
Comprehensive check list of Cercosporoid fungi from Iran

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Bakhshi M, Arzanlou M and Babai-Ahari A 2012 – Comprehensive check list of Cercosporoid fungi from Iran. *Plant Pathology & Quarantine* 2(1), 44-55, doi 10.5943/ppq/2/1/7

Little is known about the biodiversity of cercosporoid fungi in Iran. We provide a comprehensive literature-based checklist for 89 cercosporoid species known to occur on different plant species in Iran. The complete annotated list covers 29 *Cercospora* species, 24 *Ramularia*, 21 *Passalora* and 15 *Pseudocercospora*.

Key words – hyphomycetes – taxonomy – mitosporic fungi

Article Information

Received 5 March 2012

Accepted 6 March 2012

Published online 10 April 2012

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Introduction

Cercosporoid fungi are generally associated with leaf spots, but also can cause necrotic lesions on flowers, fruits, bracts, seeds and pedicels of numerous hosts in a wide range of climates worldwide (Agrios 2005, Crous et al. 2000, Goodwin et al. 2001), encompassing economically important pathogens of major agricultural crops such as cereals, vegetables, ornamentals, forest trees, grasses and many others (Goodwin et al. 2001). Furthermore, a number of cercosporoid fungi are considered as potential biocontrol agents of weeds (Morris & Crous 1994).

The genus *Cercospora* was established by Fresenius in 1863. Since then many species have been assigned to this genus and there has been a significant expansion of the generic concept, including numerous *Passalora*-like fungi (Braun & Melnik 1997). The first monograph of *Cercospora* Fresen. s. lato. was published by Chupp (1954). Later, Deighton (e.g., 1967, 1976), Braun (1995), Braun &

Melnik (1997) and then other authors narrowed the generic concept of *Cercospora* s. lato. and divided it into smaller units. Crous & Braun (2003) in their revision of cercosporoid fungi based on molecular sequence analyses and reassessment of morphological characters, recognized four true cercosporoid genera, viz. *Cercospora*, *Pseudocercospora* Speg., *Passalora* Fr. and *Stenella* Syd., and several other morphologically similar genera.

Cercospora and allied genera have traditionally been treated as anamorphs of the ascomycetous genus *Mycosphaerella* Johanson, (e.g., Braun & Melnik 1997, Kim & Shin 1998, Crous & Braun 2003). However, a teleomorph connection for the majority of cercosporoid fungi still remains unknown, and a *Mycosphaerella* state has been proven for only a few species.

With the advent of molecular techniques in recent years, sequence data from different protein coding and non-coding of genomic regions have widely been applied to

figure out phylogenetic relationships amongst wide arrays of fungal groups at different taxonomic levels of interest (Arzanlou 2007, Arzanlou 2008, Arzanlou 2010, Crous et al. 2000, Crous et al. 2009). Phylogenetic analysis based on concordance of multiple sequence data have placed *Cercospora* and allied genera in *Mycosphaerella* clade (Mycosphaerellaceae, Capnodiales, Dothideomycetidae) (Crous et al. 2007, Crous et al. 2009). The genus *Mycosphaerella* is one of the largest genera in Ascomycetes and comprises several thousand species (Crous et al. 2001, Aptroot 2006, Crous et al. 2009).

Contrary to earlier belief in monophyly of *Mycosphaerella*, recent work of Crous and co-workers on phylogeny of Capnodiales revealed *Mycosphaerella* to be polyphyletic, and it has been split into several families; those members of Mycosphaerellaceae, Teratosphaeriaceae and Schizothyriaceae have plant pathological relevance (Crous et al. 2007, 2009). A bewildering diversity of anamorphs exists in these lineages and up to 30 anamorph genera have now been linked to *Mycosphaerella* (Crous et al. 2007, 2009, Arzanlou et al. 2007, 2008, Arzanlou & Bakhshi 2012). However, recent phylogenetic analysis based on multiple sequence data sets have shown this to be incorrect. Mycosphaerellaceae, in fact, consists of numerous genera with morphologically conserved *Mycosphaerella*-like teleomorphs, and distinct anamorphs (Crous et al. 2007, Crous et al. 2009). Species of *Mycosphaerella* have a worldwide distribution from tropical and subtropical to warm and cool regions and have adapted to different ecological niches as saprobes, plant pathogens or endophytes (Farr et al. 1995, Goodwin et al. 2001, Crous et al. 2009).

Cercosporoid fungi are common and widespread on a wide range of vascular plants, especially in tropical regions. The mainland of Iran covers diverse climatic zones with a great biodiversity of vascular plants and, accordingly, a high diversity of foliicolous fungi. The exploration of this fungal group is, however, far from being complete and the cercosporoid hyphomycetes from Iran are still insufficiently known. Therefore, a comprehensive examination of cercosporoid fungi in

Iran, based on the current taxonomic classification (Crous & Braun 2003), is urgently needed. In order to contribute to the knowledge of this group of fungi in Iran, and in the hope that what is reported here will stimulate other researchers to study the diversity of cercosporoid fungi, we have assembled a checklist of these fungi recorded to date from Iran.

Materials and Methods

List of species

The list of cercosporoid fungi was compiled using reports available in the literature. Most of the quoted works are the result of field research by Iranian mycologists, although a small number of reports have been documented by foreign investigators. The list includes cercosporoid species together with their host species from which they have been collected. The fungal nomenclature and taxonomy follows Crous & Braun (2003). Species names used in the original publications, which deviate from those in the latter publication, are cited as synonyms. The checklist is organised alphabetically by genus and species name.

Results

A list containing 29 species of *Cercospora*, 21 species of *Passalora*, 22 species of *Ramularia* and 15 species of *Pseudocercospora* is given (Table 1). *Cercospora* species have been collected on 50 host plants belonging to 41 genera and 28 families. The highest numbers of cercosporoid parasites were recorded on representatives of the *Fabaceae* (with nine species), *Malvaceae* (with four species) and *Euphorbiaceae* (with three species). *Passalora* species were recorded on 29 host plants belonging to 23 genera and 14 families, including the *Asteraceae* (with four species) and *Apiaceae* (with three species), which represent the host plant families with most *Passalora* species. *Pseudocercospora* species were recorded on 18 host plants belonging to 15 genera and 12 families. The highest numbers of *Pseudocercospora* parasites were recorded on the *Solanaceae* (three species). *Ramularia* species were collected on 30 host plants

Table 1 Cercosporiod fungi known from Iran.

Species	Hosts	References
<i>Cercospora</i> - <i>acnidae</i> Ellis & Everh.	<i>Amaranthus chlorostachys</i> var. <i>chlorostachys</i> Willd. & Thell.	Pirnia et al. 2010
- <i>althaeina</i> Sacc.	<i>Althaea rosea</i> Cav., <i>Althaea</i> sp.	Petrak 1956, Scharif & Ershad 1966, Ebrahimi & Minnasion 1973
- <i>apii</i> Fresen.	<i>Abutilon theophrasti</i> Medik., <i>Euphorbia heterophylla</i> L., <i>Pelargonium zonale</i> , , <i>Solanum lycopersicum</i> L., <i>Vigna sinensis</i> (L.) Walp., <i>Zantheschia aethiopica</i> (L.) Spreng.	Pirnia et al. 2010
- <i>beticola</i> Sacc.	<i>Beta maritima</i> L., <i>B. vulgaris</i> L., <i>Spinacia oleracea</i> L.	Esfandiari 1946a, Esfandiari 1947, Khabiri 1952, 1958, Golato 1960, Eskandari 1964, Scharif & Ershad 1966, Eskandari et al. 1969, Vinnot-Bourgin et al. 1969, Altman et al. 1972, Ebrahimi & Minnasion 1973, Vaziri 1973, Alian et al. 2008
- <i>canescens</i> Ellis & Martin	<i>Phaseolus vulgaris</i> L., <i>Vigna sinensis</i> (L.) Endl	Altman et al. 1972, Ershad 1995
- <i>cheiranthi</i> Sacc.	<i>Cheiranthus cheiri</i> L.	Esfandiari 1948, Scharif & Ershad 1966
- <i>citruillina</i> Cooke	<i>Citrullus vulgaris</i> Schrad. ex Eckl. & Zeyh.	Scharif & Ershad 1966
- <i>daticicola</i> Esfand.	<i>Datisca cannabina</i> L.	Esfandiari 1951
- <i>elaeagni</i> Heald & Wolf	<i>Elaeagnus angustifolia</i> L.	Ershad 1995
- <i>fukushiana</i> (Mat.) Yam.	<i>Impatiens balsamina</i> L.	Hedjaroude 1983
- <i>gerberae</i> Chupp & Viegas	<i>Gerbera jamesonii</i> Hook.	Ershad 1995
- <i>hydrangea</i> Ellis & Everh.	<i>Hydrangea hortensia</i> Siebold.	Hedjaroude 1983
- <i>iridis</i> Chupp	<i>Iris</i> sp.	Pirnia et al. 2010
- <i>kikuchii</i> Matsumoto & Tomoy	<i>Glycine max</i> (L.) Merr.	Zad 1979, Majidieh-Ghassemi 198
- <i>lactuca-sativae</i> Sawada = <i>C. longissima</i> Cooke & Ellis	<i>Lactuca sativa</i> L.	Banihashemi 1985, Pirnia et al. 2010
- <i>malayensis</i> Stev. & Solh.	<i>Hibiscus esculentus</i> L.	Petrak 1956, Scharif & Ershad 1966
- <i>medicaginis</i> Ellis & Everh.	<i>Medicago</i> sp.	Scharif & Ershad 1966
- <i>mercurialis</i> Pass.	<i>Mercurialis annua</i> L.	Pirnia et al. 2010
- <i>musae</i> Zimm.	<i>Musa sapientum</i> L.	Amani et al. 2010
- <i>neriicola</i> Ershad	<i>Nerium oleander</i> L.	Ershad 2002
- <i>ricinella</i> Sacc. & Berl.	<i>Ricinus communis</i> L.	Petrak 1956, Khabiri 1958, Scharif & Ershad 1966
- <i>scharifii</i> Petr.	<i>Rosa</i> sp.	Petrak 1956
- <i>sorghii</i> Ellis & Everh.	<i>Sorghum bicolor</i> (L.) Moench, <i>S. halepense</i> Pers.	Mehrian & Rajoo 2004, Mehrian 2006, Pirnia et al. 2010
- <i>taurica</i> Tranzsch.	<i>Heliotropium</i> sp.	Petrak 1939
- <i>traversiana</i> Sacc.	<i>Trigonella foenum-graceum</i> L.	Scharif & Ershad 1966 as <i>Cercospora</i> sp., Vinnot- Bourgin et al. 1970, Ershad 1995
- <i>viola</i> Sacc.	<i>Viola odorata</i> L., <i>V. sintenisii</i> Becker, <i>V. sylvestris</i> Lam., <i>Viola</i> sp.	Esfandiari 1948, Khabiri 1952, Khabiri 1958, Scharif & Ershad 1966, Vinnot-Bourgin et al. 1970, Ershad 1995
- <i>zebrina</i> Pass.	<i>Medicago sativa</i> L.	Ebrahimi & Minassian 1973

Species	Hosts	References
- <i>zonata</i> Wint. = <i>C. fabae</i> Fautr.	<i>Vicia faba</i> L.	Esfandiari 1948, Scharif & Ershad 1966, Ebrahimi & Minnasion 1973, Hedjaroude 1976, Pirnia et al. 2010
- <i>Cercospora</i> spp.	<i>Arachis hypogaea</i> L., <i>Capparis spinosa</i> L., <i>Citrus aurantium</i> L., <i>C. sinensis</i> (L.) Osbeck., <i>Citrus</i> sp., <i>Ficus carica</i> L., <i>Gladiolus segetum</i> Ker-Gawl., <i>Glycine max</i> (L.) Merr., <i>Hibiscus cannabinus</i> L., <i>Hydrangea hortensia</i> Siebold., <i>Lactuca sativa</i> L., <i>Malus pumila</i> Mill., <i>Plantago major</i> L., <i>Punica granatum</i> L.	Afzali et al. 2010, Scharif 1953, Ebrahimi 1964, Scharif & Ershad 1966, Scharif & Akhavizadegan 1967, Daftari & Behdad 1968, Vaziri 1973, Ebrahimi & Minassian 1973, Roohibakhsh & Ershad 1997
Passalora		
- <i>bolleana</i> (Thum.) Braun = <i>Cercospora bolleana</i> (Thum.) Speg.	<i>Ficus carica</i> L.	Petrak 1956, Scharif & Ershad 1966, Vinnot- Bourgin et al. 1970, Ershad 1995
- <i>calotropidis</i> (Ellis & Everh.) Braun = <i>Cercospora calotropidis</i> Ellis & Everh. = <i>C. patouillardii</i> Sacc.	<i>Calotropis procera</i> Dryand	Petrak 1953, Petrak 1956, Vinnot- Bourgin et al. 1970, Ershad 1995
- <i>calystegiae</i> (Speg.) Braun = <i>Cercospora calystegiae</i> Speg.	<i>Calystegia</i> sp.	Hedjaroude 1983
- <i>carlinae</i> (Sacc.) Braun = <i>Cercospora carlinae</i> Sacc.	<i>Calina</i> sp.	Petrak 1941
- <i>circumscissa</i> (Sacc.) Braun = <i>Cercospora circumscissa</i> Sacc.	<i>Amygdalus communis</i> L., <i>Cerasus avium</i> (L.) Moench, <i>C. vulgaris</i> Miller, <i>Prunus domestica</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946a, Khabiri 1958, Vinnot- Bourgin 1958, Scharif & Ershad 1966
- <i>cousinia</i> Petr.	<i>Cousinia nekermanica</i> Rech. f., <i>Cousinia</i> sp.	Petrak 1949, Esfandiari 1951, Jorstad 1960, Ershad 1995
- <i>dubia</i> (Riess) Braun = <i>Cercospora dubia</i> (Riess) Wint.	<i>Chenopodium brumale</i> L.	Hedjaroude 1976
- <i>fraxini</i> (DC.) Arx	<i>Fraxinus excelsior</i> L.	Kalte et al. 2008
- <i>fraxinicola</i> (Ershad) Braun & Crous = <i>Cercospora fraxinicola</i> Ershad	<i>Fraxinus rotundifolia</i> Miller	Ershad 2000
- <i>fulva</i> (Cooke) Braun & Crous = <i>Fulvia fulva</i> (Cooke) Ciferri = <i>Cladosporium fulvum</i> Cooke.	<i>Lycopersicum esculentum</i> Mill.	Scharif & Ershad 1966, Ershad 1995
- <i>graminis</i> (Fuckel) Hohn.	<i>Glyceria fluitans</i> R.Br.	Esfandiari 1948
- <i>kirchneri</i> (Hegy) Petr.	<i>Anethum graveolens</i> L., <i>Foeniculum vulgare</i> Mill.	Esfandiari & Petrak 1950, Esfandiari 1951, Petrak 1956, Scharif & Ershad 1966, Ebrahimi & Minassian 1973, Ershad 1995
- <i>microsora</i> (Sacc.) Braun = <i>Cercospora microsora</i> Sacc.	<i>Tilia begonifolis</i> Stev., <i>Tilia</i> sp.	Petrak 1941, Esfandiari 1946b, Khabiri 1958, Scharif & Ershad 1966, Ershad 1995
- <i>miser</i> (Karst.) Redhead, Vilgalys & Hopple = <i>Coprinus miser</i> Karst.	<i>Salix</i> sp.	Saber & Esmaeili Taheri 2002
- <i>phaeopappi</i> Petr.	<i>Phaeopappus aucheri</i> (DC.) Boiss; <i>P. kotschy</i> (Boiss. & Heldr) Boiss	Petrak 1939, Esfandiari 1948, Golato 1960

Species	Hosts	References
- <i>punctum</i> (Delacr.) Petzoldt = <i>Cercospora Petroselini</i> Sacc.	<i>Petroselinum sativum</i> Hoffm.	Ebrahimi & Minassian 1973
- <i>rhamni</i> (Fuckel) Braun = <i>Cercospora rhamni</i> Fuckel	<i>Rhamnus frangula</i> L.	Vinnot-Bourgin 1958
- <i>rosae</i> (Fuckel) Hohn.	<i>Rosa</i> sp.	Esfandiari 1948
- <i>scandicearum</i> (Magnus) Braun = <i>Cercospora scandicearum</i> Magnus	<i>Anthriscus sylvestris</i> Hoffm.	Vinnot-Bourgin et al. 1970
- <i>scariola</i> Syd.	<i>Scariola orientalis</i> (Boiss) Sojak	Petrak 1949, Esfandiari 1951
- <i>smilacis</i> (Thum.) Braun = <i>Cercospora smilacis</i> Thum = <i>C. smilacina</i> Sacc.	<i>Smilax aspera</i> L., <i>S. excels</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946b, Khabiri 1958
<i>Pseudocercospora</i>		
- <i>abelmoschi</i> (Ellis & Everh.) Deighton = <i>Cercospora abelmoschi</i> Ellis & Everh. = <i>C. hibisci</i> Tracy & Earle	<i>Hibiscus cannabinus</i> L.	Esfandiari 1947, 1948, Scharif & Ershad 1966, Scharif & Akhavizadegan 1967 as <i>Cercospora</i> sp., Vinnot-Bourgin et al. 1970
- <i>atromarginalis</i> (Atk.) Deighton = <i>Cercospora atromarginalis</i> Atk.	<i>Solanum nigrum</i> L.	Vinnot-Bourgin et al. 1970, Ershad 1995
- <i>cavarae</i> (Sacc. & D.Sacc.) Deighton = <i>Cercospora cavarae</i> Sacc. & D.Sacc.	<i>Glycyrrhiza glabra</i> L.	Hedjaroude 1983
- <i>cruenta</i> (Sacc.) Deighton = <i>C. cruenta</i> Sacc.	<i>Vigna sinensis</i> (L.) Endl.	Kaiser et al. 1968 as <i>Cercospora</i> sp., Vaziri 1973
- <i>fici</i> (Heald & Wolf) Liu & Guo = <i>Cercospora fici</i> Heald & Wolf	<i>Ficus carica</i> L.	Scharif & Ershad 1966
- <i>fuligena</i> (Roldan) Deighton	<i>Solanum nigrum</i> L. <i>Physalis alkekengi</i> L.	Aghajani & Ahmadi 2010
- <i>gomphrenae</i> Sawada ex Goh & Hsieh = <i>Cercospora gomphrenae</i>	<i>Gomphrena globosa</i> L.	Hedjaroude 1983
- <i>jujubae</i> (Chowdhury) Khan & Shamsi = <i>Cercospora jujubae</i> Chowdhury	<i>Ziziphus spina-christi</i> (L.) Willd.	Ershad & Khosravi 1996
- <i>kaki</i> Goh & Hsieh = <i>Cercospora kaki</i> Ellis & Everh.	<i>Diospyros kaki</i> L., <i>D. lotus</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946b, Khabiri 1958, Golato 1960, Scharif & Ershad 1966, Vinnot-Bourgin et al. 1970
- <i>phyllitidis</i> (Hume) Braun & Crous = <i>Cercospora petunia</i> (Saito) Muller & Chupp	<i>Petunia</i> var. Hort.	Ershad 1995
- <i>punicae</i> (Henn.) Deighton = <i>Cercospora punicae</i> Henn.	<i>Punica granatum</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946b, Golato 1960, Ershad 1995
- <i>rubi</i> (Sacc.) Deighton = <i>Cercospora rubi</i> Sacc.	<i>Rubus</i> sp.	Hedjaroude 1976
- <i>salvadorae</i> (Maire) Deighton = <i>Cercospora salvadorae</i> Maire	<i>Salvadora persica</i> L.	Ershad 1990

Species	Hosts	References
- <i>sphaerella-eugeniae</i> (Sacc.) Crous, Alfenas & Barreto = <i>Cercospora eugeniae</i> (Rangel) Chupp-Tis	<i>Eugenia jambos</i> L.	Ershad 1990
- <i>vitis</i> (Lev.) Speg. = <i>Cercospora vitis</i> (Lev.) Sacc.	<i>Vitis sylvestris</i> Gmel, <i>V. vinifera</i> L.	Esfandiari 1947, Vinnot-Bourgin et al. 1970, Hedjaroude 1976, Ershad 1990
Ramularia		
- <i>alpine</i> (Massal.) Nannf.= <i>Ovularia alpine</i> Massal.	<i>Alchemilla</i> sp.	Petrak 1949, Esfandiari 1951
- <i>anchusae</i> Massal.	<i>Anchusa italica</i> Retz., <i>A. ovate</i> Lehm.	Petrak 1953, Khabiri 1958, Vinnot-Bourgin et al. 1970, Moaven et al. 2003
- <i>beccabungae</i> Fautr.	<i>Veronica beccabunga</i> L.	Petrak & Esfandiari 1941
- <i>bornmulleriana</i> (Magnus) Braun = <i>Ovularia bornmulleriana</i> Magnus	<i>Onobrychis sintenisii</i> Bornm.	Petrak 1939
- <i>cynarae</i> Sacc. = <i>R. carthami</i> Zaprom.	<i>Carthamus oxyacantha</i> M. Bieb., <i>C. tinctorius</i> L.	Minassian 1971, Vinnot-Bourgin et al. 1969 as <i>Cercospora carthami</i> Sundar & Ramakr., Altman et al. 1972, Ebrahimi & Minassian 1973 as <i>Ramularia</i> sp.
- <i>geranii</i> Fuckel var. <i>geranii</i>	<i>Geranium pyrenaicum</i> L.	Hedjaroude & Abbasi 2000
- <i>heraclei</i> (Oud.) Sacc.	<i>Heracleum persicum</i> Desf. ex Fischer, <i>Heracleum</i> sp.	Esfandiari 1948, Ershad 1995
- <i>iranica</i> Petr.	<i>Acantholimon</i> sp.	Petrak 1949, Esfandiari 1951
- <i>lamii</i> Fuckel = <i>R. leonuri</i> Sacc. & Penz. = <i>R. menthae</i> Sacc.	<i>Leonurus cardiac</i> L., <i>Mentha arvensis</i> L.	Vinnot-Bourgin et al. 1969 as <i>R. menthicola</i> Sacc., Hedjaroude 1983, Ershad 1995, Anonymous 2005 as <i>R. menthicola</i> Sacc.
- <i>macrospora</i> Fres.	<i>Campanula rapunculus</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946b, Scharif & Ershad 1966
- <i>marrubii</i> Massal.= <i>R. sideritis</i> Hollos.	<i>Sideritis</i> sp.	Petrak 1939
- <i>primulae</i> Thum.	<i>Primula aqualis</i> L.	Aghapour et al. 2010
- <i>rhabdospora</i> (Berk. & Broome) Nannf. = <i>R. plantaginea</i> Sacc.	<i>Plantago lanceolata</i> L.	Esfandiari 1948
- <i>rubella</i> (Bonord) Nannf. = <i>Ovularia obliqua</i> (Cooke) Oud.	<i>Rumex crispus</i> L., <i>Rumex</i> sp.	Esfandiari 1948, Vinnot- Bourgin et al. 1969, Ershad 1995
- <i>rubicola</i> Ershad	<i>Rubus caesius</i> L.	Ershad 2000
- <i>rufomaculans</i> Peck	<i>Polygonum</i> sp.	Khabiri 1958
- <i>rumicis</i> Kalchbr. & Cooke = <i>R. decipiens</i> Ellis & Everh.	<i>Rumex crispus</i> L., <i>Rumex</i> sp.	Vinnot-Bourgin et al. 1970, Ershad 1995, Fotouhifar et al. 2003
- <i>rumicis-scutati</i> Allesch.	<i>Rumex scutatus</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946a, Esfandiari 1946b
- <i>sambucina</i> Sacc.	<i>Sambucus ebulus</i> L.	Petrak & Esfandiari 1941, Esfandiari 1946b
- <i>simplex</i> Pass.	<i>Ranynchulus oxyspermus</i> Willd.	Moaven et al. 2003
- <i>uredinicola</i> Khodap. & Braun	<i>Melampsora</i> sp.	Khodaparast & Braun 2005
- <i>urticae</i> Ces.	<i>Urtica dioica</i> L., <i>U. urens</i> L.	Esfandiari 1948, Vinnot-Bourgin 1958
- <i>valeriana</i> (Speg.) Sacc.	<i>Valeriana sisymbriifolia</i> Vahl.	Petrak 1939
Ramularia sp.	<i>Foeniculum vulgare</i> Mill., <i>Potentilla</i> sp., <i>Rumex</i> sp.	Khabiri 1952, Vaziri 1973, Hedjaroude 1976

belonging to 22 genera and 17 families, including the *Polygonaceae* (with five species) and *Rosaceae* (with three species), which represent the host plant families with most *Ramularia* species.

Discussion

Despite their widespread distribution, current knowledge on the cercosporoid fungi of Iran is scant. Hopefully, the information gathered here will provide both a reference work and be an incentive for further work aimed at disclosing the diversity of cercosporoid fungi in Iran.

Since the description of the genus *Cercospora*, the taxonomy of this genus as well as the description of individual species within this group has proven burdensome. While *Cercospora* was defined at genus level by morphology, species definition was based largely on host association. A significant problem pertaining to the taxonomy of *Cercospora* is the degree of host-specificity of the various species. Most species are still defined based on host, and they are assumed to be host-specific or restricted at least to a family of plants (Chupp 1954). However, the tenability of many species may be called into question because some taxa, including *C. apii*, the type species of *Cercospora*, have been shown to be non host-specific (Crous & Braun 2003).

Most hyphomycetous genera linked to *Mycosphaerella* have conventionally been dealt with as part of the cercosporoid fungi (Crous & Braun 2003). In most cases cercosporoid fungi have been treated as asexual fungi, and teleomorphs have been confirmed for only a few species. Groenewald et al. (2006) detected the two mating type genes in approximately even proportions in *C. beticola*, *C. zae-maydis* and *C. zeina* populations, and speculated that a sexual cycle may occur regularly in these species. However, the actual sexual stage was not observed. Hence, the application of the criterion of intersterility is also mainly limited in cercosporoid fungi.

Iran is one of the richest biodiversity hotspots in the world. This is due to the variety of climatic zones ranging from subtropical and tropical rain forests to wetlands. Despite this wealth, however, little information is available,

regarding cercosporoid fungi and their distribution as well as host range in Iran. Most publications describe the species from herbarium material and no cultures of cercosporoid fungi are present in the country.

It is difficult to rely solely on morphology for the species identification in this group. Since the combination of morphological and phylogenetic analyses of new proposed taxa in *Cercospora* complex is very important in order to avoid misidentification, in our opinion, future work should be focused on phylogenetic analysis of cercosporoid fungi. Hence, we are currently busy with phenotypic and molecular characterization of cercosporoid fungi of Iran based on single spore cultures.

Acknowledgements

The authors would like to thank the Research Deputy of the University of Tabriz, Iran for financial support.

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