holw.       | Epicampea macroura, Melica laxiflora, and | Arizona, California, Chile, Ecuador,          | [106,116,199,240,281,337,479]            |
|                                         | Mulderbergia spp.                         | Mexico, Texas                                 |                                          |
|                                         |                                           |                                               |                                          |
| Uromyces eragrostidica Gjaerum          | Eragrostis rigidior and Eragrostis sp.    | Ethiopia, Kenya, Tanzania, and Zimbabwe       | [244]                                    |
|                                         |                                           |                                               |                                          |
| Uromyces eragrostidis Tracy             | Anthéricum torreyi, Cypholepis yemenica,  | Arizona, Argentina, Australia, Botswana,      | [90,110,116,141,171,172,199,208,243,244,250,480]|
|                                         | Desmostachya bipinnata, Eragrostis spp.,  | Brazil, China, Georgia, Ghana, India, Israel,|                                          |
|                                         | and Tripogon chinensis                    | Kenya, Malawi, Malaysia, Mississippi,         |                                          |
|                                         |                                           | México, Nebraska, Oklahoma, Pakistan, Puerto  |                                          |
|                                         |                                           | Rico, South Africa, Texas, West Indies,       |                                          |
|                                         |                                           | and Venezuela                                 |                                          |
| Uromyces eriochloae (Syd. & P. Syd.)    | Eriochloa spp.                            | China, Indonesia, Japan, Madagascar, and      | [85,90,232,309,465]                      |
| Syd., P. Syd. & E.J. Butler             |                                           | Philippines                                   |                                          |
| Uromyces erigonii Ellis & Harkn.        | Eriogramum virgatum                       | California                                    | [340,388]                                |
| Uromyces eriospermi Kalchbr. & Cooke    | Eriospermum spp.                          | South Africa, Tanzania, and Zimbabwe          | [137,138,250,274]                        |
| Uromyces ermelensis Doidge              | Indigofera sp.                            | South Africa                                  | [138]                                    |
|                                         |                                           |                                               |                                          |
| Uromyces ervi (Wallr.) Westend.         | Ervum spp., Lens spp., Pisum sativum, and | Algeria, Austria, Belgium, Bulgaria, China,   | [82,96,128,220,393,481,482]              |
|                                         |                                           | Czech Republic, Denmark, Finland, France,     |                                          |
|                                         |                                           | Germany, Hungary, Italy, Japan, Morocco,      |                                          |
|                                         |                                           | Netherlands, Pakistan, Poland, Portugal,      |                                          |
|                                         |                                           | Romania, Russia, Spain, Switzerland,          |                                          |
|                                         |                                           | Sweden, Taiwan, and Ukraine                  |                                          |
| Uromyces erythrinae Lagerh.             | Erythrina sp.                             | Ecuador                                       | [165]                                    |
| Uromyces erythronii (DC.) Pass.         | Erythronium sp., Lilium spp., and Tulipa   | Bulgaria, China, Germany, Greece, Japan,      | [82,92,96,158,179,483]                   |
|                                         |                                           | Japan, Korea, and Spain                       |                                          |
### Table 3. Cont.

| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| *Uromyces eugenei-mayorii* M. Morelet | *Ulex europaeus* | Italy | [451] |
| *Uromyces eugentianae* Cummins | Gentiana spp. and Halenia guatemalensis | Canada, Iowa, Norway, and Washington (USA) | [129,187,252,484–486] |
| *Uromyces eulophiae* Gjaerum | *Eulophia paivaena* subsp. borealis | India, Rwanda, and Uganda | [318,487,488] |
| *Uromyces euphaeus* Syd. | *Hypoxis glabella* | Australia | [489] |
| *Uromyces euphlebius* Syd. & P. Syd. | Phoradendron calyculatus, and Phoradendron sp. | México | [15,490] |
| *Uromyces euphorbiae* Cooke & Peck | *Acalypha communis*, Chamaesyce sp., Euphorbia spp., and Poinsettia heterophylla | Afghanistan, Argentina, Azirona, Brazil, California, Canada, China, Cuba, Colombia, Costa Rica, Cyprus, India, Israel, Jamaica, Japan, Mississippi, Mauritius, New York, Pakistan, Panama, South Africa, Texas, Uganda, Venezuela, West Indies, and Zambia | [96,102,203,209,227,255,263,269,300,308,310,318,348,469,475,488,491,492] |
| *Uromyces euphorbiae-convallatae* Speschnew | *Euphorbia* sp. | Russia | [493] |
| *Uromyces euphorbiae-japonicae* E. Fisch. | *Euphorbia javanica* | Indonesia | [309] |
| *Uromyces euphorbiae-lunulatae* Liou & Y.C. Wang | *Euphorbia esula*, *E. kansui*, and *E. lunulata* | China | [96,108,109] |
| *Uromyces euphorbiae-nicaeensis* Unamuno | *Euphorbia nicaeensis* | Spain | [494] |
| *Uromyces euphorbiae-polytimeticae* Zenkova | *Euphorbia polytimetica* | Tajikistan | [495] |
| *Uromyces euphorbicola* (Berk. & M.A. Curtis) Tranzschel | *Euphorbia* spp. | Brazil, Colombia, Madagascar, South Africa, and Zimbabwe | [102,138,157,250,465] |
| *Uromyces euritae* Tranzschel | Ceratoides latens, Krascheninnikovia ceratoides, and K. latens | China, Turkey, and Uzbekistan | [80,91,146,161] |
| *Uromyces euryopsidicola* A.R. Wood & M. Scholler | Euryops empetrifolius and *E. tenuissimus* | South Africa, North and Western Cape Province | [496] |
| *Uromyces evaristigatus* Cummins | Phthirusa pyrifolia | El Salvador | [15] |
| *Uromyces fallens* (Arthur) Barthol. | *Trifolium pratense* | Iran | [497] |
| *Uromyces fatoae* Henn. | *Fatoua pilosa* | Japan | [498] |
| *Uromyces fedtschenkoi* Faizieva | Rumex fedtschenkoi | Uzbekistan | [457] |
| *Uromyces ferganensis* Tranzschel & Erem. | *Stipa caucasica*, *S. holosericea*, and *S. lessingiana* | Iran, Siberia, and Russia | [106,382,499] |
Table 3. Cont.

| Species                         | Host                                    | Locality                                                                 | Reference                           |
|---------------------------------|-----------------------------------------|--------------------------------------------------------------------------|-------------------------------------|
| Uromyces ferrariae Doidge       | Ferraria sp.                            | South Africa and Zimbabwe                                                | [138,250]                          |
| Uromyces ferulae Juel          | Ferula spp. and Heracleum cachemiricum | Australia, Iran, Israel, Pakistan, and Morocco                           | [81,500]                           |
| Uromyces ferulaginis Lindr.     | Feruladinis silvaticae                  | Poland                                                                   | [501]                              |
| Uromyces festucae-nigricanis Gonz. Frag. | Festuca nigricans                      | Morocco and Spain                                                         | [279,502]                          |
| Uromyces ficariae (Schumach.) Lév. | Ficaria spp. and Ranunculus spp.        | Bulgaria, Czech Republic, Czechoslovakia, Denmark, Finland, Germany, Iran, Norway, Poland, Russia, Sweden, Turkey, and Ukraine [80,82,105,111,128,132,134,432,438,503] |
| Uromyces fiebrigii Henn. & Vestergr. | Bauhinia sp.                           | Paraguay                                                                 | [216]                              |
| Uromyces florians Sacc.         | Peucedanum fraxinifolium and Peucedanum sp. | South Africa                                                            | [138,504]                          |
| Uromyces fischerianus Mayor     | Ranunculus glacialis                   | Switzerland                                                              | [119]                              |
| Uromyces fischeri-eduardi Magnus | Vicia spp.                              | Bulgaria, Mongolia, Poland, Romania, and Turkey                          | [80,82,135,505]                    |
| Uromyces flavicomae Liu         | Euphorbia flavicoma                    | France                                                                   | [506]                              |
| Uromyces flenningiae Henn.      | Flenningia sp.                          | Uganda                                                                   | [507]                              |
| Uromyces fleuryae J.M. Yen      | Fleurya podocarpa                       | Gabon                                                                    | [508]                              |
| Uromyces florialis Vestergr.    | Bauhinia hiemalis, B. cuabrensis, B. holophylla, B. rufa, and Bauhinia sp. | Brazil                                                                   | [102,216]                          |
| Uromyces floscopae Syd. & P. Syd. | Floscopaperuviana and Floscopa sp.      | Brazil                                                                   | [102,509]                          |
| Uromyces fontii Gonz. Frag.     | Peplis acutangula                      | Morocco                                                                  | [510]                              |
| Uromyces formosus Syd. & P. Syd. | Danthius libanotis                    | Israel and Iran                                                          | [81]                               |
| Uromyces fo沃olatus Juel       | Bauhinia hirsuta, B. mirandina, and Bauhinia sp. | Brazil                                                                  | [100–102,511]                     |
| Uromyces fragilipes Tranzschel  | Agropyron squarrosum, Agrostis spp., Deschampsia spp., Eremopyrum bonapartis, Festuca spp., Hordeum spp., and Scribneria bolanderi | California, Iran, Pakistan, and Russia                                   | [106,161,347,412,512,513]         |
| Uromyces fraserae Arthur & Ricker | Frasera speciosa                      | Wyoming                                                                  | [514]                              |
| Uromyces fremonti Syd. & P. Syd. | Oenothera fremontii                   | Kansas                                                                   | [79]                               |
| Uromyces fulgens Bubák         | Chamaecytisus spp., Cytisus spp., and Lembotropis nigricans | Bulgaria, Czech Republic, France, Greece, Hungary, Itlay, Poland, Romania, Russia, Ukraine, and Yugoslavia | [82,220,421]                      |
| Species                        | Host                                      | Locality                                                                 | Reference       |
|-------------------------------|-------------------------------------------|---------------------------------------------------------------------------|-----------------|
| *Uromyces fuscatus* Arthur     | *Polygonum alpinum*                       | Idaho and Utah                                                            | [281]           |
| *Uromyces fusisporus* Cooke & Massee | *Acacia neriifolia, A. salicina,* and *Acacia* sp. | Australia                                                                 |                 |
| *Uromyces gaeumannii* Mayor & Vienn. Bourg. | *Hippocrepis* spp. | France, Greece, Libya, Morocco, Palestine, Portugal, Spain, Tunisia, and Yugoslavia |                 |
| *Uromyces gagnei* Beck        | *Gagea* spp., *Lloydia triflora,* and *Ornithogalum umbellatum* | Austria, Bulgaria, Czech Republic, China, Denmark, Finland, Germany, Japan, Norway, Poland, Romania, Russia, Turkey, Sweden, and Ukraine | [54,80,82,128,135,222,228,228,440] |
| *Uromyces galactiae* Rezende & Dianese | *Galactia pedunculata* | Brazil                                                                    | [517]           |
| *Uromyces galegae* Sacc.      | *Astragalus glycyphylloides* and *Galega* spp. | Czech Republic, France, Greece, Hungary, Italy, Poland, Russia, Turkey, and Yugoslavia | [80,82,220,421] |
| *Uromyces galegicola* Woron.  | *Galega orientalis*                       | Armenia, Romania, and Turkey                                               | [80,228,518,519] |
| *Uromyces gali Dietel*        | *Galium aparine* and *G. spurium*         | Japan                                                                     | [222,414]       |
| *Uromyces galii-californici* Linder | *Galium* californicum* and *Galium* sp. | California                                                                 | [520]           |
| *Uromyces galphimiae* Dietel & Holw. | *Galphimia* glauca* and *G. humboldtiana* | México                                                                     | [456,479]       |
| *Uromyces garanbiensis* (Hirats. f. & Hashioka) Sawada | *Ehretia dicksonii* | Taiwan                                                                    | [521]           |
| *Uromyces gauiae* Petr.       | *Caltha introloba*                        | Australia                                                                  | [346,522]       |
| *Uromyces gaussei* Mayor & Vienn.-Bourg. | *Dorycnopsis* gerardii | France                                                                    | [516]           |
| *Uromyces geissorhizae* Hen.   | *Geissorhiza* sp.                         | Western Cape Province                                                     | [523]           |
| *Uromyces gemmatus* Berk. & M.A. Curtis | *Convolvulus parviflorus* and *Convolvulus* sp. | Brazil, China, Cuba, Ecuador, India, Japan, Jamaica, México, Taiwan, West Indies, and Venezuela | [94,96,97,100,101,122,264,306,319,524,525] |
| *Uromyces genistae* Fuckel     | *Cytisus capitatus,* *Genista tinctoria,* *Genista* sp., and *Tithymalus cyarpissias* | Czech Republic, Morocco, and Turkey                                       | [80,83,220,525] |
| *Uromyces geranii* (DC.) G.H. Otth & Wartm. | *Erodium* spp. and *Geranium* sp.         | Australia, Bulgaria, China, Chile, Czech Republic, Denmark, Finland, France, Germany, India, Japan, Kenya, Korea, Norway, Pakistan, Poland, Portugal, Romania, Russia, Spain, Sweden, Turkey, Ukraine, and Zimbabwe | [80,82,87,88,94,96,128,179,208,436,526] |
| Species                                | Host                              | Locality                              | Reference            |
|----------------------------------------|-----------------------------------|---------------------------------------|----------------------|
| Uromyces geraniicola Speg.             | Geranium patagonicum              | Chile                                 | [240,258]            |
| Uromyces ghaznicus Petr.               | Limonium sp.                      | Afghanistan                           | [527]                |
| Uromyces giganteus Speg.               | Kalidium foliatum and Suaeda spp. | Australia, Arizona, China, California, Idaho, Texas, and Ukraine | [47,96,300,337,421]  |
| Uromyces gigantiformis Salazar-Yepes & Burrilca | Bidens sp.                  | Colombia                              | [423]                |
| Uromyces giganteus Speg.               | Sophora alopecuroides             | Pakistan                              | [528]                |
| Uromyces gladioli Henn.                | Babiana spp., Geissorhiza spp., Gladiolus spp., Moraea ramose, and Romulea spp. | Cuba, Kenya, Malawi, Nigeria, South Africa, and Uganda | [138,140,168,273,291,458,529,530] |
| Uromyces globosus Dietel & Holw.       | Sapium spp.                       | México                                | [103,456,479]        |
| Uromyces glaucii F. Kern               | Glyceria spp.                     | Illinois, Indiana, New Jersey, Rhode Island, and Wisconsin (USA) | [39,191,299]        |
| Uromyces glycyrrhizae (Rabenh.) Magnus | Glycyrrhiza spp.                  | Armenia, Algeria, Azerbaijan, Bulgaria, Caucasus, Czech Republic, China, Greece, Iraq, Israel, Itlay, Japan, Kazakhstan, Pakistan, Palestine, Portugal, Romania, Spain, Turkey, and Uzbekistan | [39,78,80–82,91,96,116,146,196,278,317,327,356,393,409,531–536] |
| Uromyces gnaphalii Ellis & Everh.      | Gnaphalium sp.                    | Colorado                              | [388]                |
| Uromyces goyaensis Henn.               | Bauhinia sp.                      | Guatemala and México                  | [281,486,537]        |
| Uromyces graminis (Niessl) Dietel      | Calalis platycarpos, Ferula communis, Melica spp., and Thapsia garganica | Afghanistan, Armenia, Bulgaria, Greece, Italy, Morocco, Romania, Spain, Portugal, and Ukraine | [82,111,158,228,348,421,519,534,539] |
| Uromyces grandiotii Gáum.             | Ancrumia ciespidata               | Chile                                 | [540]                |
| Uromyces greenstockii Dودge           | Ipomoea greenstockii              | South Africa                          | [138]                |
| Uromyces guatemalensis Vestergr.       | Bauhinia inermis, B. unguulata, and Bauhinia sp. | Costa Rica, El Salvador, Guatemala, and Venezuela | [216,281,444,541]   |
| Uromyces guayacuru Speg.              | Statice brasiliensis              | Buenos Aires                          | [542]                |
Table 3. Cont.

| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| Uromyces gueldenstaedtiae Liou & Y.C. Wang | Populus sp. | China | [543] |
| Uromyces guerkeanus Henn. | Lotus spp. and Tetragonolobus biflorus | Belarus, Egypt, France, Greece, Italy, Iraq, Malta, Morocco, Palestine, Portugal, Spain, Syria, Tunisia, and Yugoslavia | [196,220,422,426,544] |
| Uromyces guraniae Mayor | Gurania sp. | Brazil and Colombia | [127,212,226] |
| Uromyces gypsophilae Cooke | Gypsophila sp. | Asia, Europe, Turkey, Iran, and Iraq | [80,82,165,196,317,346,543-547] |
| Uromyces habrochloae Gjaerum | Habrochloa bulbocaulis | Malawi | [244] |
| Uromyces hainanicus J.Y. Zhuang & S.X. Wei | Ipomoea sumatrana | China | [319] |
| Uromyces halimodendri Solkina | Halimodendron argenteum and H. halodendron | China and Uzbekistan | [198,220] |
| Uromyces handelii Bubák | Lotus gelbii | Iraq | [220,548] |
| Uromyces haraeanus Syd. & P. Syd. | Scirpus spp. | China, Japan, and Russia | [90,92,297,549] |
| Uromyces hardenbergiae McAlpine | Hardenbergia monophylla | Australia | [280] |
| Uromyces hariotianus Lagerh. | Odontonema callistachyum, Pseudarthamenium cuspidatum, Pseudarthamenium sp., and Thyrsacanthus strictus | Costa Rica and México | [218,281,550] |
| Uromyces harmsianus (Henn.) Doidge | Crotalaria spp. | India, Kenya, Malawi, Rwanda, South Africa, Tanzania, and Uganda | [138,168,171,172,551] |
| Uromyces haussknechtii Tranzschel | Euphorbia thamnoide and E. pilosa | India and Syria | [157,350] |
| Uromyces haworthii Ê.S.C. Souza, Z.M. Chaves, W.R.O. Soares, Pinho & Dianese | Phthirurus stelis | Brazil | [60] |
| Uromyces hedysari-obscuri (DC.) Carestia & Picc. | Hedysarum spp. | Alaska, Austria, Canada, Czech Republic, China, Germany, France, Finland, Hungary, India, Italy, Kazakhstan, Mongolia, Romania, Russia, Switzerland, and Tajikistan | [94,96,220,357,436,535,552,553] |
| Uromyces hedysari-paniculati (Schwein.) Farl. | Desmodium spp. and Meloboma spp. | Colombia, Costa Rica, Cuba, Indiana, Jamaica, Massachusetts, Mexico, Trinidad and Tobago, Venezuela, West Indies, and Vermont | [87,88,171,172,185,191,310,415] |
Table 3. Cont.

| Species                        | Host                                                                 | Locality                                                                                     | Reference            |
|-------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------|
| Uromyces heimerlianus Magnus  | Ervum spp., Euphorbia spp., Lathyrus spp., and Vicia spp.           | Armenia, Austria, Belarus, Bulgaria, China, Czech Republic, France, Germany, Hungary, Italy, Japan, Portugal, Romania, Russia, Serbia, Spain, Switzerland, Ukraine, and Yugoslavia | [220,519,554]       |
| Uromyces himii Mayor & Vienn. Bourg. | Medicago arborea                                           | France                                                                                       | [516]                |
| Uromyces helichrysi Lagerh.   | Helichrysum plicatum, Helichrysum rupestris, and Helichrysum siculum | Algeria, Greece, and Turkey                                                                  | [80,421,435]         |
| Uromyces heliotropii Sred.    | Heliotropium spp.                                                | Australia, Bulgaria, Cyprus, Greece, Israel, Pakistan, Ukraine, and Uzbekistan               | [80,81,111,145,393,421,555,556] |
| Uromyces hellebori-thibetani Y. Zhuang & S.X. Wei | Helleborus thibetanus                                           | China                                                                                       | [195]                |
| Uromyces hemnendorfii Vestergr. | Bauhinia forficata                                               | São Paulo                                                                                   | [219]                |
| Uromyces hermonis Magnus      | Euphorbia herniarifolia and E. peplus                            | Greece and Iraq                                                                             | [196,345,421]       |
| Uromyces herterianus Dietel    | Borrella verticillata, Diodia sp. and Spermacoce verticillata     | Argentina, French Guiana, and Uruguay                                                       | [395,415,557]       |
| Uromyces hessii Berndt        | Zantedeschia angustiloba                                         | Angola                                                                                      | [558]                |
| Uromyces heterantherae (Henn.) P. Syd. & Syd. | Heteranthera reniformis                                         | Brazil                                                                                      | [102,144]           |
| Uromyces heterodermus Syd. & P. Syd. | Erythronium spp.                                               | Alberta, California, Canada, Columbia, Colorado, Idaho, Montana, Oregon, Texas, Utah, and Washington (USA) | [79,185,187,559]     |
| Uromyces heterogeneus Cooke   | Hibiscus syriacus                                               | India                                                                                       | [126,560]           |
| Uromyces heteromallus Syd.    | Haloxylon recurvum                                              | Pakistan                                                                                   | [208,356,561–563]   |
| Uromyces heteromorphae Thüm.  | Heteromorpha spp. and Peucedanum spp.                           | Eritrea, Malawi, and South Africa                                                          | [138,273,287,564]   |
| Uromyces hewittiae Syd. & P. Syd. | Hewittia bicolor and Hewittia sp.                        | Philippines                                                                                  | [565]                |
| Uromyces hidakaensis Muray. & Takeuchi | Pisum sativum                                                 | Japan                                                                                       | [222,566]           |
| Uromyces himalacus Y. Ono, Adhikari & Rajbh. | Lilium sp.                                                    | Nepal                                                                                       | [567]                |
| Uromyces hippocrepidis Syd. & P. Syd. | Hippocrepis ciliate and H. comosa                               | Greece, France, Spain, and Switzerland                                                     | [220,421,568]       |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| *Uromyces hippomarathi* Lindr. | *Hippomarathrum crispum*, *H. libanotis*, and *H. microcarpum* | Iran and Morocco | [279,317,569] |
| *Uromyces hippomarathricola* Sousa da Câmar | *Hippomarathrum pterochlaenum* | Portugal | [570] |
| *Uromyces holcii* Jørst. | *Jasminium spp.* | Euthopia, India, Kenya, and Sri Lanka | [140,571,572] |
| *Uromyces holubii* Doidge | *Dracaena* sp. | Namibia and South Africa | [124,378] |
| *Uromyces holwayi* Lagerh. | *Chlorophytum* sp. and *Lilium* spp. | China, California, Canada, Idaho, Iowa, Japan, New York, Nebraska, New Jersey, Oregon, Pakistan, and Washington (USA) | [94,96,187,412,559] |
| *Uromyces hordeastri* A.L. Guyot | *Bellevia flexuosa*, *Hordeum* spp., and *Muscari parviflorum* | France and Israel | [81,126] |
| *Uromyces houstoniatus* J. Sheld. | *Houstonia* spp. and *Sisyrinchium* spp. | Connecticut, Illinois, Kansas, Massachusetts, Missouri, Mississippi, New York, Pennsylvania, Vermont, and Wisconsin (USA) | [191,251] |
| *Uromyces howei* (Peck) De Toni | *Asclepias curassavica*, *A. guatemalensis*, and *A. nivea* | Bermuda, Cuba, Guatemala, Jamaica, and Peru | [260,281,308,574] |
| *Uromyces huallagensis* Henr. | *Desmodium* sp. | Peru | [575] |
| *Uromyces hyacinthinus* W. Schneid. | *Hyacinthus fastigiatus* | Canada | [115] |
| *Uromyces hyalinus* Peck | *Sophora nuttalliana*, *S. sericea*, and *S. stenophylla* | Arizona, Colorado, México, and Wyoming | [116,225,292,559,576] |
| *Uromyces hybridi* W.H. Davis | *Trifolium hybridum* | Connecticut, India, Massachusetts, Maine, and Vermont | [191,577,578] |
| *Uromyces hyderabadensis* Ramachar, K.N. Rao & Bagyan. | *Atylosia scarabaeoides* | India | [579] |
| *Uromyces hydrocotylicola* J.Y. Zhuang | *Hydrocotyle* sp. | China | [96,580] |
| *Uromyces hymenocarpi* Jaap | *Hymenocarpos cinnarum* | Croatia, Greece, Israel, and Turkey | [80,81,421,581] |
| *Uromyces hyparrheniae* Gjaerum | *Hyparrhenia* spp. | Angola, Cameroon, Ethiopia, and Uganda | [243,244] |
| *Uromyces hyparrhenicola* Gjaerum | *Hyparrhenia dregeana* | South Africa | [243] |
| Species                                      | Host                                      | Locality                                                                 | Reference                                |
|---------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------|------------------------------------------|
| *Uromyces hyperici* (Schwein.) M.A. Curtis | *Ascyrum hypericoides, Elodea sp., and Hypericum spp.* | China, California, Florida, Georgia, Indiana, Iowa, Japan, Massachusetts, Missouri, Maine, New York, Texas, Uganda, Vermont, and Wisconsin (USA) | [89,90,186,202,251,262,582,583]          |
| *Uromyces hyperici-frondosi* (Schwein.)     | *Hypericum spp. and Triadenum virginicum*  | Brazil, Chile, California, Colombia, Guatemala, Maine, Massachusetts, Pennsylvania, South Africa, and Vermont | [78,101,118,139,138,191,281,520,584]     |
| Arthur                                      | *Hypericum brasiliense*                    | Formosa                                                                  | [180]                                    |
| *Uromyces hypostis* Tarr & G.F. Laundon     | *Hypoestes verticillaris*                 | South Africa, Sudan, Tanzania, and Zimbabwe                              | [218,250,274]                           |
| *Uromyces hypophilus* Spec.                 | *Euphorbia sp.*                           | Mendoza                                                                  | [391]                                    |
| *Uromyces ictericus* Cummins                | *Iresine celosia and Iresine sp.*         | Costa Rica and Guatemala                                                 | [167,233,310]                           |
| *Uromyces ignobilis* (Syd. & P. Syd.) Arthur| *Muhlenbergia sp. and Sporobolus spp.*    | Barbados, Cuba, Dominica, Grenada, Guatemala, Mexico, Pakistan, Texas, and Venezuela | [281,406,571]                           |
| *Uromyces illotus* Arthur & Holw.           | *Mucuna andreana, M. rubro-aurantiacea, M. sloanei, and M. urens* | The Dominican Republic, Ethiopia, and Guatemala                           | [281,406,571]                           |
| *Uromyces imperfectus* Arthur               | *Bauhinia spp.*                           | Jamaica, Nicaragua, and Venezuela                                        | [225,308,444,586]                       |
| *Uromyces inaequalitus* Lasch               | *Cerastium sp., Melandrium sp., and Silene sp.* | Argentina, Bulgaria, Canada, Chile, China, Finland, Greece, Japan, Nepal, Norway, Romania, Taiwan, South Africa, Sweden, and Ukraine | [82,91,92,97,111,128,135,142,185,188,240,415,421,587] |
| *Uromyces inayatii* Syd. & P. Syd.          | *Apluda aristata* and *A. mutica*         | India and Papua New Guinea                                               | [85,426]                                |
| *Uromyces indicus* Pat.                     | *Sporobolus indicus*                      | Barbados                                                                 | [588,589]                               |
| *Uromyces indigoferae* Dietel & Holw.       | *Indigofera spp.*                         | Argentina, Arizona, Costa Rica, China, Guatemala, Florida, India, Mexico, Panama, Texas, and Venezuela | [90,116,171,172,262,281,292,357,375,415,425,492,559,590] |
| *Uromyces induratus* Syd., P. Syd. & Holw.  | *Dicliptera spp., Jacobinia sp., and Justicia racemosa* | Argentina, Bolivia, Brazil, Costa Rica, and Mexico                       | [102,218,292,310,333]                   |
| *Uromyces infarctus* Berndt                 | *Cayaponia sp.*                           | Costa Rica                                                               | [127]                                    |
| *Uromyces inflatus* (Cooke) McKenzie        | *Anisotome sp.*                           | New Zealand                                                              | [591]                                    |
| Species                          | Host                                           | Locality                              | Reference                  |
|---------------------------------|------------------------------------------------|----------------------------------------|----------------------------|
| Uromyces ingicola Henn.         | Inga sp.                                       | Amazonas                               | [575]                      |
| Uromyces ingiphilus Spec.       | Inga edulis                                     | Argentina                              | [592]                      |
| Uromyces insignis P. Syd. & Syd. | *Echinocephalum latifolium* and *Melanthera latifolia* | Brazil                                 | [102,219]                  |
| Uromyces insularis Arthur       | Clitoria cajanifolia                           | Puerto Rico                            | [466]                      |
| Uromyces intricatus Cooke      | *Chorizanthe* sp., *Eriogonum* spp., and *Gayophyllum ramosissimum* | Arizona, Canada, California, Idaho, Oregon, Montana, and Washington (USA) | [185,187,300,412,448]      |
| Uromyces invisis (Speg.) Spec.  | *Solanum sisymbriifolium*                      | Argentina                              | [415,592]                  |
| Uromyces ipatingae F.A. Ferreira & Y. Hirats. | *Clitoria fairchildiana*                    | Brazil                                 | [219,593]                  |
| Uromyces iresines Lagerh.       | *Iresine* spp.                                 | Argentina, Colombia, Dominican Republic, Ecuador, Guatemala | [118,119,144,167,281]      |
| Uromyces isachnes Petch         | *Isathne kunthiana*                            | Sri Lanka                              | [594]                      |
| Uromyces itoanus Hirats. f.     | *Kummerowia stipulacea*, *K. striata*, and *Mirolespedeza* spp. | China, Korea, Japan, and Taiwan        | [89,90,483,595,596]        |
| Uromyces ixiae (Lév.) G. Winter | *Acidanthera* spp., *Antholyzasp.*, *Babiana* spp., *Engysiphon* sp., *Geissorhiza* sp., *Gladiolus* spp., *Hesperantha* spp., *Ixia* spp., *Lapeirousia* spp., *Melasphaerula* spp., *Romulea* sp., and *Sparaxis* spp. | Kenya and South Africa               | [123,140]                  |
| Uromyces jacksonii Arthur & Fromme | *Agrostis* spp., *Deschampsia* spp., *Festuca* spp., and *Hordeum* spp. | California, Idaho, Oregon, Michigan, and Washington (USA) | [241,559]                  |
| Uromyces jamaicensis Vestergr.  | *Bauhinia* spp.                                | Cuba, El Salvador, Jamaica, México, Puerto Rico, and Venezuela | [184,216,292,306,308,444,541] |
| Uromyces janiphae (G. Winter) Arthur | *Jatropha* spp. and *Manihot* sp.              | Brazil, Colombia, Costa Rica, Cuba, Ecuador, Panama, Puerto Rico, México, and Venezuela | [76,118,119,125,431,456,511,597] |
| Uromyces japonicus Berk. & M.A. Curtis | *Orchidaceae*                                 | Bulgaria, China, Italy, Japan, Poland, Russia, and Ukraine | [51,82,96,135,160,598,599] |
| Uromyces jatrophae Dietel & Holw. | *Jatropha multifida*                           | Brazil, Colombia, Cuba, México, Jamaica, Puerto Rico, and Virgin Islands | [102,103,184,227,308,479,597] |
| Uromyces jatropticola Henn.      | *Cnidoscolus* sp. and *Jatropha* sp.            | Brazil                                 | [103,600]                  |
| Uromyces joffrini Delacr.        | *Vanilla planifolia*                           | France                                 | [476]                      |
| Species                  | Host                                                                 | Locality                                                                 | Reference |
|-------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|-----------|
| *Uromyces johowii*      | *Vicia macroa*, *V. nigricans*, and *Vicia sp.*                      | Chile                                                                    | [282,494] |
| *Uromyces jonesii*      | *Ranunculus sp.*                                                     | California, Colorado, Montana, and Wyoming                                | [187,300,368,412,601] |
| *Uromyces jordanus*     | *Euphorbia cyparissias*                                             | Austria, Bulgaria, Czech Republic, Germany, Hungary, Romania, Russia, Switzerland, and Ukraine | [82,220,602] |
| *Uromyces junci*        | *Ambrosia psilostachya*, *Arnica spp.*, *Aster spp.*, *Bahia dissecata*, *Cirsium spp.*, *Eriophyllum sp.*, *Grindelia spp.*, *Helianthus spp.*, *Jaumea spp.*, *Juncus spp.*, *Juniperus litoralis*, *Luzula alopecurus*, and *Pulicaria dysenterica* | Arizona, Bolivia, Bulgaria, Canada, California, Chile, Colorado, Florida, Germany, Idaho, Israel, Japan, North and South Dakota, Nebraska, Montana, Oklahoma, Oregon, Pennsylvania, Poland, Romania, Spain, Wyoming, and Wisconsin (USA) | [81,82,105,116,135,185,187,262,377,386,559,603] |
| *Uromyces juncicola*    | *Juncus stipulatus*                                                 | Mendoza                                                                  | [180]     |
| *Uromyces junci-effusi* | *Juncus spp.*                                                       | Arizona, California, Canada, Idaho, Florida, Georgia, Maine, Missouri, Montana, Oregon, Utah, Washington, and Wyoming | [114,116,144,185,187,191,202,262,559] |
| *Uromyces juncinus*     | *Junco acutiflori*                                                  | Italy                                                                    | [604]     |
| *Uromyces kaernbachii*  | *Abras precatorius*                                                 | Papua New Guinea                                                         | [136]     |
| *Uromyces kaimontanus*  | *Veratrum album*, *V. grandiflorum*, *V. nigrum*, and *V. puberulum* | China, Japan                                                             | [222,605] |
| *Uromyces kalmusii*     | *Euphorbia sp.*                                                     | China, Germany, Poland, and Russia                                       | [105,135,606,607] |
| *Uromyces karjaginii*   | *Seseli cuneifolium*                                                | Azerbaijan                                                                | [608]     |
| *Uromyces kawakamii*    | *Euphorbia serrulata*                                               | China, Japan, and Taiwan                                                 | [94,97,108,446] |
| *Uromyces kentaniensis* | *Antholyza aethiopica* and *Chasmanthe aethiopica*                  | South Africa                                                             | [249,322] |
| *Uromyces kigessensis*  | *Chloris gayana*, *C. myriostachya*, and *C. roxburghiana*          | Kenya, Uganda, Zimbabwe                                                  | [171,242,460] |
| *Uromyces kigesianum*   | *Pittosporum abyssinicum*                                           | Uganda                                                                   | [609]     |
| *Uromyces kisantuensis* | *Dolichos sp.*                                                      | The Democratic Republic of the Congo                                      | [610]     |
| *Uromyces klebahnii*    | *Astragalus spp.* and *Oxytropis sp.*                              | Austria, Bulgaria, France, Italy, Romania, Russia, Switzerland, and Turkey | [80,82,220] |
| *Uromyces klotzschianus*| *Rumex dentatus*                                                    | Pakistan                                                                  | [61]      |
| *Uromyces kochiae*      | *Kochia prostrata*                                                  | China, Russia, Turkey, and Uzbekistan                                    | [144,146,198,402] |
Table 3. Cont.

| Species                     | Host                                | Locality                                  | Reference |
|-----------------------------|-------------------------------------|-------------------------------------------|-----------|
| Uromyces kochianus Gäum.    | Geranium nodosum                    | Switzerland                               | [611]     |
| Uromyces koeleriae Uljan.   | Koeleria caucasica                  | Russia                                    | [106]     |
| Uromyces komarovitii Bubak. | Solidago virgaurea                  | Czech Republic                            | [612]     |
| Uromyces kondoi Miura       | Amblytropis multiflora              | China, Japan, and Pakistan                | [89,156,356] |
| Uromyces krameriae Arthur   | Krameria spp.                       | Florida and Texas                         | [262,281] |
| Uromyces krantzbergensis Doidge | Anthericum sp.                 | Namibia                                   | [138]     |
| Uromyces kunigamiensis Shimab. | Fimbristylis dichotoma and Fimbristylis sp. | China and Japan                          | [108,222] |
| Uromyces kurzttzi Henn.     | Senecio spp.                        | Argentina                                 | [415,613] |
| Uromyces kwangensis Henn.   | Justicia sp.                        | Congo                                     | [218,610] |
| Uromyces kwangsi anus Cummins | Fimbristylis sp.              | China and Taiwan                          | [614,615] |
| Uromyces lachenalitae Doidge | Lachenalia spp. and Polyxena ensifolia | South Africa                            | [123,138] |
| Uromyces laevigattes Syd. & P. Syd. | Aneilema spp.          | Ghana and Tanzania                        | [318,549,616] |
| Uromyces laewis Körn.       | Euphorbia spp.                      | Bulgaria, Germany, Iran, Romania, Turkey, and Ukraine | [80,82,105,111,228,617,618] |
| Uromyces langfangensis Durrieu | Anaphalis nepalensis             | Nepal                                     | [463]     |
| Uromyces lapeyrousiae Petr. | Lapeyrousia                        | Tanzania                                  | [231]     |
| Uromyces lapponicus Lagerh. | Astragalus spp. and Oxytropis spp. | Alaska, Canada, China, Colorado, Finland, Idaho, India, Iran, Japan, Mongolia, Norway, Oregon, Pakistan, Russia, Sweden, and Turkey | [80,96,128–131,357,368,436,449,535,619] |
| Uromyces largus Arthur & Cummins | Chamaesyce lata                   | Colorado                                  | [87,88]   |
| Uromyces laserpitii-graminis E. Fisch. | Laserpitii sileris and Melica ciliata | Southern Europe and Northern Africa      | [106]     |
| Uromyces lasiocorydis Henn. | Lasiocorys abyssinica              | Eritrea                                   | [287,426] |
| Uromyces lathyrinus Speg.   | Lathyrus spp. and Vicia spp.       | Argentina, Brazil, Chile, and Paraguay    | [100–102,219,620] |
| Uromyces latimammatus J.Y. Zhuang & S.X. Wei | Ipomoea sumatrana             | China                                     | [621]     |
| Uromyces laezistanticus Petr. | Orobus roseus                     | Armenia and Turkey                        | [220]     |
| Uromyces lenticola Petr.    | Lens esculenta                     | Iran                                      | [430]     |
| Uromyces leonotidis Bagyan., Gjaerum & M. Raju | Leonotis nepetifolia           | India                                     | [622]     |
| Species                                      | Host                          | Locality                                                                 | Reference            |
|---------------------------------------------|-------------------------------|--------------------------------------------------------------------------|----------------------|
| Uromyces leptaleus Syd.                     | Stellaria laxa                | China, Japan, Philippines, and Taiwan                                    | [89,90,97,565,623]   |
| Uromyces leptochloae Wakef.                 | Leptochloa obtusiflora        | Kenya and Uganda                                                         | [140,168]            |
| Uromyces lereddei Dupias                    | Colutea arborescens           | France                                                                   | [220,624]            |
| Uromyces lespedezae (Thüm.) Peck            | Lespedeza capitata            | Vermont                                                                  | [583]                |
| Uromyces lespedezae-bicoloris F.L. Tai & C.C. Cheo | Lespedeza bicolor and L. formosa | China                                                                    | [108,109,625]        |
| Uromyces lespedezae-macrocarpae Liou & Y.C. Wang | Campylotropis macrocarpa, Lespedeza bicolor, and L. formosa | China                                                                    | [108,109]            |
| Uromyces lespedezae-procumbentis (Schwein.) Lagerh. | Campylotropis spp., Kummerowia spp., and Lespedeza spp. | Canada, China, Georgia, India, Japan, Korea, Missouri, Taiwan, and Pennsylvania | [94,108,109,185,202,255,357,482,596] |
| Uromyces lespedezae-sericeae S. Ahmad       | Lespedeza sericea             | Pakistan                                                                 | [208]                |
| Uromyces libycus Trotter                   | Lotus pusillus                | Libya                                                                    | [197,626]            |
| Uromyces ligulariae Hirats. & Hoshioka      | Ligularia tussilaginea var. formosana | China, Japan, Taiwan                                                      | [94,97,109,627]      |
| Uromyces limonii-carolinianii Savile & Conners | Limonium carolinianum         | Canada, Mississippi, and Texas                                           | [185,559,628]        |
| Uromyces limosellae F. Ludw.                | Limosella sp.                 | Australia                                                                | [280]                |
| Uromyces loculatus Cummins                  | Kyllinga alba                 | Zambia                                                                   | [341]                |
| Uromyces loculiformis T.S. Ramakr. & K. Ramakr. | Chlorophytm attenuatum       | China, India, and Nepal                                                  | [96,464,629]         |
| Uromyces lomandracearum J. Walker & van der Merwe | Lomandra longifolia and Lomandra sp. | Australia                                                               | [62,630]            |
| Uromyces longipedicellaris Ramachar & A. Sudh. Rao | Rumex vesicarius             | Pakistan                                                                 | [631]                |
| Uromyces longipes (Lasch) Tranzschel        | Pedicularis sp.               | Russia                                                                   | [382]                |
| Uromyces loranthis H.S. Jacks.              | Loranthus                    | Brazil                                                                   | [376]                |
| Uromyces lotononidica Berndt                | Lotononis cypitoside          | South Africa                                                             | [632]                |
| Uromyces lugubris Kalchbr.                  | Euphorbia cyparissias         | South Africa                                                             | [137]                |
| Uromyces lupini Berk. & M.A. Curtis         | Lupinus spp.                  | Arizona, California, Canada, Colorado, México, Montana, Oregon, Washington, and Wyoming | [116,185,187,368,412,454,598] |
Table 3. Cont.

| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| Uromyces lupinicola Bubák | *Lupinus* spp. | Bulgaria, Finland, Lithuania, Norway, and Spain | [158,363,587,612] |
| Uromyces lychnidis Tracy & Earle | *Lychnidis drummondii* | Utah | [633] |
| Uromyces lygeii P. Syd. & Syd. | *Lygeum spartum* | Sardegna | [325] |
| Uromyces macnabbii Cummins | Chionochloa spp. and Danthonia spp. | New Zealand | [284,591] |
| Uromyces macounianus Ellis & Everh. | *Euphorbia maculata var. affinis* and *E. serpyllifolia* | Canada and British Columbia | [103,388,634] |
| Uromyces macowanii Bubák | *Scilla prasina* | Africa | [612] |
| Uromyces magnatus (Arthur) Arthur | *Polygonatum* sp. and *Vagnera* sp. | Illinois, Iowa, Minnesota, Montana, Nebraska, North and South Dakota, and Wisconsin | [306,307] |
| Uromyces magnusii Kleb. | *Medicago minima* | China, Turkey, and Ukraine | [80,96] |
| Uromyces maiireanus P. Syd. & Syd. | *Ornithogalum* spp. | Morocco, South Africa, Tanzania | [142,144,318] |
| Uromyces major Henn. | *Muhlenbergia reverchonii*, *Muhlenbergia* sp., and *Sporobolus indicus* | Belize, México, Texas, Trinidad, and Tobago | [112,117,635] |
| Uromyces malloti Henn. | *Mallo tus moluccanus* and *Melanolepis multiglandulosa* | Guinea, New Papua, and the Philippines | [136,177] |
| Uromyces mangenotii Mayor & Vienn. Bourg. | *Vicia pubescens* | France | [516] |
| Uromyces manihoticola Henn. | *Manihot* spp. | Brazil | [102,103,291] |
| Uromyces manihotis Henn. | *Manihot* spp. | Brazil, Colombia, Cuba | [102,227,291] |
| Uromyces manihotis-catingae Henn. | *Manihot* spp. | Brazil | [102,600] |
| Uromyces marinus Guyot & Malençon | *Medicago marina* | Morocco | [220,279] |
| Uromyces martini Henn. | *Melanthera* spp., *Bidens* spp. | Florida | [225,262,636] |
| Uromyces massonieae Doidge | *Massonia latifolia* | South Africa | [138] |
| Uromyces mayorii Tranzschel | *Euphorbia* spp. | California and Colombia | [227,412] |
| Uromyces melandrii Dinet & Neger | *Indigofera* | The Democratic Republic of the Congo | [610] |
| Uromyces megalosporus Speg. | *Tessaria absinthioides* | Tucumán | [371] |
| Uromyces meimerlianus Magnus | *Vicia* sp. | Germany | [531] |
| Uromyces mellandrii Dietel & Neger | *Melandrium cucubaloides* | Los Lagos | [162] |
| Uromyces melantherae Cooke | *Melanthera brownii* | Ghana, South Africa, and Uganda | [138,168,616] |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| *Uromyces melasphaerulae* Syd. & P. Syd. | *Melasphaerula graminea* | Western Cape Province | [424] |
| *Uromyces melothriae* Henn. | *Melothria tomentosa* | Eritrea | [287,427] |
| *Uromyces menganthis* Azbukina & Zenkova | *Meygounia trifoliata* | Primorye | 1966 [637] |
| *Uromyces mercurialis* Henn. | *Mercurialis leiocarpa* | China, Japan, and Taiwan | [94,96,97] |
| *Uromyces mexicanus* Dietel & Holw. | *Desmodium* | Arizona, Costa Rica, México | [116,171,310,479] |
| *Uromyces meygounensis* Petr. | *Euphorbia bungei* | Iran | [638] |
| *Uromyces microchloae* Syd. & P. Syd. | *Microlophium setaceum* | Bolivia, Brazil, Central Africa, Sudan, and Uganda | [106,168,199,394] |
| *Uromyces microsorus* Kalchbr. & Cooke | *Prunus armeniaca* | South Africa | [137] |
| *Uromyces microtidis* Cooke | *Microtis porrifolia* | Australia and New Zealand | [245,313,639] |
| *Uromyces miersiae* Gáum. | *Miersia chilensis* | Chile | [540] |
| *Uromyces mikaniae* Viégas | *Mikania sp.* | Brazil | [219,640] |
| *Uromyces mimusops* Cooke | *Mimusops sp.* | South Africa | [641] |
| *Uromyces minimus* Davis | *Muhlenbergia sylvatica* | Canada, Michigan, Oregon, and Wisconsin | [185,635] |
| *Uromyces minor* J. Schröt. | *Medicago denticulata, Pisum sativum,* and *Trifolium spp.* | Armenia, Austria, Bulgaria, California, Caucasus, Chile, China, Czech Republic, Estonia, Finland, France, Germany, Hungary, India, Montana, Pakistan, Poland, Romania, Russia, Spain, Sweden, Switzerland, Texas, Ukraine, New Zealand, Oregon, Washington, and Wyoming | [220,313,355,357,559,642] |
| *Uromyces minutus* Dietel | *Carex spp.* | Alabama, Central and Eastern United States, Iowa, Mississippi, Texas, and Wisconsin | [255,475,559,643,644] |
| *Uromyces miurae* Syd. & P. Syd. | *Fritillaria kamtschatcensis* | Alaska, Canada, Idaho, Japan, Russia, and Washington (USA) | [94,185,187,645,646] |
| *Uromyces moehringiae* S. Ito & Hirats. f. | *Moehringia lateriflora* | Japan | [94,297] |
| *Uromyces moesiacus* Lindtner & Vienn. Bourg. | *Lathyrus nissolia* | Yugoslavia | [451] |
| *Uromyces mogianensis* Bubák | *Fritillaria graeca, F. rhodocanakis,* *Rhinopetalum arianum, R. gibbosum,* and *R. karelinii* | Afghanistan, Greece, and Uzbekistan | [421,555,612] |
| Species                          | Host                                      | Locality                                    | Reference                  |
|---------------------------------|-------------------------------------------|---------------------------------------------|-----------------------------|
| Uromyces mongolicus U. Braun & G. Hirsch | Euphorbia kozlovi   | Mongolia                                   | [535,647]                  |
| Uromyces monspessulanus Tranzschel | Euphorbia serrata | Balearic Islands, Libya, and Spain  | [129,157,197,648]           |
| Uromyces montanae Arthur & Holw. | Montanoa dumicola, M. pittieris, M. hibiscifolia, and Montanoa sp. | Costa Rica and Guatemala | [225,281,310]               |
| Uromyces montanus Arthur        | Lupinus mexicanus | Guatemala and México                       | [281,398]                   |
| Uromyces montis-ferrati Maire   | Euphorbia luteola | Northern Africa                            | [649]                       |
| Uromyces moraeae Syd. & P. Syd. | Moraea spathacea | South Africa                               | [138,144]                   |
| Uromyces mucunae Rabenh.        | Mucuna pruriens | China, Cambodia, Japan, India, Indonesia, Madagascar, Malawi, Mauritius, Taiwan, Tanzania, South Africa, Guinea, Philippines, Thailand, and Uganda | [97,209,273,309,465,565,605,650–652] |
| Uromyces muhlenbergiae S. Ito   | Muhlenbergia japonica | Japan                                 | [635]                       |
| Uromyces mulgedii Lindr.        | Lactuca sp. | The Czech Republic and Turkey            | [569]                       |
| Uromyces mulini J. Schröt.      | Mulinum integrifolium | Argentina and Chile                  | [240,331,415]               |
| Uromyces musae Henn.            | Musa spp. | Congo, Fiji, and Philippines            | [565,610,653,654]           |
| Uromyces muscari (Duby) Niess   | Bellevlava spp., Chionodoxa spp., Dicpadi erythraeum, Endymionspp., Gagea sp., Hyacinthoides spp., Leopoldia spp., Muscari spp., Ornithogalum sp., Scilla spp., and Urginea spp. | Afghanistan, Bulgaria, California, Canada, Germany, Greece, India, Israel, Iran, Italy, Morocco, New Zealand, Norway, Scotland, Sweden, and Turkey | [80–82,105,123,124,179,317,318,389,534,655] |
| Uromyces mussooriensis Syd. & P. Syd. | Stipa sibirica | India                                   | [106,656]                   |
| Uromyces myosotidis Baçç.       | Myosotis sp. | Turkey                                   | [471]                       |
| Uromyces myristica Berk. & M.A. Curtis | Euphorbia bicolor | Texas                                   | [657]                       |
| Uromyces myrsines Dietel        | Ardisia compressa, Iaconora sp., Myrsine spp., and Ranaea spp. | Bolivia, Brazil, Costa Rica, and Uruguay | [100,101,143,310]            |
| Uromyces mysticus Arthur        | Hordeum jubatum | California, Canada, Colorado, Idaho, Israel, and Utah | [81,112,114,185,412,559]   |
| Uromyces namaquandanus Mennicken, W. Maier & Oberw. | Rhoepa cordifolia | Namibia                                | [384]                       |
| Uromyces nassauvae J.C. Lindq.  | Nassauvia lagascae | Argentina                             | [415]                       |
| Uromyces nassellae Cummins      | Nassella pubflora | Bolivia                                 | [106]                       |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| Uromyces natalensis Magnus | Euphorbia spp. | Madagascar and South Africa | [169,465] |
| Uromyces natricis A.L. Guyot | Ononis rotundifolia | France | [342] |
| Uromyces nattrassii Cummins | Statica spicata | Cyprus | [350] |
| Uromyces nauicinus Berndt | Cayaponia sp. | Ecuador | [127] |
| Uromyces necopinus Cummins | Hypoxis hirsuta | Connecticut, Massachusetts, and New York | [167,233] |
| Uromyces neotropicalis J.R. Hern. & Aime | Cayaponia rigida, C. selysioides, and Cucurbita sp. | Guiana and Guyana | [63,557] |
| Uromyces nevadensis Harkn. | Primula suffrutescens | California | [78,658] |
| Uromyces nidificans Tranzschel | Aellenia subaphylla, Cimacoptera korshinskyi, Salsola arbuscula, and Salsola sp. | Central Asia, Iran, and Uzbekistan | [146,161,346] |
| Uromyces niteroyensis Rangel | Panicum spp. and Setaria spp. | Argentina, Brazil, Colombia, India, French Guiana, and México | [102,110,395,415,659] |
| Uromyces nordenskjoldii Dietel | Vicia darapskyana and Vicia sp. | Argentina and Chile | [415] |
| Uromyces notabilis Wakef. | Cyperus sp. and Kylinga sp. | Uganda | [168,462] |
| Uromyces nothoscordi Syd. & P. Syd. | Nothoscordum striatum | Texas | [660] |
| Uromyces novissimus Spec. | Trianosperma ficifolia | Argentina, Brazil, Colombia, Panama, México, and West Indies | [48,324,469] |
| Uromyces numidicus Maire | Geranium atlanticum | Northern Africa | [649] |
| Uromyces nyakensis Syd. & P. Syd. | Gladiolus nyakensis | Malawi | [424] |
| Uromyces nymphoidis Săvul. | Nymphoides peltata | Romania | [228] |
| Uromyces oaxacanus Dietel & Holw. | Jatropha urens | Arizona, Belize, Guatemala, and México | [103,116,281] |
| Uromyces oberwinklerianus Berndt | Acalypha sp. | Costa Rica | [310] |
| Uromyces obscurus Durrieu | Heteropogon contortus | Nepal and Uganda | [244,464] |
| Uromyces oblongisporus H.S. Jacks. & Holw. | Rhynchospora corymbosa, R. exaltata, and Rhynchospora sp. | Brazil | [166,219] |
| Uromyces oblongisporus Ellis & Everh. | Artemisia tridentata | China and Wyoming | [225,661] |
| Uromyces oblongus Vize | Medicago polymorpha and Trifolium spp. | California and Washington | [78,454,662] |
| Uromyces obscurus Dietel & Holw. | Phaseolus sp. | México | [456,479] |
| Table 3. Cont. |
|----------------|
| **Species**    | **Host**                        | **Locality**                                                                 | **Reference** |
| Uromyces occidentalis Dietel | *Euphorbia* ssp., *Lupinus* ssp., and *Tithymalus* spp. | Arizona, California, Colorado, México, Montana, Nevada, Nigeria, Oregon, and Utah | [114,116,187,292,316,412,663] |
| Uromyces occultus J.C. Lindq.    | *Juncus densiflorus* var. *pohlii* | Argentina, Brazil, Chile, and México                                         | [102,486,664] |
| Uromyces ocimi Hansf.            | *Ocimum* mentholifolium          | Uganda                                                                       | [168] |
| Uromyces oedipus Dietel          | *Sophora japonica*              | Japan                                                                         | [665] |
| Uromyces oenotherae Burrill      | *Onothera linifolia*            | Illinois                                                                      | [582] |
| Uromyces olivierae J. Anikster & I. Wahl | *Belleviala eigii*           | Israel                                                                        | [390] |
| Uromyces ononis Pass.            | *Euphorbia* ssp. and *Ononis* ssp. | Bulgaria, Cyprus, Greece, Israel, Italy, Libya, Poland, Morocco, Romania, Spain, and Turkey | [80–82,105,111,220,532,666,667] |
| Uromyces ophiorrhizae Gäum.      | *Ophiorrhiza longiflora*        | Indonesia                                                                     | [309] |
| Uromyces orbicularis Dietel      | *Desmodium* ssp.               | Argentina, Brazil, and Bolivia                                                | [143,171,269] |
| Uromyces orchidearum Cooke & Massee | *Chilaloglottis* ssp.         | Australia                                                                      | [268] |
| Uromyces orientalis Syd. & P. Syd. | *Indigofera* spp.            | Australia, Ethiopia, Ghana, India, Japan, Kenya, Pakistan, Malawi, Philippines, Tanzania, Uganda, and Zambia | [85,168,171,172,357] |
| Uromyces ornatipes Arthur        | *Phrygilanthus sonorae*        | México                                                                        | [15,76,77] |
| Uromyces ornithogali (Wallr.) Niessl | *Geaea arvensis*, *Ornithopus nanum*, and *Ornithopus* sp. | Romania, Portugal, Spain, and Ukraine                                         | [111,158,179,228] |
| Uromyces ornithopodoides Gonz. Frag | *Ornithopus isthmocarpus* and *O. compressus* | Portugal                                                                      | [317] |
| Uromyces oro-bi-tuberosi (Pers.) Liro | *Gladiolus* sp.               | Finland                                                                       | [668] |
| Uromyces orthosiphonis T.S. Ramakr. & Sriniv. | *Orthosiphon glabrus*         | India                                                                         | [152,669] |
| Uromyces otakou G. Cunn.         | *Poa* ssp.                     | New Zealand                                                                   | [591,670] |
| Uromyces otaviensis Mennicken, W. Maier & Oberw. | *Ipomoea verbascoides*    | Namibia                                                                       | [385] |
| Uromyces ovalis Dietel            | *Leersia oryzoides*            | Japan                                                                         | [671] |
| Uromyces ovirensis Jaap           | *Primula wulfeniana*           | Austria                                                                        | [672] |
| Uromyces pachyceps Lagerh.        | *Ipomoea* sp.                  | Brazil, Ecuador                                                               | [126] |
| Uromyces pallidus Niessl          | *Chamaecytisus* ssp., *Cytisus* ssp., and *Lembotropis nigricans* | Austria, Belarus, Bulgaria, Czech Republic, Germany, Hungary, Italy, Poland, Romania, Ukraine, and Yugoslavia | [105,135,220,673] |
| Species                          | Host                                                                 | Locality                                                                 | Reference                        |
|---------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------|
| *Uromyces panici-sanguinalis* Rangel | Digitaria horizontalis, Panicum sanguinale, and Panicum sp.          | Brazil, Cuba, Grenada, and Venezuela                                      | [171,674,675]                    |
| *Uromyces pannosus* Vestergr.| Bauhinia candicans                                                   | Brazil                                                                   | [216]                            |
| *Uromyces papillatus* Kalchbr. & Cooke | Heteromorpha arborescens                                              | South Africa                                                             | [137]                            |
| *Uromyces paradoxus* Syd. & P. Syd. | Commiphora zimmermannii and Commiphora sp.                          | Kenya and Mozambique                                                     | [138,140,676]                    |
| *Uromyces parilis* Syd.        | Rumex occultans                                                      | Israel                                                                   | [81]                             |
| *Uromyces paspalicola* Arthur & Holw. | Paspalum racemosum                                                  | Ecuador                                                                  | [199,294]                        |
| *Uromyces paulshoekensis* Mennicken, W. Maier & Oberw. | Roepera foetida                                                      | South Africa and Northern Cape Province                                   | [384]                            |
| *Uromyces puegii* R.N. Goswami & Ngachan | Achyranthes aspera                                                   | India                                                                    | [677]                            |
| *Uromyces pavoniae* Arthur      | Pavonia racemosa                                                      | Puerto Rico                                                              | [259,678]                        |
| *Uromyces pazschkeanus* Henn.   | Vigna sp.                                                            | Eritrea                                                                  | [287,427]                        |
| *Uromyces peckianus* Farl.      | *Aristida* spp., *Atriplex* spp., *Bryzopyrum* sp., *Chenopodium* spp., *Distichlis* spp., *Houstonia* spp., *Plantago* spp., and *Salicornia* spp. | Alabama, California, Canada, Florida, Oklahoma, Massachusetts, Missouri, Montana, New York, Texas, and Wisconsin (USA) | [185,187,262,455,475,559,636] |
| *Uromyces peglerae* Pole-Evans   | Digitaria spp.                                                       | Kenya, India, Malawi, Mauritius, New Guinea, Pakistan, Philippines, South Africa, Uganda, and Zimbabwe | [171,172,232,441,447]            |
| *Uromyces peireskiae* Dietel     | *Peireskia* grandifolia, *P. sacharosa*, and *Peireskia* sp.          | Argentina and Brazil                                                     | [394,415]                        |
| *Uromyces pentacanis* (Dietel & Neger) Arthur & Holw. | *Nassella* spp. and *Stipa* spp.                                    | Argentina, Australia, Bovilia, Chile, and New Zealand                    | [24,199,415]                     |
| *Uromyces penniseti* S. Ahmad    | Pennisetum lanatum                                                   | Pakistan                                                                 | [536,679]                        |
| *Uromyces pentaeae* D.K. Agarwal | Pentace burmanica                                                    | India                                                                    | [680]                            |
| *Uromyces pentaschistidis* Gjaerum | Pentaschistis airoides                                               | South Africa                                                            | [243]                            |
| *Uromyces peracarpae* S. Ito & Tochinai | *Peracarpa* carnosoid and *P. circaeoides*                            | Japan and Russia                                                         | [94,297]                         |
| *Uromyces peraffinis* Dietel     | Bauhinia sp.                                                         | Brazil                                                                   | [219]                            |
| *Uromyces pereskiae* H.S. Jacks. & Holw. | *Pereskia* aculeata, *P. grandifolia*, and *Pereskia* sp.             | Argentina and Brazil                                                     | [269,681]                        |
| Species                   | Host                                                                 | Locality                                                                                   | Reference                      |
|---------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------------------------------|
| *Uromyces perigignius* Halst. | Carex spp., Ratibida columnaris, Rudbeckia spp., and Solidago spp. | Bermuda, Canada, Idaho, Iowa, Maine, Missouri, Montana, Oregon, Pennsylvania, Washington, and Wisconsin | [185,187,191,252,260]         |
| *Uromyces perlebiae* Vestergr. | Bauhinia spp.                                                       | Brazil                                                                                     | [102,216]                     |
| *Uromyces permeritus* Cummins | Tournefortia sarmentosa and Tournefortia sp.                         | Papua New Guinea                                                                           | [223,426]                     |
| *Uromyces persicus* Syd. & P. Syd. | Astragalus spp., Oxytropis spp., and Phaca spp.                   | Alaska, Alberta, Austria, Canada, Colorado, India, Iran, Japan, Kazakhstan, Norway, Oregon, Russia, Siberia, Sweden, Tajikistan, and Turkmenistan | [220,357,682]                 |
| *Uromyces petitmenginii* Maire | Minuartia globulosa and M. mereyi                                     | Greece, Turkey                                                                             | [80,421,470]                  |
| *Uromyces phace-frigidae* (Wahlenb.) Har. | Astragalus spp. and Phaca spp.                                      | Alaska, Canada, Caucasus, Kyrgyzstan, Pakistan, Norway, Russia, and Sweden                | [367,436,553,646]             |
| *Uromyces phalaridicola* Katajef | Phalaris minor                                                       | Turkmenistan                                                                               | [106]                         |
| *Uromyces phaseolicola* Specg. | Phaseolus prostratus                                                 | Argentina                                                                                 | [126,180]                     |
| *Uromyces phlei-michelii* Cruchet | Phleum alpinum, P. phleoides, and P. michelii                        | Morocco and Switzerland                                                                    | [126,279]                     |
| *Uromyces phlogacanthi* Gäum. | Phlogacanthus celebicus                                              | Indonesia                                                                                  | [309,683]                     |
| *Uromyces phyllachoroides* Mayor | Phthirusa purijolia                                                  | Colombia                                                                                  | [15,226]                      |
| *Uromyces phyllachoreoides* Henn. | Cynosurus elegans                                                    | Tunisia                                                                                   | [684]                         |
| *Uromyces phyteumatum* Vienn.-Bourg. | Physanthyllis tetraphylla                                           | Greece                                                                                    | [544]                         |
| *Uromyces phyteumatum* (DC.) Niessl | Phyteuma spp.                                                        | The Czech Republic, Denmark, France, Germany, Norway, Poland, Romania, and Spain          | [128,158,159,228,440]         |
| *Uromyces pianhyensis* Henn. | Wedelia spp.                                                          | Brazil, Ethiopia, India, Puerto Rico, Virgin Islands, and West Indies                    | [264,312,571,600]             |
| *Uromyces pictus* Thüm.    | Abutilon elaeocarpoides and Abutilon sp.                            | Galapagos Islands and Ethiopia                                                             | [571,685,686]                 |
| *Uromyces pieningii* Cummins | Ipomoea argentaurea and Ipomoea pes-caprae                           | Ghana and Indonesia                                                                        | [126,341]                     |
| Species                        | Host                                                                 | Locality                                                                 | Reference                  |
|-------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------|
| *Uromyces pisi-sativi* (Pers.) Liro | Astragalus spp., Colutea sp., Cytisus scoparius, Euphorbia sp., Galega officinalis, Genista spp., Lathyrus spp., Lotus spp., Medicago spp., Onobrychis spp., Pisum spp., Trifolium pratense, Ulex europaeus, and Vicia sp. | Finland, Germany, Hong Kong, Israel, Libya, Turkey, Serbia, and Uzbekistan | [80,81,329]                |
| *Uromyces pittospori* Henn.    | Pittosporum abyssinicum                                              | Eritrea                                                                  | [287,687]                  |
| *Uromyces plantiusculus* (Mont.) Jørst. | Rumex frutescens                                                   | Tristan da Cunha                                                          | [688]                      |
| *Uromyces plantaginis* Vestergr. | Plantago barbata and *P. tubulosa*                                  | Argentina                                                                 | [165,415]                  |
| *Uromyces plumbarius* Peck     | *Gaura* spp., *Oenothera* spp., *Onagra biennis*, and *Pachyphlius marginatus* | California, Canada, Colorado, Connecticut, Florida, Idaho, Louisiana, Iowa, México, Minnesota, Mississippi, Oregon, Texas, and Utah | [114,155,185,187,262,475,559] |
| *Uromyces poae-alpinae* Rytz   | *Poa alpina* and *Ranunculus montanus*                              | Germany and Poland                                                        | [135,160]                  |
| *Uromyces poinsettiae* Syd.     | *Poinsettia heterophylla*                                            | Argentina                                                                 | [689]                      |
| *Uromyces poiretiae* Syd.       | *Poirotia scandens*                                                  | Venezuela                                                                 | [431,690]                  |
| *Uromyces polemanniae* Kalchbr. & Cooke | *Polemannia* spp.                                                  | South Africa                                                              | [137,142]                  |
| *Uromyces poliotelis* Syd.      | *Anguria* sp., *Gurania* sp., and *Selysia prunifera*                | Costa Rica                                                                | [127,229]                  |
| *Uromyces politus* (Berk.) McAlpine | *Muehlenbeckia cunninghamnii*                                      | Australia                                                                 | [280,343]                  |
| *Uromyces polyxeni* McAlpine   | *Polycnemum pentandrum*                                             | Bulgaria, Britain, Iran, and Ukraine                                      | [82,280,317,422]           |
| *Uromyces polygalae* Grove     | *Polystachya* spp.                                                   | Mongolia and Uganda                                                       | [535,691]                  |
| *Uromyces polygoni-avicularis* (Pers.) G.H. Otth | *Polygonum nepalense*                                       | Nepal                                                                    | [692,693]                  |
| *Uromyces polynii* (Henn.) Dietel & Holw. | *Polynia* spp.                                                   | Argentina, Brazil, Colombia, Guatemala, and México                         | [219,269,281,375]          |
| *Uromyces polymorphus* Peck & Clinton | *Lathyrus* sp.                                                      | New York                                                                  | [694]                      |
| *Uromyces polytriadicola* Arthur & Cummins | *Polytrias amaura*                                                  | Philippines                                                                | [232]                      |
| *Uromyces pontederiae* W.R. Gerard | *Pontederia cordata*                                               | Argentina, Brazil, Delaware, Florida, Georgia, Missouri, New York, Pennsylvania, Texas, and Virginia | [415,559,695]              |
| Species                          | Host                                      | Locality                                      | Reference                  |
|----------------------------------|-------------------------------------------|-----------------------------------------------|----------------------------|
| Uromyces pontedericola Speg.     | *Pontederia sagittata*                    | Argentina and India                           | [34,592]                   |
| Uromyces poonensis W.D. More & Moniz | *Sesbania aegyptiaca, S. grandiflora, and S. sesban* | India                                         | [357,696]                  |
| Uromyces porcensis Mayor         | *Inga ingoides*                          | Colombia                                      | [226]                      |
| Uromyces porosus (Peck) H.S. Jacks. | *Vicia americana and V. sparsifolia*     | Iowa                                          | [155,295,454]              |
| Uromyces pozoa Dietel & Neger    | *Poa hydrocotylofina*                    | Colombia                                      | [240,417]                  |
| Uromyces praetextus Vestergr.    | *Bauhinia sp.*                            | Brazil                                        | [216]                      |
| Uromyces prangi Har.             | *Hippomarathrum cristatum and Prangos sp.* | Bulgaria and Iran                             | [82,347]                   |
| Uromyces pratensis Juel          | *Poa pratensis, Ranunculus auricomus, and R. cassubicus* | Finland                                      | [329]                      |
| Uromyces pratiae Speg.           | *Hypsela reniformis and Pratia repens*    | Argentina, Brazil, and Ecuador                | [123,219,415]              |
| Uromyces pretoriensis Doidge     | *Commelina africana*                      | Ghana, Uganda, Namibia, and South Africa      | [138,168,443]              |
| Uromyces primaverilis Speg.      | *Allium striatellum*                      | Argentina, Illinois, Kansas, Missouri, Michigan, Missouri, Texas, Oklahoma, and Uruguay | [305,415,455,542,559] |
| Uromyces primulae-integrifoliae (DC.) Niessl | *Primula deorum and P. integrifolia*    | Bulgaria and Switzerland                      | [82,159]                   |
| Uromyces prismaticus Vienn. Bourg. | *Secale montanum*                        | Iran                                          | [320]                      |
| Uromyces prvae Syd. & P. Syd.    | *Priva lappulacea*                       | Cuba and Venezuela                            | [697,698]                  |
| Uromyces prosopidis (Jacz.) Jacz. | *Prosopis farcta*                        | Iran                                          | [659]                      |
| Uromyces pseudarthriae Cooke     | *Pseudarthria robusta*                    | South Africa                                  | [700]                      |
| Uromyces psoraleae Peck          | *Psoralea lanceolata*                     | Arizona, Canada, Colorado, Idaho, Montana, Oregon, South Africa, Utah, Washington and Wyoming | [142,185,187,368,559,701] |
| Uromyces psychotriae Henn.       | *Psychotria sp.*                          | Brazil                                        | [219,575]                  |
| Uromyces pteroclaineae Lindr.    | *Cachryde sp.*                            | Algeria                                       | [501]                      |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| *Uromyces pulchellus* Ellis & Everh. | *Silene douglasii* and *Silene sp.* | California and Washington (USA) | [78, 388] |
| *Uromyces pulvinatus* Kalchbr. & Cooke | *Euphorbia inaequilatera* | South Africa | [702] |
| *Uromyces punctiformis* Syd. & P. Syd. | *Vigna strobilophora* | Mexico | [703] |
| *Uromyces purpureus* Lagerh. | *Liliaceae* | Angola | [704] |
| *Uromyces pustulatus* Wakef. | *Bauhinia fassoglossis* | Uganda and Kenya | [140, 168] |
| *Uromyces puttemansii* Rangel | *Panicum spp.* and *Setaria spp.* | Argentina, Brazil, Cuba, Honduras, Jamaica, México, Panama, Uruguay, and Venezuela | [126, 171, 674] |
| *Uromyces pyriformis* Cooke | *Acorus calamus* | Iowa, Illinois, Japan, Massachusetts, Maine, Minnesota, Mississippi, New York, and Taiwan | [92, 155, 574, 596] |
| *Uromyces quaagafonteinus* Mennicken & Oberw. | *Ehrharta calycina* | South Africa | [378, 429] |
| *Uromyces quinchantalii* Neger | *Quinchantalinium spp.* | Argentina, Bolivia, and Chile | [415, 705] |
| *Uromyces ramacharii* Ravinder & Bagyan. | *Ocimum sp.* | India | [706] |
| *Uromyces ranunculi-distichophylli* Semadeni | *Ficaria sp.* and *Ranunculus sp.* | Africa, America, China, Canada, Europe, Iran, Japan, and Russia | [106] |
| *Uromyces rapanicae* Henn. | *Rapanea sp.* | São Paulo | [450] |
| *Uromyces ratioides* Jørst. | *Caapiopia sp.* | Ecuador | [124, 212] |
| *Uromyces ratus* H.S. Jacks. & Holw. | *Caapiopia sp.* | Brazil | [210, 212] |
| *Uromyces rayssiae* J. Anikster & I. Wahl | *Scilla hyacinthoides* | Israel | [390] |
| *Uromyces rebeccaie* Bruckart, M. Abbasi & Aime | *Suaeda californica* | California | [47] |
| *Uromyces regecii* Vestergr. | *Bauhinia candicans* | Brazil | [216, 219] |
| *Uromyces reicheli* Dietel | *Miilla bivalvis* and *Triteleia gaudichaudiana* | Chile | [240, 415] |
| *Uromyces reichertii* J. Anikster & I. Wahl | *Scilla hyacinthoides* and *Hordeum bulbosum* | Israel | [81] |
| *Uromyces renovatus* P. Syd. & Syd. | *Lupinus sp.* | Czech Republic, Greece, Israel, Kenya, Finland, Portugal, and Spain | [81, 131, 140, 144, 158, 707] |
| Species                        | Host                                      | Locality                                      | Reference                                      |
|-------------------------------|-------------------------------------------|-----------------------------------------------|------------------------------------------------|
| Uromyces reticulatus (Thüm.) Bubák | *Allium victorialis*                     | Portugal and Spain                            | [158,612]                                     |
| Uromyces reynoldsii Thaung    | *Modecca bracteata* and *Trichosanthes* spp. | Myanmar                                       | [212]                                         |
| Uromyces rhinacanthii Cummins | *Rhinacanthus nasutus*                    | Ghana, West Africa                            | [218,609]                                     |
| Uromyces rhodesicus Wakef.    | *Bauhinia galpinii* and *B. macrantha*    | South Africa and Zimbabwe                     | [138,250]                                     |
| Uromyces rhynchosporae Ellis  | *Rhynchospora*                            | Brazil, Bermuda, California, Cuba, Florida, Georgia, Hawai, stationary, 108,120,306,307,388,412,559 |
| Uromyces ribicola H.S. Jacks. & Holw. | *Ribes albofolium* and *R. andicola* | Bolivia, Brazil, and Colombia                 | [101,126,227]                                 |
| Uromyces rickerianus Arthur   | *Polygonum* spp. and *Rumex* spp.        | Colorado, Idaho, Utah, and Wyoming            | [187,368]                                     |
| Uromyces riloensis Hinkova    | *Doronicum cordifolium*                  | Bulgaria                                      | [82]                                          |
| Uromyces rostratus Henn.      | *Eriosema* sp.                           | Rio de Janeiro                                | [331]                                         |
| Uromyces rottboelliae Arthur  | *Rottboella compressa*, *R. exaltata*, and *R. speciosa* | Congo, India, and Philippines                 | [171,708]                                     |
| Uromyces rubidus Arthur & Holw. | *Andropogon condensatus*               | Brazil                                        | [199]                                         |
| Uromyces rudbeckiae Arthur & Holw. | *Rudbeckia* spp. and *Solidago* spp. | Canada, China, Idaho, Florida, Japan, Korea, Iowa, Missouri, Mississippi, Montana, Taiwan, Texas, Argentina, Armenia, Australia, Brazil, Bulgaria, Chile, Denmark, Finland, Germany, Greece, India, Iran, Italy, Japan, Malawi, New Zealand, Norway, Pakistan, Poland, Portugal, Sicily, South Africa, Spain, Romania, Sweden, Tanzania, Turkey, Uganda, Ukraine, Uzbekistan, and Russia | [94,108,109,185,483,559] |
| Uromyces ruelliae Holw.       | *Beloperone californica*, *Beloperone* sp., *Justicia brandegeana*, and *Ruella* sp. | Arizona, California, Florida, México, and Nevada | [218,262,409,412]                             |
| Uromyces rugosus Arthur       | *Lupinus* sp.                            | México                                        | [398]                                         |
| Uromyces rugulosus Pat.       | *Campylotropis* spp. and *Lespedeza* spp. | China                                         | [96]                                          |
| Uromyces ruiz-leali J.C. Lindq. | *Anarthrophyllum* elegans                | Argentina                                     | [415]                                         |
| Uromyces rumicis (Schumach.) G. Winter | *Emex australis*, *Ficaria* spp., *Medicago* spp., *Ranunculus* ficaria, and *Rumex* spp. | Argentina, Armenia, Australia, Brazil, Bulgaria, Chile, Denmark, Finland, Germany, Greece, India, Iran, Italy, Japan, Malawi, New Zealand, Norway, Pakistan, Poland, Portugal, Sicily, South Africa, Spain, Romania, Sweden, Tanzania, Turkey, Uganda, Ukraine, Uzbekistan, and Russia | [75,80,82,128,135,142,158,245,279,313,468,519,534] |
| Uromyces rumicis (Schumach.) G. Winter | *Rumicis* sp.                            | Australia, Morocco, and Switzerland           | [709]                                         |
### Table 3. Cont.

| Species                                   | Host                          | Locality                              | Reference                  |
|-------------------------------------------|-------------------------------|---------------------------------------|----------------------------|
| *Uromyces rumicum* (DC.) Fuckel           | Rumicis hydrolapathi         | Egypt and Minnesota                   | [179,710]                  |
| *Uromyces rzedowskii* J.F. Hennen & Cummins | Ledenbergia macrantha        | México                                 | [292,403]                  |
| *Uromyces sabineae* Arthur                | Poitea spp. and Sabinea punicea | Cuba, Dominican Republic, Puerto Rico | [184,486]                  |
| *Uromyces saginatus* Syd.                 | Urginea altissima             | Namibia, Zimbabwe                      | [138,250]                  |
| *Uromyces sakawensis* Henn.               | Solidago virgaurea            | Japan                                  | [711]                      |
| *Uromyces salicorniae* (DC.) de Bary      | Arthrocnemum glaucum and Salicornia spp. | China, Germany, Finland, Poland, Portugal, Romania, and United Kingdom | [105,133,135,195,228,329] |
| *Uromyces salmeae* Arthur & Holw.         | Galinsoga sp. and Salmea scandens | Costa Rica, Dominican Republic, Guatemala, Puerto Rico, Virgin Islands, and West Indies | [125,184,225,264,281,282,406] |
| *Uromyces salpichroae* H.S. Jacks & Holw. | Salpichroa diffusa and Salpichroa sp. | Bolivia and Ecuador | [210]                      |
| *Uromyces salsolae* Rabenh.               | Climacoptera sp., Gamanthus gamocarpus, Gossypium hirsutum, Halocharis hispida, Noaea spp., Petrosimonia spp., and Salsola spp. | Algeria, China, Cyprus, Finland, Israel, Japan, Mongolia, Morocco, Pakistan, Russia, Romania, Turkey, and Ukraine | [80,81,111,146,198,228,329,435,535] |
| *Uromyces sasaensis* Gjaerum              | Valeriana kilimandscharica and V. volkensii | Uganda                              | [317,712]                  |
| *Uromyces sataren sis* P.B. Chavan & Bakare | Blainvillea acmella and B. latifolia | China and India               | [319,713]                  |
| *Uromyces saulensis* Berndt               | Selysia prinifera             | France                                 | [127]                      |
| *Uromyces saururi* Henn.                  | Saaururies chinensis and S. loureiro | China, Japan, and Taiwan            | [96,97,222]                |
| *Uromyces saussureae* P. Karst.           | Saussurea sp.                 | Japan, Siberia                         | [714]                      |
| *Uromyces savulescui* Rayss               | Limonium simutum and Limonium sp. | The Canary Islands, Greece, and Israel | [81,327]                   |
| *Uromyces scaberulus* L. Guo & Y.C. Wang | Lespedeza bicolor, L. cuneate, L. cyrtobotrya, and L. formosa | China                                  | [156]                      |
| *Uromyces scaevolae* G. Cunn.             | Scaevola albida, S. calendulacea, S. spinescens, and S. radicans | Australia and New Zealand            | [67,313]                   |
| *Uromyces schanginiae* Thüm.              | Suada spp.                    | California and Egypt                   | [710,715]                  |
| *Uromyces schinzianus* Henn.              | Bauhinia fassoglegensis, B. reticulate, and B. thomningii | Somalia, South Africa, and Uganda | [138,168]                  |
| *Uromyces schismi* Jørst.                 | Schismus scaberrimus          | South Africa                           | [411]                      |
| *Uromyces schoenanthi* Syd. & P. Syd.     | Andropogon schoenanthus, Apluda mutica, Cymbopogon schoenanthus, Polytrias amaura, and P. diversifolia | India, New Guinea, Pakistan, and the Philippines | [152,201,318] |
Table 3. Cont.

| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| Uromyces schweinfurthii Henn. | Acacia ehrenbergiana, A. flava, and A. seyal | South Yemen and Ethiopia | [287,687] |
| Uromyces scillinus (Durieu & Mont.) Har. | Scilla autumnalis | Algeria and Europe | [451] |
| Uromyces scirpi-maritimi Hirats. f. & Yoshin. | Bolboschoenus maritimus, Glaux maritima, Scirpus fluviatilis, and S. maritimus | Japan and Russia | [222,297] |
| Uromyces scirpinus Syd. | Scirpus supinus | Philippines | [232] |
| Uromyces scleranthi Rostr. | Minuartia spp. and Scleranthus spp. | Barbados, Brazil, Colombia, Cuba, Dominica, Grenada, Guyana, Nigeria, Rio de Janeiro, Saint Lucia, Puerto Rico, Venezuela, and West Indies | [80,107,128,280,329,422] |
| Uromyces scleriae Henn. | Scleria spp. | Australia, Bulgaria, Denmark, Finland, Norway, Sweden, Turkey, and Ukraine | [80,107,128,280,329,422] |
| Uromyces sclerochloae Tranzschel | Sclerochloa dura | Central Asia (Turkmenistan and Iran) | [161,383] |
| Uromyces scleropae Baudyš & Picb. | Scleropoa ridigai | Croatia | [451] |
| Uromyces scrophulariae (DC.) Fuckel | Scrophularia auriculata | Carmarthenshire and Wales | [716] |
| Uromyces scutellatus (Schrank) Niessl | Euphorbia spp. | Bulgaria, Chile, Germany, Iran, Iraq, Poland, Romania, Russia, Serbia, Spain, Turkey, Ukraine, and Uzbekistan | [43,80,82,105,111,146,179,196,228,236,347,386] |
| Uromyces secamones Wakef. | Secamone platystigma | Uganda | [168] |
| Uromyces sedi Gäum. | Sedum anacampseros | France | [717] |
| Uromyces seditosus F. Kern | Aristida spp. and Plantago spp. | Alabama, Arkansas, California, Colorado, Illinois, Indiana, Kansas, Iowa, Missouri, Nebraska, Nebraska, New York, Oklahoma, Texas, Wisconsin, and Virginia | [537,559,718] |
| Uromyces seligeri Tranzschel & Erem. | Lathyrus grandiflorus and L. sylvestris | Greece and Russia | [220,382,421] |
| Uromyces sellierae G. Cunn. | Selliera radicans | New Zealand | [67] |
| Uromyces senanensis Gjaerum | Astragalus fridae | Iran | [276] |
| Uromyces senecionicola Arthur | Cacalia sp., Senecio roldana, and Senecio sp. | México | [292,398] |
| Uromyces senecionis-gigantis Gjaerum | Senecio gigas | Ethiopia | [719] |
| Uromyces senorensis J.F. Hennen & Cummins | Compositae | Mexico | [703,720] |
| Species                  | Host                                                | Locality                        | Reference |
|--------------------------|-----------------------------------------------------|----------------------------------|-----------|
| *Uromyces sepultus* Mains | *Setaria tenax*                                     | America, México                  | [721]     |
| *Uromyces seseli-graminis* E. Fisch. | *Arrhenatherum elatius, Melica ciliata,* and *Poa* sp. | Europe                           | [106]     |
| *Uromyces seselis* Sousa da Cámara | *Seseli tectorum*                                   | Portugal                         | [722]     |
| *Uromyces sessei* Lagerh. | *Sesia* sp.                                         | Ecuador                          | [325]     |
| *Uromyces setariae-italicae* Yoshino | *Bracharia* sp., *Chaetochloa* sp., *Eriochloa* sp., *Lasiacis* sp., *Setaria* sp., and *Urochloa* sp. | Worldwide                        | [294]     |
| *Uromyces shahrudensis* Petr. | *Onobrychis* sp.                                    | Iran                             | [723]     |
| *Uromyces shearianus* Arthur |                                                   | Arizona, California, Colorado, México, Utah, and Wyoming | [114,292,412,559] |
| *Uromyces shikokianus* Kusano | *Cladrastis platycarpa* and *C. shikokiana*         | Japan                            | [222]     |
| *Uromyces sii-latifolii* P. Karst. | *Sium latifolium*                                   | Britain and Russia               | [714]     |
| *Uromyces silenes* (Schltld.) Fuckel | *Arenaria glabrescens,* *Arenaria* sp., and *Silene* sp. | California, Colorado, Iowa, Kansas, Montana, Pennsylvania, Portugal, Turkey, Utah, and Washington (USA) | [80,114,454,559] |
| *Uromyces silenes-chloraefoliae* Vienn.-Bourg. | *Silene chlorifolia*                                | Iran                             | [320]     |
| *Uromyces silenes-ponticae* Const. | *Silene* sp.                                        | Bugaria, Iraq, Libya, Romania, Portugal, and Turkey | [80,82,196,228,532] |
| *Uromyces silksvleyensis* Mennicken & Oberw. | *Bartholina burnanniensis*                          | Western Cape Province            | [378]     |
| *Uromyces silphii* (Syd. & P. Syd.) Arthur | *Aster macrophyllus,* *Helianthus* sp., *Heliopsis helianthoides,* *Juncus* sp., and *Silphium* sp. | Argentina, Canada, Czech Republic, Chile, Florida, Georgia, Idaho, Illinois, Iowa, México, Minnesota, Missouri, New York, Oklahoma, Oregon, Pennsylvania, Poland, Texas, Uruguay, Washington, Wisconsin, and Vermont | [185,187,191,292,415,559] |
| *Uromyces simulans* Peck | *Vilfa* sp.                                          | Colorado                         | [724]     |
| *Uromyces siphocampylus-gigantei* Berndt | *Siphocampylus giganteus*                           | Ecuador                          | [725]     |
| *Uromyces sisririnchicola* Speg. | *Sisririnchium iridifolium*                         | Chile                            | [258]     |
| *Uromyces skottsbergii* Jørst. | *Enargea marginata*                                 | Argentina and the Falkland Islands | [726,727] |
| *Uromyces smilacis* Mayor | *Smilax* sp.                                         | Colombia                         | [226,227] |
| Species                          | Host                                      | Locality                              | Reference          |
|---------------------------------|-------------------------------------------|----------------------------------------|--------------------|
| Uromyces snowdeniae Cummins     | Snowdenia scabra                         | Kenya                                  | 140                |
| Uromyces socius Arthur & Holw.  | Loranthus spp. and Struthanthus spp.      | Guatemala and México                   | 15,281             |
| Uromyces solani Dietel & Holw.  | Solaria appendiculatum                    | Colombia, Guatemala, and México        | 227,281,456,479    |
| Uromyces solariae Dietel        | Solaria miersoides                        | Chile                                  | 240                |
| Uromyces solidaginis (Sommerf.) | Solidago spp.                             | Colorado, Finland, Idaho, Japan, Montana, Oregon, Poland, Russia, Washington, and Wyoming | 92,329,454,559     |
| Uromyces solidaginis-caricis    | Carex varia                               | Indiana                                | 728                |
| Uromyces solidus Berk. & M.A.  | Desmodium strictum                       | North Carolina                         | 657                |
| Uromyces sommerfeltii Hyl., Jørst. & Nannf. | Solidago spp. | China, Canada, Germany, Finland, Idaho, Japan, Russia, Mississippi, Montana, Nepal, Norway, Oregon, Poland, Russia, Sweden, and Turkey | 80,94,129–131,135,185,187,436,475,567 |
| Uromyces sonorensis J.F. Hennen & Cummins | Merremia palmeri                      | México                                  | 729                |
| Uromyces sophorae Peck          | Sophora alopecuroides, S. sericea, and S. mollis | Pakistan and México                   | 563,730            |
| Uromyces sophorae-flavescentis  | Sophora alopecuroides, S. angustifolia, S. flavescens, S. jaubertii, and S. japonicum | China, Japan, Korea, Turkey, Russia, and Uzbekistan | 96,146,297,483     |
| Dietel                          | Sophora japonica                         | Japan                                   | 92,731             |
| Uromyces sophorae-vicifolia F.L. | Sophora vicifolia                        | China                                   | 732                |
| Syd. & P. Syd.                  | Sparaxis lineata, S. tricolor, and Sparaxis sp. | South Africa                           | 142                |
| Uromyces sparganii Cooke & Peck | Acorus calamus, Hypericum virginicum, and Sparganium eurycarpum | Canada, Iowa, Indiana, India, Michigan, Mississippi, New York, Nebraska, and Wisconsin | 152,185,475        |
| Uromyces sparsus (Kunze & J.C. Schmidt) Lev. | Arenaria marina, Spergularia spp. and Stellaria patens | Bulgaria, Denmark, Finland, Germany, Nepal, Norway, Romania, and Ukraine | 82,111,128,135,179,188,228,329 |
| Uromyces spartii-juncei P. Syd. & Syd. | Spartium junceum                        | France, Greece, Portugal, Spain, Switzerland, and Yugoslavia | 220                |
| Uromyces speciosus Holw.        | Frasera macrophylla                      | Colorado and New México                 | 559,733            |
Table 3. Cont.

| Species                      | Host                                                                 | Locality                                                                 | Reference           |
|------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------|
| *Uromyces spargazzinii* (De Toni) Arthur | Commelina angustifolia, C. elegans, C. erecta, C. nudiflora, and C. virginica | Florida, Taiwan, Texas, and the Virgin Islands                          | [299,447]           |
| *Uromyces spermacoces* (Schwein.) Thüm. | Diodia teres, D. virginiana, D. sp., and Spermacocce tenuior         | Brazil, Carolina, Florida, Georgia, Indiana, Missouri, Mississippi, Oklahoma, Pennsylvania, and Texas | [202,203,262,455,584] |
| *Uromyces sphaericus* H.S. Jacks. & Holw. | Perymenium ecuadoricum  | Ecuador                                                                    | [210,219]           |
| *Uromyces sphaerocarpus* Syd. & P. Syd. | Indigofera potaninii, I. pseudotinctoria, I. tinctoria, and Indigofera sp. | China and Japan                                                        | [96,734]           |
| *Uromyces sphaerophysae* Pospelov ex Nevod. | Swainsonia salsula  | China                                                                     | [198]               |
| *Uromyces splendens* A. Blytt | Astragalus oroboides  | Norway                                                                     | [735]               |
| *Uromyces sporoboli* Ellis & Everh. | Allium spp., Sporobolus spp.                                        | Bolivia, Chile, Indiana, Kansas, Iowa, Missouri, Nebraska, Puerto Rico, Texas, and Wisconsin | [199,386,559,635]   |
| *Uromyces sporobolicola* J.C. Lindq. | Sporobolus marginatus, S. pyramidalis, and S. pyramidatus            | Argentina, India, Pakistan, and México                                    | [171,415,488,736]   |
| *Uromyces sporoboloides* Cummins | Sporobolus berteroanus  | Ecuador                                                                    | [737]               |
| *Uromyces spragueae* Harkn. | Calyptridium umbellatum, C. umbellatum var. caudicifera, Spraguea umbellate, and Spraguea sp. | California, Oregon, and Wyoming                                           | [186,559,658]       |
| *Uromyces standleyanus* Arthur | Gaudichaudia schiedea  | El Salvador                                                                | [301]               |
| *Uromyces statices* Berk. & M.A. Curtis | Statice sp.  | California                                                                 | [598]               |
| *Uromyces statices-mucronatae* Malençon | Statice mucronata  | Morocco                                                                    | [279]               |
| *Uromyces statices-sinensis* Liou & Y.C. Wang | Statice sinensis  | China                                                                     | [543]               |
| *Uromyces steironematis* Arthur | Spartina michauxiana  | Nebraska                                                                   | [738]               |
| *Uromyces stellariae* Syd. & P. Syd. | Stellaris kotschyan     | Iran                                                                       | [739]               |
| *Uromyces stellariae-saxatilis* L. Guo & Y.C. Wang | Stellaria media, S. saxatilis, S. vestita, and Stellaria sp. | China                                                                     | [96]                |
| *Uromyces stenorrhynchi* Henn. | Stenorrhynchus sp.  | Peru                                                                       | [740]               |
| Species                        | Host                                                                 | Locality                                                                                                                                                                                                 | Reference                  |
|-------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Uromyces stipinus Tranzschel & Erem. | Stipa rubens                                                        | Russia                                                                                                                                                                                                 | [106]                       |
| Uromyces strauchii Doidge     | Clutia daphnoides                                                    | Southern Africa                                                                                                                                                                                        | [138]                       |
| Uromyces striatellus Tranzschel | Euphorbia esula, E. leptocephala, E. sieboldiana, and Euphorbia sp. | China, Iran, Japan, Ukraine, and Russia                                                                                                                                                               | [94,108,109,157,297]        |
| Uromyces striatus J. Schröt.  | Argyrolobium spp., Cicer arietinum, Ervum lens, Euphorbia spp., Hosackia sp., Hymenocarpos cinnaratus, Lathyrus odoratus, Lens culinaris, Lotus spp., Manihot esculenta, Medicago lupulina, Melilotus spp., Pisum spp., Trifolium spp., and Vicia spp. | Worldwide                                                                                                                                                                                              | [104,165,220,222,225]       |
| Uromyces striolatus Tranzschel | Euphorbia aff-esula, E. boissieriana, E. esula, and Euphorbia sp.  | Bulgaria, China, Iran, and Pakistan                                                                                                                                                                    | [82,108,157,317,356]        |
| Uromyces strobilanthis Barclay | Pteracanthus articifolius, Strobilanthes alata, S. dalhousieana, and Strobilanthes sp. | India, Pakistan, Taiwan, and the Philippines                                                                                                                                                           | [218,563,565]               |
| Uromyces strumariae A.R. Wood  | Strunaria gennana                                                   | Western Cape Province                                                                                                                                                                                  | [741]                       |
| Uromyces struthanthi Perd.-Sánch. | Struthanthus sp.                                                   | Panama                                                                                                                                                                                                  | [15]                        |
| Uromyces stylochaetonis Doidge | Stylochaeton natalense                                             | KwaZulu-Natal                                                                                                                                                                                         | [249]                       |
| Uromyces sublevis Tranzschel  | Euphorbia baetica, E. petrophila, and E. victoria                   | Lebanon, Portugal, and Ukraine                                                                                                                                                                         | [157,158,422,449]           |
| Uromyces substriatus Syd. & P. Syd. | Lupinus argentus                                                     | Montana                                                                                                                                                                                                 | [79]                        |
| Uromyces suksdorfii Dietel & Holw. | Lychnis drummondii, Lychnis sp., Silene oregano, S. pacifica, S. scouleri, and Silene sp. | Arizona, California, Idaho, Oregon, Utah, México, and Washington                                                                                                                                     | [114,116,187,454,559]       |
| Uromyces superficis Vestergr. | Bauhinia mirandina, B. mollis, and Bauhinia sp.                      | Argentina, Brazil, Bolivia, and Venezuela                                                                                                                                                              | [216,394,431]               |
| Uromyces superflus P. Syd. & Syd. | Panicum antidotale and P. depauperatum                              | America, India, and Pakistan                                                                                                                                                                           | [144,171,294]               |
| Uromyces superstomatalis Berndt | Cayaponia rigida                                                    | France                                                                                                                                                                                                  | [127]                       |
| Uromyces suzukii Sawada ex Hirats. f. | Sigesbeckia orientalis                                              | China, Japan, and Taiwan                                                                                                                                                                                | [94,108,319]                |
| Uromyces symaethidis W. Schmeid. | Simethis bicolor                                                    | Italy                                                                                                                                                                                                   | [742]                       |
| Uromyces tairae Hirats. f.     | Messerschmidia argentea                                            | Japan                                                                                                                                                                                                   | [743]                       |
| Uromyces tarapotensis Henn.    | Camptosema sp.                                                     | Peru                                                                                                                                                                                                     | [575]                       |
| Uromyces teheranicus Petr.     | Trifolium retense                                                  | Iran                                                                                                                                                                                                     | [744]                       |
| Species | Host | Locality | Reference |
|---------|------|----------|-----------|
| *Uromyces tehuelches* Speg. | *Alstroemeria patagonica* | Argentina | [167,592] |
| *Uromyces tener* J. Schröt. | *Manettia gracilis* | Brazil | [219,331] |
| *Uromyces tenuicuítis* McAlpine | *Parietaria judaica* and *Sporobolus* spp. | Australia, China, Fiji, Ghana, Guyana, Grenada, India, Japan, Jamaica, Kenya, Malawi, México, Malaysia, Nigeria, Pakistan, Philippines, Puerto Rico, South Africa, Sierra, Taiwan, Uganda, Virgin Island, West Indies, and Zimbabwe | [97,171,172,184,243,244,280,615] |
| *Uromyces tenuistipes* Dietel & Holw. | *Desmodium* spp. and *Meibomia* sp. | Bolivia, Colombia, Cuba, and México | [172,479,597,745] |
| *Uromyces teodoresculi* Rayss | *Onobrychis crista-galli* | Israel and Palestine | [81] |
| *Uromyces tepeciensis* J.F. Hennen & Cummins | *Loeselia amplexent* | México | [292] |
| *Uromyces tessariae* (Speg.) J.C. Lindq. | *Tessaria absinthisoides* | Spain | [746] |
| *Uromyces thapsi* Opiz ex Bubák | *Verbascum* spp. | Greece, Romania, Spain, Turkey, Ukraine, and Uzbekistan | [111,146,158,228,421] |
| *Uromyces thellungi* Maire | *Rumex roseus, R. simpliciflorus, and R. vesicarius* | Canary Islands, Iran, Israel, and Pakistan | [472] |
| *Uromyces thelymitrae* McAlpine | *Thelymitra antennifera* and *T. flexuosa* | Australia | [81,280,317,356] |
| *Uromyces thermopsidicola* Shimab. | *Thermopsis chinensis* | Japan | [222] |
| *Uromyces tinctoriicola* Magnus | *Euphorbia* spp. | Armenia, Germany, Iraq, Morocco, Spain, Turkey, Romania, and Ukraine | [80,196,228,422,519] |
| *Uromyces tingitanus* Henn. | *Rumex* spp. | The Canary Islands, Libya, and Morocco | [197,279] |
| *Uromyces tolerandus* H.S. Jacks. & Holw. | *Manihot esculenta* and *Manihot* sp. | Brazil | [219] |
| *Uromyces tomentellus* Cooke | *Leguminosae* sp. | California | [747] |
| *Uromyces tosensis* Henn. | *Commelina communis* | Argentina, Chile, Córdoba, and Uruguay | [371,386] |
| *Uromyces transcaspicus* Petr. | *Astragalus angustidens* | Turkmenistan | [748] |
| Species                           | Host                                                                 | Locality                                                                                           | Reference                |
|----------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------|
| **Uromyces transversalis** (Thüm.) G. Winter | Crocosmia spp., Freesia refracta, Gladiolus spp., Tritonia spp., and Watsonia spp. | Argentina, Australia, Brazil, California, Cuba, England, Florida, France, Malawi, Martinique, Mauritius, México, New Zealand, South Africa, Tanzania, Uganda, Venezuela, Zambia, and Zimbabwe | [69,142,209,250,273,487,530,650] |
| **Uromyces tranzschelii** Syd. & P. Syd. | Euphorbia crenulata, E. lucida, E. montana, E. palmeri, E. robusta, and E. robusta | Arizona, Colorado, Montana, Oregon, Utah, and Wyoming | [103,157,187,292,368,412] |
| **Uromyces traucoensis** Monteal. & Oehrens | Selliera radicans | Chile | [749] |
| **Uromyces triandrae** T.S. Ramakr. & Sriniv. | Themeda triandra | India | [669] |
| **Uromyces trichoclines** Henn. | Trichocline polymorpha | Brazil | [219,323] |
| **Uromyces tricholeanae** Gonz. Frag. & Cif. | Tricholaena rosea | Dominican Republic | [750] |
| **Uromyces trichoneurae** Doidge | Astrebla elymoides, A. lappacea, A. pectinate, A. squarrosa, Trichoneura grandiglumis, and T. lisboa | Australia, India, South Africa | [169,488,751] |
| **Uromyces trichorynes** McAlpine | Tricoryne elatior | Australia | [245,267] |
| **Uromyces trifoli-megalanthi** (Dietel & Neger) H.S. Jacks. & Holw. | Trifolium peruvianum and Trifolium sp. | Brazil, Chile, and Peru | [101,126] |
| **Uromyces trifoli-purpurei** Const. | Trifolium campestre, T. eriosphaerum, T. purpureum, T. scabrum, T. stellatum, and Trifolium sp. | Bulgaria, Greece, France, Israel, Italy, Russia, Romania, and Spain | [81,126,228,327] |
| **Uromyces trifoli-repentis** Liro | Trifolium spp. | Worldwide | [225,361] |
| **Uromyces trigonellae** Pass. | Trigonella spp. | Bulgaria, Israel, Romania, and Turkey | [80–82,197,228,357] |
| **Uromyces trigonellae-occultae** Henn. | Trigonella occulta | Egypt | [752] |
| **Uromyces tripogonis** Payak & Thirum. | Tripogon lisboae | India | [753] |
| **Uromyces tripogonis-sinensis** Y.C. Wang | Tripogon chinensis and T. lisboae | China and India | [106,108,109] |
| **Uromyces tripsaci** F. Kern & Thurst. | Tripsacum dactyloides | Ecuador and Venezuela | [431,754] |
| **Uromyces triquetrus** Cooke | Ascyrum hypericoides, Hypericum spp., and Triadenum japonicum | Argentina, Brazil, California, Canada, China, Colombia, Indiana, Indonesia, Iowa, Maine, México, Missouri, Mississippi, Taiwan, Oregon, Japan, and Wisconsin | [96,97,187,219,252,255,292,412,415,449,475] |
| **Uromyces triseti** Katajev | Trisetum cavanillesii | Turkmenistan | [106] |
| Species                                  | Host                                                                 | Locality                                                      | Reference               |
|------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|-------------------------|
| *Uromyces triteleiae* Dietel & Neger     | *Brodiaea porrifolia*, *Leucocoryne alliacea*, and *Triteleia porrifolia* | Chile                                                         | [162,166,240,415]       |
| *Uromyces trollii-caroli* Ulbr.          | *Trifolium* sp.                                                      | Germany and India                                             | [34,755]                |
| *Uromyces trollii-Kalchbr. & MacOwan     | *Roepera foetida* and *Zygophyllum foetidum*                        | South Africa                                                  | [138,385]               |
| *Uromyces tropaeoli* Ranoj.              | *Tropaeolum major*                                                  | Yugoslavia                                                    | [212]                   |
| *Uromyces truncatulus* Trotter           | *Geranium versicolor*                                               | Greece                                                        | [421]                   |
| *Uromyces truncicola* Henn. & Shirai     | *Sophora japonica* and *Sophora* sp.                               | China, Japan, and Korea                                       | [468,483,734]           |
| *Uromyces tuberculatus* Fuckel           | *Euphorbia* spp.                                                    | The Balearic Islands, Canary Islands, China, Finland, Germany, Iran, Malaysia, Romania, Pakistan, Portugal, Spain, and Uzbekistan | [105,129,130,228,317,318,329,356] |
| *Uromyces tulipae* Dietel                | *Tulipa edulis*                                                     | Japan                                                         | [756]                   |
| *Uromyces tungurahuensis* Syd.           | *Aspilia lanceolata*                                                | Ecuador                                                       | [757]                   |
| *Uromyces turcomanicus* Katajev          | *Muscari leucostomum*, *Hordeum bulbosum*, *H. marinium*, and *H. spontaneum* | Iraq, Jordan, Libya, Russia, and Turkmenistan                | [126,243,244]           |
| *Uromyces tylotornae* Gjaerum            | *Tylosera fascioglossis*                                            | Uganda and Sudan                                              | [428]                   |
| *Uromyces ulcinus* Dietel                | *Euphorbia* sp.                                                     | Brazil                                                        | [143,219]               |
| *Uromyces umiamensis* Berndt & Baiswar   | *Cucumis* sp. and *Momordica cochincheninis*                        | India                                                         | [127,212,234]           |
| *Uromyces undulatoparietis* B. Li        | *Ligularia hookeri*                                                 | China                                                         | [108,109]               |
| *Uromyces undulatus* Tranzschel          | *Euphorbia condylocarpa* and *Euphorbia* sp.                        | Armenia and Iran                                              | [157,318]               |
| *Uromyces unioniensis* Viégas            | *Desmodium* sp. and *Melobium* sp.                                 | Brazil                                                        | [394,640]               |
| *Uromyces unitus* Peck                    | *Calandrinia leana*                                                | Washington (USA)                                              | [758]                   |
| *Uromyces urariae* B. Li                 | *Urraria lagopodioides*                                             | China                                                         | [759]                   |
| *Uromyces urbanianus* Henn.              | *Oryctanthus spicatus*                                              | Argentina, Brazil, Colombia, Guatemala, Honduras, México, and Trinidad and Tobago | [15,227,473]           |
| *Uromyces urginea* M.S. Patil            | *Urginea indica*                                                   | India                                                         | [399]                   |
| *Uromyces ushuiwaiensis* Speg.           | *Impatiens hochstetteri*                                           | Ethiopia                                                      | [258,760]               |
| *Uromyces ustalis* Tranzschel             | *Ranunculus repens*                                                | Siberia                                                       | [761]                   |
| Species                                      | Host                                      | Locality                                                   | Reference |
|---------------------------------------------|-------------------------------------------|------------------------------------------------------------|-----------|
| *Uromyces uesterianus* Dietel               | Myrtaceae                                 | Colombia and São Paulo                                      | [762]     |
| *Uromyces valens* F. Kern                   | Carex aestivalis, *C. lupulina*, and *C. utriculata* | Indiana, North Carolina, and Wisconsin                     | [763–765] |
| *Uromyces valerianae* (Schumach.) Fuckel    | *Valerianella* spp.                       | Colombia, China, Czech Republic, Czechoslovakia, Denmark, Finland, France, Germany, Greece, Japan, Mongolia, Norway, Poland, Romania, Scotland, Spain, South Africa, Sweden, Switzerland, Taiwan, Turkey, and Ukraine | [80,82,90,94,128,132,133,135,138,228,283,421,440] |
| *Uromyces valerianae-microphyllae* Berndt  | *Valeriana microphylla*                   | Ecuador                                                    | [766]     |
| *Uromyces valerianae-wallichii* (Dietel) Arthur & Cummins | *Valeriana* spp. | China, Japan, Taiwan, India, and Pakistan                   | [87,98,108,109,356] |
| *Uromyces vallesiatus* E. Fisch.            | *Vicia ervilia* and *V. onobrychioides*   | Albania, Bulgaria, France, Greece, Romania, Switzerland, Turkey, and Yugoslavia | [82,126,220] |
| *Uromyces vanderystii* Henn.                | *Teranumus labialis*                     | The Democratic Republic of the Congo                       | [610]     |
| *Uromyces vankanorum* Berndt                | *Atriplex lampa*                         | Argentina                                                  | [282]     |
| *Uromyces verrucosae-craccae* Mayor        | *Cestrum nitidum*                        | México                                                     | [292,375] |
| *Uromyces veratri* (DC.) J. Schröt.         | *Adenostyles* spp., *Homogyne alpina*, *Ligularia* spp., and *Veratrum* spp. | Austria, Bulgaria, China, Germany, Japan, Korea, Poland, Romania, Russia, Spain, Switzerland, and Turkey | [82,135,158,222,228,231,283,402] |
| *Uromyces verbasci* Niessl                 | *Verbascum* spp.                         | Bulgaria, Germany, Poland, and Ukraine                     | [82,105,135] |
| *Uromyces verrucosae-craccae* Mayor        | *Vicia cracca*                           | France and Switzerland                                     | [126,220] |
| *Uromyces verrucosus* J. Schröt.           | *Arenaria serpyllifolia*, *Cucubalus baccifer*, *Dianthus armeria*, *Lychnis* spp., *Melandrium* spp., and *Silene* spp. | Armenia, Bulgaria, Czech Republic, Denmark, Greece, Germany, Indiana, Iran, Michigan, New York, Norway, Poland, Romania, Sweden, Texas, Turkey, Ukraine, and Wisconsin | [105,107,135,228,317,422,519] |
| *Uromyces verus* H.S. Jacks. & Holw.      | *Bauhinia rufa*                          | Brazil                                                     | [101]     |
| *Uromyces vesicatorius* (Bubák) Nattrass   | *Lens esculenta* and *L. leontopetalum*   | Cyprus, Iraq, Israel, and Turkey                           | [80,81,196,599] |
| *Uromyces vesiculosus* G. Winter           | *Zygophyllum* spp.                       | Australia                                                  | [245]     |
| Species                          | Host                                                                 | Locality                                                                 | Reference                  |
|---------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------|
| *Uromyces vestergrenii* P. Syd. & Syd. | *Bauhinia tomentosa*                                                 | India and Sri Lanka                                                      | [165]                      |
| *Uromyces viciae-craccae* Const. | *Ervum lens*, *Euphorbia sp.*, *Lathyrus aphaca*, *Lens spp.*, and *Vicia spp.* | Armenia, Austria, Azerbaijan, Bulgaria, China, Czech Republic, Finland, France, Germany, Georgia, Greece, Hungary, Iran, Italy, Kazakhstan, Poland, Romania, Russia, Siberia, Switzerland, Ukraine, and Yugoslavia | [82,135,220,767,768]        |
| *Uromyces viciae-fabae* (Pers.) J. Schröt. | *Vicia spp.*, *Lathyrus spp.*, and *Pisum spp.*                     | Worldwide                                                                | [71,222,236,238,769]       |
| *Uromyces viciae-unijugae* S. Ito | *Vicia unijuga*                                                       | Japan                                                                    | [92]                       |
| *Uromyces vicipinus* H.S. Jacks. & Holw. | *Ipomoea sp.*                                                       | Brazil                                                                   | [219]                      |
| *Uromyces vicosensis* R.T. Almeida | *Bauhinia sp.*                                                        | Brazil                                                                   | [219]                      |
| *Uromyces viegasii* R.T. Almeida | *Bauhinia forficata* and *Bauhinia sp.*                              | Brazil                                                                   | [219,394]                  |
| *Uromyces viennot-bourginii* J. Anikster & I. Wahl | *Bellevalia eigii* and *Hordeum spontaneum*                             | Israel                                                                   | [81]                       |
| *Uromyces vignae* Barclay       | *Desmodium spp.*, *Dipogon spp.*, *Lablab sp.*, *Phaseolus sp.*, *Sphenostylis sp.*, and *Vigna vexillata* | Worldwide                                                                | [71,222,225]               |
| *Uromyces vignae-luteolae* Henn. | *Vigna luteola*                                                       | Congo                                                                    | [610]                      |
| *Uromyces vignae-sinensis* Miura | *Vigna sinensis*                                                      | China and Japan                                                          | [89,96]                    |
| *Uromyces visci* T. Majewski & K.A. Nowak | *Viscum congolense*                                                | Rwanda                                                                    | [551]                      |
| *Uromyces volkartii* Gäum. & Terrier | *Trisetum flavescens*                                           | Switzerland                                                              | [770]                      |
| *Uromyces vossiae* Barclay      | *Phaseolus speciosus*, *Rottboellia sp.*, and *Vossa speciosa*       | India and Pakistan                                                       | [106,294,771]              |
| *Uromyces vulpiae* Sousa da Câmarã | *Vulpia broteri*                                                   | Portugal                                                                  | [772]                      |
| *Uromyces waipoua* McNabb       | *Hypericum gramineum* and *H. japonicum*                            | New Zealand                                                              | [313]                      |
| *Uromyces wartenbos* Petr.      | *Astragalus wartensis*                                               | Armenia and Turkey                                                       | [220,276]                  |
| *Uromyces wedeliae* Henn.       | *Wedelia bicolour*, *W. biflora*, *W. chinensis*, *W. menotriche*, and *W. prostrata* | China, Eritrea, Fiji, Japan, Micronesia, Philippines, Taiwan, and Tonga | [94,97,108,109,287,565,654] |
| *Uromyces wedeliae-biflorae* Boedijn | *Wedelia biflora*                                                   | Indonesia                                                                | [309]                      |
| *Uromyces wellingtonicus* T.S. Ramakr. & K. Ramakr. | *Sporobolus indicus*                                               | India                                                                    | [629]                      |
| Species                                  | Host                                      | Locality                                          | Reference                      |
|------------------------------------------|-------------------------------------------|---------------------------------------------------|--------------------------------|
| Uromyces wiehei Cummins                  | Thalictrum rhynehocarpum                  | Kenya, Malawi, and Uganda                         | [318,609,712]                  |
| Uromyces wolfii Cummins                  | Borreria laevis                           | Venezuela                                         | [609]                          |
| Uromyces wulffiae Henn.                  | Wulffia baccata, W. maculata, W. scandens, W. stenoglossa, and Wulffia sp. | Brazil                                            | [219,394,575]                  |
| Uromyces wulffiae-stenoglossae Dietel    | Wulffia baccata, W. maculata, W. stenoglossa, and Wulffia sp. | Brazil, French Guiana, Guyana, Trinidad and Tobago, Venezuela, and West Indies | [120,219,264,431,557]          |
| Uromyces yakushimensis Hirats. f. & Katsuki | Trichosanthes bracteata, T. multiloba, and T. palmata | Japan and Myanmar                                 | [94,127,212]                  |
| Uromyces yoshinagae Henn.                | Pisum sativum                             | Honshu                                            | [360]                          |
| Uromyces yurimaguasensis Henn.            | Clitoria guianensis and Clitoria sp.      | Belize and Peru                                   | [172,575,721]                  |
| Uromyces zeyheri Bubák                   | Ixia scillaris, I. scillaris, and Tritonia pallida | South Africa                                     | [123,138,165]                  |
| Uromyces zigadeni Peck                   | Zigadenus paniculatus                     | Utah                                              | [328]                          |
| Uromyces zizaniae-latifoliae Sawada      | Zizania latifolia                         | Taiwan                                            | [773]                          |
5.5. Endemic/Native Uromyces Species

The distribution of rust fungi is governed by various ecological factors that affect their host range and endemism. As with other biotrophic pathogens, rust fungi are also found to be co-evolved with their host plants, which possibly justifies their host specificity and narrow host range. However, cross-infection in rust fungi is also observed, which opens up the need for further investigation of their host range. Among various rust fungi, the genus *Uromyces* also exhibited a broad host diversity among different terrestrial regions of the world. An analysis of data collected in the present study revealed the restriction of the *Uromyces* species towards a single host. More than 400 species of *Uromyces* were found to be endemic to more than 100 countries, provinces, or islands. The distribution of endemic species of *Uromyces* showed that the highest number of endemic species was found in Brazil (41 species) and South Africa (33 species). Other countries, such as China (18), Chile (18), Japan (17), India (17), México (15), France (12), Argentina (11), Australia (11), and Ecuador (11), showed a medium to low endemic distribution of these fungi. If we compare the continental distributions, it is clear from the geographical heat map that there is a big difference between the prevalence of endemic species in North and South America. In fact, South America showed the occurrence of the endemic *Uromyces* species. Similarly, Asia also holds a high number of species endemic to the different countries or regions in the continent. The distribution of the endemic species was found to be scattered compared to European countries; however, the number of endemic species in this region was comparatively high. Detailed information on the distribution of endemic or native *Uromyces* species is presented in Table 4 and Figure 9.

Table 4. World distribution of endemic/native *Uromyces* species.

| Uromyces Species             | Host                                      | Country       | Reference |
|-----------------------------|-------------------------------------------|---------------|-----------|
| *Uromyces actinostemonis*    | *Actinostemon concolor*                   | Brazil        | [103]     |
| *Uromyces acutatus*          | *Gageaboheonica* and *G. villosa*         | Germany       | [105]     |
| *Uromyces aegopogonis*       | *Aegopogon cenchoideus, A. geminiflorus, A. gracilis, and A. tenellus* | México        | [106]     |
| *Uromyces aeluropodinus*     | *Aeluropus littoralis*                    | Ukraine       | [111]     |
| *Uromyces agratus*           | *Jatropha stimulosa*                      | Florida       | [112]     |
| *Uromyces agropiri*          | *Agropyron sp.*                           | India         | [126]     |
| *Uromyces aineae*            | *Cucurbitaceae*                           | Ecuador       | [127]     |
| *Uromyces albiziae*          | *Albizia procera*                         | Indonesia     | [136]     |
| *Uromyces allii-monanthi*    | *Allium monanthum*                        | Japan         | [147]     |
| *Uromyces allii-sibirici*    | *Allium sibiricum*                        | Norway        | [149]     |
| *Uromyces allii-victorialis*| *Allium fistulosum, A. macrostemon, and A. victorialis* | China         | [90]      |
| *Uromyces alsinis*           | *Minaurtia hamata and M. meyeri*          | Turkey        | [80]      |
| *Uromyces alxyiae*           | *Alyxia oliveriformis*                    | Hawaii        | [176]     |
| *Uromyces amphilophys-insculptae* | *Amphilophis insculpta*                 | India         | [194]     |
| *Uromyces anabasis*          | *Anabasis aphylla*                        | China         | [195]     |
| *Uromyces anomathcae*        | *Anomathaca cruenta*                      | South Africa  | [169]     |
| *Uromyces anotidis*          | *Anotis richardiana*                      | Sri Lanka     | [214]     |
| *Uromyces antiquiensis*      | *Rhynchospora polyphylia* and *R. nervosa*| Colombia      | [119,226,227] |
| *Uromyces antipae*           | *Rosa lutea*                              | Romania       | [228]     |
| *Uromyces aphelandrae*       | *Aphelandra pectinata*                    | Costa Rica    | [218]     |
### Uromyces Species

| Uromyces Species                          | Host                                      | Country            | Reference |
|-------------------------------------------|-------------------------------------------|--------------------|-----------|
| Uromyces aquiriensis                     | Cucurbitaceae                             | Israel             | [127]     |
| Uromyces arenaric-grandiflorae            | Arenaria saponarioides                    | Turkey             | [80]      |
| Uromyces argutus                         | Spartina alterniflora and S. glabra       | Florida            | [106]     |
| Uromyces aspilium                        | Aspilia latifolia                         | Ivory Coast        | [270]     |
| Uromyces astragali-alopecuri              | Astragalus alopecurus                     | Turkey             | [276]     |
| Uromyces astragali-atropilosulii         | Astragalus atropilosulus                  | Kenya              | [276]     |
| Uromyces astragali-pseudoutrigeris       | Astragalus pseudoutriger                  | Turkey             | [276]     |
| Uromyces babianae                        | Babiana disticha                          | Western Cape       | [285]     |
| Uromyces badiai                          | Wedelia sp.                               | Eritrea            | [287]     |
| Uromyces badius                          | Haemanthus cocineus, H. pumilio, H. rotundifolius, and H. sanguineus | South Africa | [167]     |
| Uromyces bahiensis                       | On leaves of Loranthaceae                | Brazil             | [219]     |
| Uromyces belemensis                      | Bomarea sp.                               | Brazil             | [219]     |
| Uromyces belemensis                      | Beckmannia eruciformis and B. syzigachne  | Oregon             | [295]     |
| Uromyces belemensis                      | Ornmosia nobilis                          | Brazil             | [219]     |
| Uromyces berthelii                        | Cynoglossum virginianum                   | Brazil             | [199]     |
| Uromyces bisbyi                         | Eriogonum maritimum                      | Brazil             | [224]     |
| Uromyces boissierae                      | Boissiera umbellata                       | Brazil             | [199]     |
| Uromyces bombekei                        | Aspalathus pachyloba                     | South Africa       | [322]     |
| Uromyces bonae-spei                      | Tritonia scillaris and Acidanthera pallida | Southern Africa   | [325]     |
| Uromyces bonaveriae                      | Bonaveria securida and Securigera securida | Greece            | [327]     |
| Uromyces borreiae                        | Borreia verticillata                     | Rio de Janeiro     | [331]     |
| Uromyces bosseri                         | Trochomertopis diversifolia              | Madagascar         | [127]     |
| Uromyces bothriochloae-intermediae       | Bothriochloa intermedia                  | China              | [108,109] |
| Uromyces brachybotricum                  | Bradburya pubescens, B. virginiana, Centrosema pubescens, and C. virginianum | Brazil            | [219]     |
| Uromyces bradburyae                      | Briza media                               | France             | [339]     |
| Uromyces bromicola                       | Bromus coloratus and B. lithobius         | Chile              | [199]     |
| Uromyces bresleri                        | Buforrestia imperforata                  | Ghana              | [341]     |
| Uromyces buforrestae                     | Buforrestia imperforata                  | Ghana              | [341]     |
| Uromyces bresleri                        | Bulbine bulbosa                           | Australia           | [249]     |
| Uromyces buforrestae                     | Sisyrinchium cuspidatum and S. graninfolium | Chile             | [166]     |
| Uromyces calopogonii                     | Calopogonium galactioides                | Guatemala          | [172]     |
| Uromyces Species                  | Host                                      | Country          | Reference  |
|----------------------------------|-------------------------------------------|------------------|------------|
| Uromyces calotheus               | Urginea sp.                               | Sierra Leone     | [351]      |
| Uromyces calycotomes             | Calycotome spinosa                        | France           | [220]      |
| Uromyces caricis-brunneae        | Carex brunnea                             | Japan            | [94]       |
| Uromyces caricis-schmidtii       | Carex schmidtii                           | Khabarovsk       | [297]      |
| Uromyces cassiae-mimosoidis      | Cassia mimosoides and Chamaecrista mimosoides | South Africa     | [172]      |
| Uromyces cearensis               | Ipomoea sp.                               | Brazil           | [373]      |
| Uromyces cedrelae                | Toona serrata                             | Indonesia        | [177]      |
| Uromyces celtidis                | Celtis sp.                                | Brazil           | [102]      |
| Uromyces cenisiae                | Ononis cenisia                            | France           | [342]      |
| Uromyces chaetobromi             | Chaetobromus dreganin and C. schraderi    | South Africa     | [378]      |
| Uromyces chilensis               | Lathyrus magelianicus and L. multiceps    | Chile            | [386]      |
| Uromyces chiovendae              | Cissus sp.                                | Somalia          | [287]      |
| Uromyces chlidanthes             | Chorizanthe pungens                       | California       | [388]      |
| Uromyces christensenii           | Muscari parviflorum and Hordeum bulbosum | Israel           | [390]      |
| Uromyces chubutensis             | Poa chubutensis                           | Chubut           | [391]      |
| Uromyces ciceras-soongaricae     | Cicer songaricum                          | Pakistan         | [393]      |
| Uromyces circinalis              | Scilla prasina                            | South Africa     | [138]      |
| Uromyces cladomanes              | Vitis sp.                                 | Somalia          | [287]      |
| Uromyces cladastidis             | Cladrastis shikokiana                     | Japan            | [92]       |
| Uromyces clineyioides            | Monocymbium cerasiforme                   | Zimbabwe         | [243]      |
| Uromyces clitoriae               | Chlitoria mexicana                        | México           | [172]      |
| Uromyces clarvalis               | Argyrolobium flaccidum                    | India            | [357]      |
| Uromyces cobresiae               | Carex sp.                                 | Uzbekistan       | [146]      |
| Uromyces collinus                | Bauhinia sp.                              | México           | [292]      |
| Uromyces coluteae                | Colutea arborescens                       | Austria          | [299]      |
| Uromyces combreti                | Combretum sp.                             | Myanmar          | [405]      |
| Uromyces conicus                 | Cleome sp.                                | Bolivia          | [411]      |
| Uromyces correntinus             | Rhynchospora tenuis                       | Argentina        | [415]      |
| Uromyces costesianus             | Sphaeralcea velutina                      | Chile            | [386]      |
| Uromyces crepis-fraassii         | Crepisfraasii sp.                         | Greece           | [419]      |
| Uromyces crepis-fraassii         | Coronilla parviflora and C. rostrata      | Greece           | [421]      |
| Uromyces crotalariae-nitens      | Crotalaria nitens                         | Colombia         | [423]      |
| Uromyces cruchetii               | Borreria tenella                          | Colombia         | [226]      |
| Uromyces cucumivorus             | Cucumis melo                              | Iraq             | [127]      |
| Uromyces cucundii                | Silene eriocalycina                       | Iraq             | [196]      |
| Uromyces cyanotidis              | Cyanotis capitata                         | Papua New Guinea | [426]      |
| Uromyces cyathulic              | Cyathula globulifera                      | Eritrea          | [287]      |
| Uromyces dendoariosidis          | Dendroseris micrantha                     | Chile            | [240]      |
| Uromyces densus                  | Bidens pilosa                             | Puerto Rico      | [76,77]    |
| Uromyces desmodicola             | Desmodium albiforum                       | Brazil           | [102]      |
### Table 4. Cont.

| Uromyces Species                  | Host                                | Country        | Reference |
|-----------------------------------|-------------------------------------|----------------|-----------|
| Uromyces desmodii-leiocarpi       | Desmodium leiocarpm               | Brazil         | [172]     |
| Uromyces dieramatis               | Dierama spp.                       | South Africa   | [273]     |
| Uromyces dilucidus                | Sisyrinchium striatum              | Argentina      | [415]     |
| Uromyces diniensis                | Ononis fruticosa                   | France         | [460]     |
| Uromyces dipcadi                  | Dipcadi viride                     | Kenya          | [487]     |
| Uromyces discariae                | Discaria tomatou                   | New Zealand    | [313]     |
| Uromyces dispersus                | Apios fortunei                     | Japan          | [222]     |
| Uromyces dobrenezii               | Euphorbia stracheyi                | Nepal          | [464]     |
| Uromyces doebbelei                | Hypericum irazuense                | Costa Rica     | [310]     |
| Uromyces dorystaechadis           | Dorystaechas hastata               | Turkey         | [471]     |
| Uromyces drimiopsidis             | Drimiopsis maculata                | South Africa   | [138]     |
| Uromyces dubiosus                 | Lantana sp.                        | Goiás          | [291]     |
| Uromyces ducellieri               | Anabasis aphylla                   | China          | [91]      |
|                                  | Gilliesia graminea, G. monophylla, |                |           |
|                                  | Miersia chilensis, and Ornithogalum |                |           |
|                                  | biflorum                           |                |           |
| Uromyces dusenii                  | Asclepiadaceae                     | Suriname       | [473]     |
| Uromyces echinodes                | Zygophyllum morgsana               | South Africa   | [234]     |
| Uromyces edwardsiae               | Edwardsia spp. and Sophora spp.    | New Zealand    | [284]     |
| Uromyces ehrhartae-giganteae      | Ehrharta spp.                      | South Africa   | [429]     |
| Uromyces ellipticus               | Glycyrrhiza australis              | Chile          | [240]     |
| Uromyces ellisianus               | Euphorbia marginata                | Minnesota      | [277]     |
| Uromyces emmeorhizae              | Emmeorhiza umbellata               | Venezuela      | [478]     |
| Uromyces eriogoni                 | Eriogonum virgatum                | California     | [388]     |
| Uromyces ermelenesis              | Indigofera sp.                     | South Africa   | [138]     |
| Uromyces erythrinae               | Erythrina sp.                      | Ecuador        | [165]     |
| Uromyces euphlebus                | Phoradendron calyculatus           | México         | [15]      |
| Uromyces euphorbiae-javanica      | Euphorbia javanica                 | Indonesia      | [309]     |
| Uromyces euphorbiae-lunulata      | Euphorbia esula, E. Kansui, and E. |                |           |
|                                  | lunulata                           |                |           |
| Uromyces evastigatus              | Phthirusa pyrifolia                | El Salvador    | [15]      |
| Uromyces fiebrigi                 | Bauhinia sp.                       | Paraguay       | [216]     |
| Uromyces florianus                | Peucedanum fraxinfolium and        | South Africa   | [138]     |
|                                  | Peucedanum sp.                     |                |           |
| Uromyces flemmingiae              | Flemingia sp.                      | Uganda         | [507]     |
| Uromyces fleuryae                 | Fleurya podocarpa                  | Gabon          | [508]     |
| Uromyces floralis                 | Bauhinia hieamalis, B. cuyabensis, | Brazil         | [102]     |
|                                  | B. Holophylla, and B. rufa         |                |           |
| Uromyces floscopae                | Floscopia peruviana                | Brazil         | [102]     |
| Uromyces fontii                   | Peplis acutangula                  | Morocco        | [510]     |
| Uromyces foelvolutus              | Bauhinia hirsuta and B. mirandina  | Brazil         | [102]     |
| Uromyces fuscats                  | Polygonum alpinum                  | Idaho and Utah | [281]     |
| Uromyces fusisporus               | Acacia nerifolia and A. salicina   | Australia      | [177]     |
| Uromyces fremontii                | Octohera fremontii                 | Kansas         | [79]      |
Table 4. Cont.

| Uromyces Species         | Host                     | Country       | Reference |
|--------------------------|--------------------------|---------------|-----------|
| Uromyces galactiae       | Galactia pedunculata     | Brazil        | [517]     |
| Uromyces galii           | Galium aparine and G. spurium | Japan    |          |
| Uromyces galii-californici | Galium californicum and Galium sp. | California |          |
| Uromyces galphimiae      | Galphimia glauca and G. humboldtiiana | México      | [456]     |
| Uromyces garantiensis    | Ehretia dicksonii        | Taiwan        | [521]     |
| Uromyces gaudei          | Caltha introloba         | Australia     | [522]     |
| Uromyces gaussei         | Dorycnopsis gerardii     | France        | [516]     |
| Uromyces geissorhizae    | Geissorhiza sp.          | Western Cape Province |         |
| Uromyces geraniicola     | Geranium patagonicum     | Chile         | [240]     |
| Uromyces gigantiformis   | Bidens sp.               | Colombia      | [423]     |
| Uromyces globosus        | Sapium spp.              | México        | [103]     |
| Uromyces gnaphalii       | Gnaphalium sp.           | Colorado      | [388]     |
| Uromyces goyazensis      | Bauhinia sp.             | Brazil        | [538]     |
| Uromyces grandiotii      | Ancrumia cupidata        | Chile         | [540]     |
| Uromyces greenstockii    | Ipomoea greenstockii     | South Africa  |          |
| Uromyces guayacurru      | Statice brasiliensis     | Buenos Aires  | [542]     |
| Uromyces habrochloae     | Habrochloaob lockii      | Malawi        | [244]     |
| Uromyces hainanicus      | Ipomoea sumatrana        | China         | [319]     |
| Uromyces handelii        | Lotus gebelia            | Iraq          | [220]     |
| Uromyces hardenbergiae   | Hardenbergia monophylla | Australia     | [280]     |
| Uromyces hawksworthii    | Phthirusa stelis         | Brazil        | [60]      |
| Uromyces heimii          | Medicago arboea          | France        | [516]     |
| Uromyces hellebori-thibetani | Helleborus thibetanus   | China         | [195]     |
| Uromyces hessii          | Zantedeschia angustiloba | Angola        | [558]     |
| Uromyces heterantherae   | Heteranthera reniformis  | Brazil        | [102]     |
| Uromyces heterogeneus    | Hibiscus syriacus        | India         | [126]     |
| Uromyces heteromallus    | Haloxylon recurvum       | Pakistan      | [563]     |
| Uromyces hewittiae       | Hewittia bicolor         | Philippines   | [565]     |
| Uromyces hidakaensis     | Pismum sativum           | Japan         | [222]     |
| Uromyces himalaiicus     | Lilium sp.               | Nepal         | [567]     |
| Uromyces holubii         | Dracaena sp.             | Gauteng       | [573]     |
| Uromyces huallagensis    | Desmodium sp.            | Peru          | [575]     |
| Uromyces hyderabadensis  | Atylosia scarabaeoides   | India         | [579]     |
| Uromyces hydrocotyllica  | Hydrocotyle sp.          | China         | [96]      |
| Uromyces hypericinus     | Hypericum brasiliense    | Formosa       | [180]     |
| Uromyces hypsophilus     | Euphorbia sp.            | Mendoza       | [391]     |
| Uromyces indicus         | Sporobolus indicus       | Barbados      | [589]     |
| Uromyces insfarctus      | Cayaponia sp.            | Costa Rica    | [127]     |
| Uromyces inflatus        | Anisotome sp.            | New Zealand   | [591]     |
| Uromyces ingicola        | Inga sp.                 | Amazonas      | [575]     |
| Uromyces Species          | Host                                                                 | Country    | Reference |
|---------------------------|----------------------------------------------------------------------|------------|-----------|
| Uromyces ingiphilus       | Inga edulis                                                           | Argentina  | [592]     |
| Uromyces insignis         | Echinocephalum latifolium and Melanthera latifolia                   | Brazil     | [219]     |
| Uromyces insularis        | Clitoria cajanifolia                                                 | Puerto Rico| [466]     |
| Uromyces invius           | Solanum sisymbriifolium                                             | Argentina  | [415]     |
| Uromyces ipatingae        | Clitoria fairchildiana                                              | Brazil     | [219]     |
| Uromyces isachnes         | Isathne kunthiana                                                    | Sri Lanka  | [594]     |
| Uromyces jatrophicola     | Cnidoscolus sp. and Jatropha sp.                                     | Brazil     | [103]     |
| Uromyces juncicola        | Juncus stipulatus                                                   | Mendoza    | [180]     |
| Uromyces johowii          | Vicia macract, V. nigricans, and V. sp.                             | Chile      | [282]     |
| Uromyces kantaniensis     | Antholyza aethiopica and Chasmanthe aethiopica                      | South Africa| [322]    |
| Uromyces kigesianus       | Pittosporum abyssinicum                                             | Uganda     | [609]     |
| Uromyces kochianus        | Geranium nodosum                                                     | Switzerland| [611]     |
| Uromyces koeleriae        | Koeleria caucasica                                                   | Russia     | [106]     |
| Uromyces krantzbergensis  | Anthricum sp.                                                        | Namibia    | [138]     |
| Uromyces kurzii           | Senecio spp.                                                         | Argentina  | [415]     |
| Uromyces kwangensis       | Justicia sp.                                                         | Congo      | [218]     |
| Uromyces langtangensis    | Anaphalis nepalensis                                                | Nepal      | [463]     |
| Uromyces largus           | Chamaesyce lata                                                      | Colorado   | [87,88]   |
| Uromyces sp.              | Lasiocorys abyssinica                                               | Eritrea    | [287]     |
| Uromyces latimammatus     | Ipomoea sumatrana                                                    | China      | [621]     |
| Uromyces leontidis        | Leonotis nepetifolia                                                | India      | [75]      |
| Uromyces lereddei         | Colutea arborescens                                                 | France     | [220]     |
| Uromyces lespedezae       | Lespedeza captata                                                    | Vermont    | [583]     |
| Uromyces lespedezae-bicoloris | Lespedeza bicolor and L. formosa                                    | China      | [108,109] |
| Uromyces lespedezae-macrocarpae | Campylotropis macrocarpa, Lespedeza bicolor, and L. formosa          | China      | [108,109] |
| Uromyces lespedezae-sericeae | Lespedeza sericea                                                   | Pakistan   | [208]     |
| Uromyces libycus          | Lotus pusillus                                                       | Libya      | [197]     |
| Uromyces lomandraearum    | Lomandra longifolia                                                 | Australia  | [62]      |
| Uromyces loranthi         | Loranthus sp.                                                        | Brazil     | [376]     |
| Uromyces lotononidicola   | Lotononis cytisoides                                                | South Africa| [632]    |
| Uromyces lygei            | Lygeum spartum                                                      | Sardegna   | [325]     |
| Uromyces macnabbi         | Chionochloa spp. and Danthonia spp.                                 | New Zealand| [591]     |
| Uromyces mangenotii       | Vicia pubescens                                                     | France     | [516]     |
| Uromyces manihoticola     | Manihot spp.                                                         | Brazil     | [103]     |
| Uromyces manihotis-eatingae | Manihot spp.                                                        | Brazil     | [102]     |
| Uromyces marinus          | Medicago marina                                                     | Morocco    | [220]     |
| Uromyces martini          | Melanthera spp. and Bidens spp.                                     | Florida    | [262]     |
| Uromyces massoniae        | Massonia latifolia                                                  | South Africa| [138]    |
| Uromyces megalosporus     | Tessaria absinthioides                                              | Tucumán    | [371]     |
Table 4. Cont.

| Uromyces Species    | Host                     | Country       | Reference |
|---------------------|--------------------------|---------------|-----------|
| Uromyces melandrii  | Melandrium cucubaloides  | Los Lagos     | [162]     |
| Uromyces melasphaerulae | Melasphaerula graminea       | Western Cape Province | [424] |
| Uromyces melothriae | Melothria tomentosa       | Eritrea       | [287]     |
| Uromyces meygounensis | Euphorbia bungei      | Iran          | [638]     |
| Uromyces miersiae   | Miersia chilensis        | Chile         | [540]     |
| Uromyces mikaniae   | Mikania sp.              | Brazil        | [219]     |
| Uromyces minusops   | Minusops sp.             | South Africa  | [700]     |
| Uromyces moehringiae | Moeihringia lateriflora | Japan         | [297]     |
| Uromyces mongolicus | Euphorbia kozloevii      | Mongolia      | [535]     |
| Uromyces montis-ferrati | Euphorbia luteola     | Northern Africa | [649] |
| Uromyces moraeae    | Moraea spathacea         | South Africa  | [144]     |
| Uromyces mussooriensis | Stipa sibirica      | India         | [106]     |
| Uromyces myosotidis | Myosotis sp.             | Turkey        | [470]     |
| Uromyces myristicus | Euphorbia bicolor        | Texas         | [657]     |
| Uromyces namaqualandus | Roepera cordifolia   | Namibia       | [384]     |
| Uromyces nassauvae  | Nassauvia lagascae       | Argentina     | [415]     |
| Uromyces nassellae  | Nassell apubiflora       | Bolivia       | [106]     |
| Uromyces natriessi  | Statice spicata          | Cyprus        | [350]     |
| Uromyces naucinus   | Cayaponia sp.            | Ecuador       | [127]     |
| Uromyces nevadensis | Primula suffrutescens    | California    | [78]      |
| Uromyces notabilis  | Cyperus sp. and Kyllinga sp. | Uganda    | [487]     |
| Uromyces nothoscordi | Nothoscordum striatum    | Texas         | [660]     |
| Uromyces numidicus  | Geranium atlanticum      | Northern Africa | [649] |
| Uromyces nymphoidis | Nymphoides peltata       | Romania       | [228]     |
| Uromyces oberevikleriianus | Acalypha sp.  | Costa Rica    | [310]     |
| Uromyces oblectaneus | Rhynchospora corymbosa and R. exaltata | Brazil | [219] |
| Uromyces obscurus   | Phaseolus sp.            | México        | [456]     |
| Uromyces ocimi      | Ocimum menthofolium      | Uganda        | [168]     |
| Uromyces oedipus    | Sophora japonica         | Japan         | [665]     |
| Uromyces oenotherae | Oenothera linifolia      | Illinois      | [582]     |
| Uromyces oleivae    | Belvala eigii            | Israel        | [390]     |
| Uromyces ophiiorrhizeae | Ophiirhiza longiflora | Indonesia    | [309]     |
| Uromyces orchidearum | Chiloglottis spp.       | Australia     | [268]     |
| Uromyces ornatispe | Phrygilanthus sonorae    | México        | [15]      |
| Uromyces ornithopodiodes | Ornithopus isthmocarpus and O. compressus | Portugal | [317] |
| Uromyces orthosiphonis | Orthosiphon glabratrus | India        | [152]     |
| Uromyces otakou     | Poa spp.                 | New Zealand   | [591]     |
| Uromyces otaviensis | Ipomoea verbascoides     | Namibia       | [385]     |
| Uromyces ovalis     | Leersia oryzoides        | Japan         | [671]     |
Table 4. Cont.

| Uromyces Species       | Host                                      | Country     | Reference |
|------------------------|-------------------------------------------|-------------|-----------|
| Uromyces ovirensis     | Primula wulfeniana                        | Austria     | [672]     |
| Uromyces pannosus      | Bauhinia candidans                        | Brazil      | [216]     |
| Uromyces papillatus    | Heteromorpha arborescens                  | South Africa| [137]     |
| Uromyces parilis       | Rumex occultans                           | Israel      | [81]      |
| Uromyces paspalicola   | Paspalum racemosum                        | Ecuador     | [294]     |
| Uromyces pavii         | Achyranthes aspera                        | India       | [677]     |
| Uromyces pavoniae      | Pavonia racemosa                          | Puerto Rico | [259]     |
| Uromyces pazzchkeanus  | Vigna sp.                                 | Eritrea     | [287]     |
| Uromyces penniseti     | Pennisetum lanatum                        | Pakistan    | [536,679]|
| Uromyces pentaceae     | Pentace burmanica                         | India       | [680]     |
| Uromyces pentaschistidis | Pentaschistis airoides                  | South Africa| [243]     |
| Uromyces peraffinis    | Bauhinia sp.                              | Brazil      | [219]     |
| Uromyces perlebiae     | Bauhinia spp.                             | Brazil      | [102]     |
| Uromyces phalaridica   | Phalaris minor                            | Turkmenistan| [106]     |
| Uromyces phaseolicola  | Phaseolus prostratus                      | Argentina   | [126]     |
| Uromyces phlogacanthi  | Phlogacanthus celebicus                   | Indonesia   | [309]     |
| Uromyces phlathoroides | Cynosurus elegans                         | Colombia    | [15]      |
| Uromyces phystanthyllidis | Physanthyllis tetraphylla              | Greece      | [544]     |
| Uromyces pittospori    | Pittosporum abyssinicum                   | Eritrea     | [287]     |
| Uromyces plantusculus  | Rumex frutescens                         | Tristan da Cunha | [688] |
| Uromyces plantaginis   | Plantago barbata and P. tubulosa         | Argentina   | [415]     |
| Uromyces poiretiae     | Poiretia scandens                         | Venezuela   | [431]     |
| Uromyces polemanniae   | Polemannia spp.                           | South Africa| [142]     |
| Uromyces politelis     | Anguria sp., Gurania sp. and Selysia prunifera | Costa Rica | [127]     |
| Uromyces politus       | Muehlenbeckia cunninghamii               | Australia   | [343]     |
| Uromyces polygoni-aviculii | Polygonum nepalense                    | Nepal       | [693]     |
| Uromyces polytriadica  | Polytrias amaura                          | Philippines | [232]     |
| Uromyces poonensis     | Sesbania agyptiaca, S. grandiflora, and S. sesban | India      | [357]     |
| Uromyces porcensis     | Inga inoides                              | Colombia    | [226]     |
| Uromyces porosus       | Vicia americana and V. sparsifolia        | Iowa        | [155]     |
| Uromyces pozoae        | Poza hydrocotylifolia                    | Chile       | [240]     |
| Uromyces pratensis     | Poa pratensis, Ranunculus auricomus, and R. cassubicus | Finland | [329]     |
| Uromyces prismaticus   | Secale montanum                          | Iran        | [320]     |
| Uromyces procerus      | Festuca procera                          | Chile       | [240]     |
| Uromyces pseudarthriae | Pseudarthria robusta                      | South Africa| [700]     |
| Uromyces psychotriae   | Psychotria sp.                            | Brazil      | [219]     |
| Uromyces pulvinatus     | Euphorbia inaequilatera                  | South Africa| [702]     |
| Uromyces quaggafonteinus | Ehrharta calycina                      | South Africa| [429]     |
Table 4. Cont.

| Uromyces Species | Host | Country | Reference |
|------------------|------|---------|-----------|
| Uromyces ramosii | Ocimum sp. | India | [706] |
| Uromyces rapaeae | Raphanea sp. | São Paulo | [450] |
| Uromyces raticoides | Cayaponia sp. | Ecuador | [212] |
| Uromyces satus | Cayaponia spp. | Brazil | [212] |
| Uromyces rayssiae | Scilla hyacinthoides | Israel | [390] |
| Uromyces rebecca | Suaeda californica | California | [47] |
| Uromyces regius | Bauhinia candicans | Brazil | [219] |
| Uromyces reicheli | Milla biulvis and Triteleia gaudichaudiana | Chile | [415] |
| Uromyces reichertii | Scilla hyacinthoides and Hordeum bulbosum | Israel | [81] |
| Uromyces reynoldii | Modocabracteata and Trichosanthes spp. | Myanmar | [212] |
| Uromyces roloensis | Doronicum cordifolium | Bulgaria | [82] |
| Uromyces rostratus | Eriosema sp. | Rio de Janeiro | [331] |
| Uromyces rupestris | Andropogon condensatus | Brazil | [199] |
| Uromyces rugosus | Lupinus sp. | México | [398] |
| Uromyces rugulosus | Campylotropis spp. and Lespedeza spp. | China | [96] |
| Uromyces ruiz-leali | Anarthrophyllum elegans | Argentina | [415] |
| Uromyces rzedowskii | Ledenberga macrantha | México | [292] |
| Uromyces sakawensis | Solidago virgaurea | Japan | [711] |
| Uromyces sasaensis | Valerianakilimandscharica and V. volkensii | Uganda | [712] |
| Uromyces satarensis | Blainville acmella and B. latifolia | China and India | [319] |
| Uromyces saulensis | Selysia prunifera | France | [127] |
| Uromyces ruberulus | Lespedeza bicolor, L. cuneate, L. cyrtobotrya, and L. formosa | China | [156] |
| Uromyces scirpinus | Scirpus supinus | Philippines | [232] |
| Uromyces secamones | Secamone platystigma | Uganda | [168] |
| Uromyces sedi | Suedan anacampseros | France | [717] |
| Uromyces seligeri | Lathyrus grandiflorus and L. sylvestris | Greece and Russia | [421] |
| Uromyces sellierae | Selliera radicans | New Zealand | [67] |
| Uromyces semenans | Astragalus fridae | Iran | [276] |
| Uromyces senecionica | Cacalia sp. and Senecio roldana | México | [292] |
| Uromyces senecionis-gigantis | Senecio gigas | Ethiopia | [719] |
| Uromyces seselis | Seseli tortuosum | Portugal | [722] |
| Uromyces sessae | Sessea sp. | Ecuador | [325] |
| Uromyces shahrudensis | Onobrychis sp. | Iran | [723] |
| Uromyces shikokianus | Cladrastis platycarpa and C. shikokiana | Japan | [222] |
| Uromyces silenes-chloraeifoliae | Silene chlorifolia | Iran | [320] |
| Uromyces silvesleyensis | Bartholina burmanniana | Western Cape and South Africa | [378] |
| Uromyces simulans | Vilfa sp. | Colorado | [724] |
| Uromyces siphoncampyli-gigantei | Siphoncampylius giganteus | Ecuador | [725] |
| Uromyces similis | Smilax sp. | Colombia | [227] |
| Uromyces snowdeniae | Snowdenia scabra | Kenya | [140] |
Table 4. Cont.

| Uromyces Species                     | Host                  | Country          | Reference |
|--------------------------------------|-----------------------|------------------|-----------|
| Uromyces solariae                   | Solaria miersioides   | Chile            | [240]     |
| Uromyces solidaginis-caricis         | Carex varia           | Indiana          | [728]     |
| Uromyces solidus                    | Desmodium strictum   | North Carolina   | [657]     |
| Uromyces sonorensis                 | Merremia palmeri      | México           | [729]     |
| Uromyces sophorae-japonicae         | Sophora japonica      | Japan            | [92]      |
| Uromyces sophorae-viciifoliae       | Sophora viciifolia    | China            | [732]     |
| Uromyces sparaxidis                 | Sparaxis lineata and S. tricolor | South Africa | [142]     |
| Uromyces sphaericus                 | Perymenium ecuadoricum | Ecuador         | [210]     |
| Uromyces sphaerophysae              | Swainsona salsula     | China            | [198]     |
| Uromyces splendens                  | Astragalus oroboides  | Norway           | [735]     |
| Uromyces sporoboloides              | Sporobolus berteroanus | Ecuador     | [737]     |
| Uromyces standleyanus               | Gaudichaudia schiedeana | El Salvador     | [301]     |
| Uromyces statices                   | Static sp.            | California       | [598]     |
| Uromyces statices-micronatae        | Static micronata      | Morocco          | [279]     |
| Uromyces steironematis              | Spartina michauxiana  | Nebraska         | [738]     |
| Uromyces stellariae                 | Stellaria kotschyanan | Iran             | [739]     |
| Uromyces stellariae-saxatilis       | Stellaria media, S. saxatilis, and S. vestita | China     | [96]      |
| Uromyces stenorrhynchi              | Stenorrhynchus sp.    | Peru             | [740]     |
| Uromyces stipinus                   | Stipa rubens          | Russia           | [106]     |
| Uromyces strauchii                  | Clutia daphnoideae    | Southern Africa  | [138]     |
| Uromyces struthanthi                | Struthanthus sp.      | Panama           | [15]      |
| Uromyces substratius                | Lupinus argenteus     | Montana          | [79]      |
| Uromyces superstonatulis            | Cayaponia rigida      | France           | [127]     |
| Uromyces tarapatensis               | Camptosema sp.        | Peru             | [575]     |
| Uromyces teheranicus                | Trifolium retense     | Iran             | [744]     |
| Uromyces tehuelches                 | Alstroemeria patagonica | Argentina    | [167]     |
| Uromyces tener                      | Manettia gracilis     | Brazil           | [219]     |
| Uromyces tepicensis                 | Loeselia ampletens    | México           | [292]     |
| Uromyces thelymitrae                | Thelymitra antennifera and T. flexuosa | Australia   | [81]      |
| Uromyces thermopsidicola            | Thermopsis chinensis  | Japan            | [222]     |
| Uromyces tolerandus                 | Manihot esculenta     | Brazil           | [219]     |
| Uromyces tomentellus                | Leguminosae sp.       | California       | [747]     |
| Uromyces tosensis                   | Commelina communis    | Japan            | [711]     |
| Uromyces tournefortiae              | Tournefortia sp.      | Brazil           | [600]     |
| Uromyces transcaspicus              | Astragalus angustidens | Turkmenistan  | [748]     |
| Uromyces traucoensis                | Selliera radicans     | Chile            | [749]     |
| Uromyces triandrae                  | Themeda triandra      | India            | [669]     |
| Uromyces trichoclines               | Trichocline polymorpha | Brazil     | [219]     |
| Uromyces tricholaenae               | Tricholaena rosea     | Dominican Republic | [750]   |
| Uromyces tricorynes                 | Tricoryne elatior     | Australia        | [245]     |
| Uromyces trigonellae-occulta        | Trigonella occulta    | Egypt            | [752]     |
Table 4. Cont.

| Uromyces Species                  | Host                                      | Country     | Reference |
|-----------------------------------|-------------------------------------------|-------------|-----------|
| Uromyces tripogonicola            | Tripogon lisboae                          | Maharashtra | [753]     |
| Uromyces triteleiae               | Brodiaea porrifolia, Leucocoryne alliacea, | Chile       | [415]     |
|                                   | and Triteleia porrifolia                  |             |           |
| Uromyces trollipii                | Roepera foetida and Zygophyllum foetidum  | South Africa| [385]     |
| Uromyces truncatulus              | Geranium versicolor                       | Greece      | [421]     |
| Uromyces tulipae                  | Tulipa edulis                             | Japan       | [756]     |
| Uromyces tunguruahuensis          | Aspilia lanceolata                        | Ecuador     | [757]     |
| Uromyces uleanus                  | Euphorbia sp.                             | Brazil      | [219]     |
| Uromyces uniamensis               | Cucumis sp. and Monordica cochinchenensis | India       | [127]     |
| Uromyces undulatoparietis         | Ligularia hookeri                         | China       | [108,109] |
| Uromyces unioniensis              | Desmidium sp. and Meloboma sp.            | Brazil      | [394]     |
| Uromyces unitis                   | On living leaves of Calandrinia leana     | Washington  | [758]     |
| Uromyces urariae                  | Uraria lagopodioides                      | China       | [759]     |
| Uromyces urginiae                 | Urginea indica                           | India       | [397]     |
| Uromyces valeriana-microphyllae   | Valeriana microphylla                     | Ecuador     | [766]     |
| Uromyces vankorum                 | Atriplex lampa                            | Argentina   | [282]     |
| Uromyces venustus                 | Cestrum nitidum                          | México      | [375]     |
| Uromyces verus                    | Bauhinia rafa                            | Brazil      | [100]     |
| Uromyces vesiculosus              | Zygophyllum spp.                         | Australia   | [245]     |
| Uromyces viciae-unijugae          | Vicia unijuga                            | Japan       | [92]      |
| Uromyces vicinus                  | Ipomoea sp.                              | Brazil      | [219]     |
| Uromyces vicosensis               | Bauhinia sp.                             | Brazil      | [219]     |
| Uromyces viegasii                 | Bauhinia forficata and Bauhinia sp.       | Brazil      | [219]     |
| Uromyces viennot-bourginii        | Bellevalia eigtii and Hordeum spontaneum  | Israel      | [81]      |
| Uromyces vignae-luteolae          | Vigna luteola                            | Congo       | [610]     |
| Uromyces visci                    | Viscum congoense                         | Rwanda      | [551]     |
| Uromyces volkartii                | Trisetum flavescens                      | Switzerland | [770]     |
| Uromyces vulpae                   | Vulpia broteri                           | Portugal    | [722]     |
| Uromyces waipoua                  | Hypericum gramineum and H. japonicium    | New Zealand | [313]     |
| Uromyces wedeliae-biflorae        | Wedelia biflora                          | Indonesia   | [309]     |
| Uromyces wellingtonicus           | Sporobolus indicus                       | India       | [629]     |
| Uromyces woffii                   | Borreria laevis                          | Venezuela   | [609]     |
| Uromyces wullffiae                | Wulffia baccata, W. maculata, W. scandens, and W. stenoglossa | Brazil | [219]     |
| Uromyces yoshinagae               | Pisum sativum                            | Honshu      | [360]     |
| Uromyces zeyheri                  | Ixia scillaris, I. scillaris, and Tritonia pallida | South Africa | [123] |
| Uromyces zigadeni                 | Zigadenus paniculatus                    | Utah        | [328]     |
| Uromyces zizaniae-latifolia       | Zizania latifolia                        | Taiwan      | [773]     |
5.5. Endemic/Native Uromyces Species

The distribution of rust fungi is governed by various ecological factors that affect their host range and endemism. As with other biotrophic pathogens, rust fungi are also found to be co-evolved with their host plants, which possibly justifies their host specificity and narrow host range. However, cross-infection in rust fungi is also observed, which opens up the need for further investigation of their host range. Among various rust fungi, the genus *Uromyces* also exhibited a broad host diversity among different terrestrial regions of the world. An analysis of data collected in the present study revealed the restriction of the *Uromyces* species towards a single host. More than 400 species of *Uromyces* were found to be endemic to more than 100 countries, provinces, or islands. The distribution of endemic species of *Uromyces* showed that the highest number of endemic species was found in Brazil (41 species) and South Africa (33 species). Other countries, such as China (18), Chile (18), Japan (17), India (17), México (15), France (12), Argentina (11), Australia (11), and Ecuador (11), showed a medium to low endemic distribution of these fungi. If we compare the continental distributions, it is clear from the geographical heat map that there is a big difference between the prevalence of endemic species in North and South America. In fact, South America showed the occurrence of the endemic *Uromyces* species. Similarly, Asia also holds a high number of species endemic to the different countries or regions in the continent. The distribution of the endemic species was found to be scattered compared to European countries; however, the number of endemic species in this region was comparatively high. Detailed information on the distribution of endemic or native *Uromyces* species is presented in Table 4 and Figure 9.

Figure 9. Geographical heat map showing distribution of endemic/native *Uromyces* species.

6. Discussion

*Uromyces* is the second-largest rust genus, the species of which are phytopathogenic to any category of plants, causing severe damage and reducing growth and yields. The present study provides literature-based complete information on this rust in a single compilation. In addition to being distributed worldwide on vascular plants, *Uromyces* species cause several damaging diseases on major agricultural crops such as alfalfa (*Medicago sativa*), bean (*Phaseolus vulgaris*), carnation (*Dianthus caryophyllus*), chickpea (*Cicer arietinum*), clover (*Trifolium* sp.), and pea (*Pisum sativum*). This study contributes to a better understanding of the taxonomy of these rust fungi in terms of their taxonomic placement, biology, pathogenicity, life cycle, diversity, and distribution. The information presented in this study helps to better understand all possible aspects of *Uromyces* in a single document.

The genus *Uromyces* is distributed globally on around 647 plant genera belonging to 95 plant families. *Poaceae* and *Fabaceae* are the most affected families, with the occurrence of more than 100 species of *Uromyces*. However, these fungi infect about 95 species; their occurrence on *Poaceae* and *Fabaceae* reflects the specificity of these rusts to grasses and legumes. In addition to host diversity, the distribution of species of *Uromyces* exhibited a wide range across the globe. The distribution of this genus extends to over 150 countries, territories, and occupancies of the world. In its continental diversity distribution, North America is followed by Asia, Europe, South America, Africa, and Oceania, respectively. A large variation in the geographical distribution along with the vast diversity of hosts demonstrated the impact of significantly changing climatic zones on rust fungi. Besides this, more than 400 *Uromyces* species are endemic to more than 100 countries, provinces, and islands. This may be due to the climatic conditions and precise distribution of hosts. Available studies on global diversity and distribution are rare; however, regional descriptions are available. A checklist of rust fungi of New Zealand provided by Mckenzie [313] reported the occurrence of 31 species of *Uromyces*. Similarly, Bahcecioglu and Kabaktepe [80] reported 74 species from Turkey, while Afshan and Khalid [536] reported 15 species of the grass family *Poaceae* from Pakistan. In India, 97 species of *Uromyces* have been reported on various hosts [75].
A total of 61 

Uromyces 

species were reported from Portugal, whereas about 91 were from Iran [430]. The occurrence of species of 

Uromyces 

reported from different countries also supports the broad diversity of these fungi on a wide range of hosts.

Although 988 species of 

Uromyces 

investigated in the present study are found all over the world, only 73 species are known to have DNA sequence data. As in the case of other rust fungi, the species of 

Uromyces 

are also difficult to culture, which may be one of the major factors behind the reduced availability of molecular data. In addition, the isolation of DNA directly from rust fungi present on a natural host and then its sequencing is not simple or easy, which also affects the molecular studies of these fungi. Phylogenetic studies based on LSU and ITS sequence data revealed that 

Uromyces 

species are polyphyletic taxa and required more DNA-based analyses for a better understanding of their taxonomic placement. The polyphyletic nature of 

Uromyces 

species was also confirmed by Aime and McTaggart [5] in their study to propose a higher ranking classification for rust fungi, with notes on genera. Similarly, this was also proposed by Gautam et al. [34] during their study on Indian Pucciniales with the description of the taxonomic outline, including important descriptive notes. Overall, the present study proposes the requirement of fresh collections of 

Uromyces 

species and their molecular characterization to generate molecular data so that their phylogenetic relationships can be explained more precisely. The development of a universal digital platform exclusively for global rust fungi should be developed for the benefit of researchers working on this specific group of fungi.

7. Conclusions

Being the second-largest plant pathogenic rust genus, 

Uromyces 

showed a great variation with respect to its diversity and distribution. After a complete analysis of information gathered in the present study, it was concluded that the species of rust genus 

Uromyces 

are distributed globally. Their distribution has been reported in over 150 countries and territories or occupancies of the world. However, the genus 

Uromyces 

predominantly showed its great diversity in North America in comparison to other continents. Approximately 647 plant genera belonging to 95 plant families are reported to be affected by these rust pathogens. Apart from this, the endemic nature of this genus is also revealed, which concluded that more than 400 species of 

Uromyces 

are found to be endemic in more than 100 countries. The biocontrol nature of some species of 

Uromyces 

is also elucidated in this study. Moreover, analyses of LSU and ITS sequence data revealed the polyphyletic nature of species of 

Uromyces 

. Further DNA-based analyses of rust disease caused by 

Uromyces 

are still required to develop a better understanding of their taxonomic placement.
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