دار شرکاه کیلان ۱۳۵۲_۱۹۶4	مر م	Color Atlas of Iranian Fungi Vol. I Compiled by: Seyed Akbar Khodaparast, Ph. D Bita Asgari, Ph. D
چاپ اول	دکتر مونس بخشی استادیار پژوهش موسسه تحقیقات گیاه پزشکی کشور	Mounes Bakhshi, Ph. D
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		ISBN: 978-600-153-292-4

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Color Atlas of Iranian Fungi _{Vol. I}

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University Of Guilan Press 2022

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Color atlas of Iranian fungi[Book]/ Seyed Akbar Khodaparast, Bita Asgari, Mounes Bakhshi; scientific literary editor Saeed Shirzadian.		1828
: رشت: دانشگاه گیلان، ۱۴۰۱= ۲۰۲۲م.	مشخصات نشر	
:ج.: مصور(رنگی)؛ ۲۲ × ۲۹ سم.	مشخصات ظاهرى	
978-600-153-292-4 _.	شابک	
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: زبان: انگلیسی.	یادداشت	
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		University Of Guilan Press
Title	:	Color Atlas of Iranian Fungi Vol. I
Compiled by	:	Seyed Akbar Khodaparast, BitaAsgari, Mounes Bakhshi
Scientific and literary editor	:	Saeed Shirzadian
First Edition	:	2022
Publisher	:	University Of Guilan Press
		* Any printing and reproduction is only at the disposal of the publishing of University of Guilan *

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قارچها در بین جانداران کره زمین یکی از متنوعترین گروهها هستند که در زیستبومهای گوناگون گسترش داشته و به شیوههای مختلف زندگی میکنند. این موجودات تاثیر بسیاری بر حیات زمین داشته، به طوری که شواهد علمی دقیق نشان میدهند که بقا، زندگی و گسترش بخشی از موجودات زمینی مستقیم یا غیرمستقیم وابسته به قارچها است. بخشی از قارچها آبزی و بخش بزرگی خشکیزی اند. وجود بسیاری از قارچها در طبیعت مفید بوده در حالی که از نظر انسانها، تعدادی نیز مضرند. شناخت دقیق قارچها برای به کارگیری انواع مفید و مقابله مؤثر با انواع مضر آنها ضروری است. گوناگونی از نظر ریختشناسی، بومشناسی، زیستشناسی و ژنتیکی، شناخت درست گونههای قارچی و ردهبندی آنها را اغلب با مشکل همراه میکند. در این راه، وجود یک منبع علمی مطمئن میتواند کمک بزرگی برای پژوهشگران و دانشپژوهان باشد. انجمن قارچشناسی ایران بنا به رسالت خود، این موضوع را مد نظر قرار داده و با احساس مسئولیت و همچنین براساس نظر متخصصان باتجریه قارچشناسی کشور، تصمیم به انتشار مجموعه حاضر با نام **اطلس قارچهای ایران** گرفته است که کمک بسیار مفیدی برای دانشجویان و پژوهشگران خواهد بود. این افراد میتوانند در هنگام شناسایی قارچها، یافتههای خود را با قارچهای معرفی شده در این اطلس مقایسه کرده و شناسایی را به درستی انجام دهند. طبق برنامهریزی انجام شده، قرار است این مجموعه به صورت دورهای که هر دوره یک جلد را شامل میشود، منتشر گردد. هر جلد گروه ویژهای از قارچهای شناسایی شده در ایران را شامل میشود. در هر جلد، تعدادی گونه همراه با شرح مشخصات و تصاویر باکیفیت معرفی می گردد. برای معرفی قارچها از بهروزترین روشهای شناسایی، به ویژه روشهای ریختشناسی و مولکولی بهره برده می شود. خوشبختانه نخستین جلد آن با همت تعدادی از پژوهشگران شایسته قارچشناسی کشور آماده و اکنون در اختیار شما است. انجمن قارچشناسی ایران قدردان یکایک پژوهشگرانی است که برای معرفی گونههای قارچی در مجموعه حاضر، همت و سعی و تلاش خود را در این راه مبذول داشتهاند. همچنین، از همکاران گرانقدر جناب آقای دکتر سیداکبر خداپرست و خانمها سرکار دکتر بیتا عسگری و دکتر مونس بخشی که برای جمع آوری، تنظیم و تدوین مطالب این جلد تلاش وافر داشتهاند، به طور ویژه سپاسگزاری و قدردانی می گردد.

محمد جوان نيكخواه

رییس انجمن قارچشناسی ایران خرداد ۱۴۰۱

مقدمه

تاکنون بیش از ۳۰۰۰ گونه قارچی از ایران گزارش شده است. به درستی معلوم نیست چه تعداد از این قارچها توصیف شدهاند و یا چه تعداد نمونه معتبر از آنها در بانکهای ذخایر ژنتیکی (هرباریومها و کلکسیونها) نگهداری می شود. کم و بیش همه به این موضوع واقفیم که تاکسونومی دانشی پویا و تحول پذیر است. بدون شک ماهیت گونهها در کوتاه مدت تغییر نخواهد کرد ولی نام آنها بسیار تغییر پذیر است و این به دلایل مختلف اتفاق می افتد. حال پرسشی که می توان در اینجا مطرح نمود این است که چگونه می توان ماهیت گونهای را که در گذشته از ایران گزارش شده را با واقعیتهای امروزی تطبیق داد؟ بهترین روش، مراجعه به نمونه معتبری است که توسط جمع آوری کننده یا توصیف کننده آن در بانکهای ذخایر ژنتیکی نگهداری می شود. اما اگر به اگر توصیف دقیق و جامعی از گونه در دسترس باشد، کمک شایانی خواهد بود. اگر این توصیف با تصاویر مناسبی نیزهمراه باشد، بسیار ارزشمندتر خواهد بود. صرفنظر از این موضوع، در صورت توصیف دقیق گونهها و ارایه کلیهای تشخیمی، کمک شایانی بسیار ارزشمندتر خواهد بود. صرفنظر از این موضوع، در صورت توصیف شده مراجعه می کنند و نیاز به منابع علمی معتبر برای شناسایی آنها دارند. شاید بهترین توصیفها، آنهایی است که با ترسیم های رنگی و یاز به منابع علمی معتبر مراه باشد. اگر در گذشته نه در دسترس باشد، کمک شایانی خواهد بود. اگر این توصیف با تصاویر رنگی و زیبای قارچها به کسانی خواهد شد که به دلایل مختلف به نمونههایی از قارچهای توصیف شده مراجعه می کنند و نیاز به منابع علمی معتبر مراه باشد. اگر در گذشته نه چندان دور نگران هزینه بالای چاپ چنین مجموعههایی از شمند و یا تصاویر رنگی و زیبای قارچها مراه باشد. اگر در گذشته نه چندان دور نگران هزینه بالای چاپ چنین مجموعههایی ارزشمند و یا تصاویر رنگی و زیبای قارچها مراه باشند. اگر در گذشته نه ورده که توجه بسیاری از دوستمهای ارزشمند و یا تصاویر رنگی و زیبای قارچها مراه رازه، نگرانی دیگری نیز به وجود آمده که توجه بسیاری از دوستداران طبیعت را به خود جلب کرده است و آن اینکه تا چ زمانی دسترسی به کاغذ برای بشر فراهم است؟ امروزه خوشبختانه چاپ الکترونیک به کمک ما آمده و برخی از این نگرانیها را

اگر فرض کنیم از همان زمانی که شناسایی قارچهای ایران آغاز شد و پژوهشگران اقدام به توصیف آنها می کردند، این امکان برای آنها وجود داشت که یک شرح مصور از آنها تهیه کنند و با کمترین هزینه آن را در اختیار جامعه قارچشناسی قرار دهند، هماکنون شرح بیش از ۳۰۰۰ گونه قارچی متعلق به ایران در یک فایل الکترونیکی قابل دسترس میبود! با این وجود، تا زمان از دست نرفته و تعداد قارچهای ایران بیش از این افزایش پیدا نکرده است، بهتر است اقدامات لازم جهت تحقق این هدف انجام پذیرد. بر این اساس، انجمن قارچشناسی ایران تصمیم گرفته است مستندات آرایههای قارچی شناسایی شده از ایران را در قالب یک مجموعه منسجم و مصور ارایه نماید. بیتردید تحقق چنین هدفی مستلزم همکاری مؤثر کلیه قارچشناسان کشور میباشد. این مجموعه، ضمن تسهیل دسترسی پژوهشگران داخلی به اطلاعات قارچهای ایران، تصویری مناسب از وضعیت تنوع زیستی قارچهای ایران را در سطح بینالمللی فراهم خواهد کرد.

در نگارش این مجموعه از جامعه قارچ شناسی ایران تقاضا گردیده است گونههایی را که تاکنون در کتابها و مجلات علمی چاپ کردهاند، براساس یک قالب مشخص تهیه و برای ویراستاران ارسال کنند. لذا کلیه گونهها پیش از این در مجلات علمی یا کتابها چاپ شدهاند اما هدف اصلی از تهیه این مجموعه، ارایه تصویر منسجم از آرایههای قارچی ایران و تسهیل دسترسی به اطلاعات مرتبط میباشد.

بر این اساس، تا مهر ۱۴۰۰ توصیف ۱۲۸ گونه از شاخه آسکومیکوتا و تعدادی محدودی از بازیدیومیکوتا دریافت شد. جلد اول شامل گونههای شاخه آسکومیکوتا که به راستههای Amphisphaeriales Amphisphaeriales ، Botryosphaeriales Amphisphaeriales ، Coniochaetales ، Cladosporiales ، Chaetothyriales Hypocreales ، Eurotiales ، Diaporthales ، Coniochaetales ، Cladosporiales ، Chaetothyriales Sordariales ، Pleosporales ، Patellariales ، Orbiliales ، Magnaporthales ، Kirschsteiniotheliales NycoBank ; Sordariales ، Pleosporales ، Patellariales ، Orbiliales ، Magnaporthales ، Kirschsteiniotheliales MycoBank ; این گونهها براساس سلسله مراتب تاکسونومیکی برگرفته از پایگاه اطلاعاتی میکوبانک (http://www.mycobank.org) یا آخرین مقالات منتشر شده در آن زمینه در راستهها گروهبندی شدهاند و سپس اسامی راستهها به ترتیب الفبایی مرتب شدهاند. برای هر گونه شرحی اصلی براساس نمونه ایرانی تهیه شده است که با یک یا چند عکس یا ترسیم همراه میباشد. نام مصنف گونهها، مترادفها و سلسله مراتب طبقهبندی براساس آخرین مقالات چاپ شده یا پایگاه اطلاعاتی میکوبانک نوشته شده است. در صورتی که اطلاعات توالی نواحی ژنی برای نمونه ایرانی در بانکهای ژن موجود باشد، شماره دسترسی هر یک در بانک ژن جهانی (NCBI; http://www.ncbi.nlm.nih.gov) ذکر شده است. برای هر گونه یک یا تعداد محدودی منبع علمی که شرح اولیه گونه ایرانی در آن چاپ شده است و یا برای تشخیص توسط نگارنده مورد استفاده قرار گرفته است، نیز فهرست شده است. در پایان از آقای دکتر سعید شیرزادیان (عضو محترم هیات علمی بخش رستنیهای موسسه تحقیقات گیاه پزشکی کشور، تهران) به خاطر زحماتی که در بازخوانی این کتاب و ویراستاری علمی و ادبی آن داشته اند قدردانی می شود. سید اکبر خداپرست بیتا عسگری

خرداد ۱۴۰۱

Preface

Although the identity of fungal species is not changing over time, their scientific names may undergo changes due to taxonomic or nomenclatural reasons. Designation of voucher specimens and providing detailed and careful description and illustration is considered as useful practice in order to make fungal species identification clear and unambiguous. So far, over 3000 fungal species have been reported from Iran; a few are assigned as holotype or authentic specimens, where the majority of reported fungi are not yet properly described. The Iranian Mycological Society, has decided to compile and publish series of monographs describing the fungi of Iran associated with the voucher information along with the dimensions of species diversity. The prime objective of this color atlas, is to illustrate the fungal species gathered from various substrates and hosts in Iran (excluding those associated with human diseases). Therefore, the present monograph aimed to serve mycologists, plant and insect pathologists, environmentalists and other interested people as a reference book for comparison, identification and diagnosis of the Iranian mycobiota. The photographs and drawings brought in this book as well as description of macroscopic and microscopic features, together with molecular markers will ensure accurate and easy identification of fungal taxa.

In this volume, 128 ascomycetous species are described mainly from plant materials (leaves, stems, branches, roots, fruits, and seeds) as saprophytes or plant pathogens, and occasionally from soil. All of the fungi in this text, are described alphabetically in order of *Amphisphaeriales, Botryosphaeriales, Capnodiales, Chaetothyriales, Cladosporiales, Coniochaetales, Diaporthales, Eurotiales, Hypocreales, Kirschsteiniotheliales, Magnaporthales, Orbiliales, Patellariales, Pleosporales, Sordariales, and Xylariales. Each fungus is described with colony characteristics, microscopic features and other useful sequence data available at GenBank (https://www.ncbi.nlm.nih.gov/genbank/). In addition, selected references and literature for taxonomic data and nomenclature, mostly from MycoBank (https://www.mycobank.org), are provided. All photographs and drawings are based on the author's own work using the materials described. Dried specimens of some fungi are mainly deposited at GUM (University of Guilan, Rasht, Iran), and IRAN...F (Fungus Reference Collection, Herbarium Ministerii Iranici Agriculturae located at Iranian Research Institute of Plant Protection, Tehran, Iran). The living cultures are also preserved at CBS (Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands), and IRAN...C (Iranian Fungal Culture Collection, Iranian Research Institute of Plant Protection, Tehran, Iran).*

We are most grateful to Dr. Saeed Shirzadian (Department of Botany, Iranian Research Institute of Plant Protection) for proofreading of the book.

Seyed Akbar Khodaparast Bita Asgari Mounes Bakhshi June 2022

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Pestalotiopsis nattrassii Steyaert, Trans. Br. Mycol. Soc.36(2): 82 (1953)

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Synonyms: *Monochaetia nattrassii* (Steyaert) B. Sutton, Can. J. Bot. 47(12): 2091 (1969) [1970]; *Pestalotia nattrassii* (Steyaert) Guba, Monograph of *Monochaetia* and *Pestalotia*: 613 (1961)

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Amphisphaeriales, Pestalotiopsidaceae, Pestalotiopsis

Description: Conidiomata acervular, subepidermal, epiphyllous, 110–230 μ m diam, scattered to gregarious, releasing black, globose conidial masses. Conidia fusoid, straight to slightly curved, 4-septate, 23–35(–29.6) × 7–9(–8.1) μ m; basal cell hyaline, thin- and smooth-walled, three median cells 16–24(–20.2) μ m long, concolourous, brown to red brown; apical cell cylindrical, hyaline, thin- and smooth-walled, 1–4 (rarely 5) apical appendages, 8–40 μ m long; basal appendage absent (on natural substrate). Colonies on PDA reaching average of 58 mm after 4 d at 25 °C, first white, then turn to dirty white to cream, conidiomata observed after 4 d as black spot. Conidia 26–36(–30.3) × 7–10(–8.3) μ m, three median cells 17–25(–20.2) μ m long, apical appendages 13–35 μ m.

Host and Distribution: On living leaves of *Camelia sinensis* (L.) Kuntze, Guilan province, Fuman, Fashalam Tea Plant Research Station (GUM 179).

Molecular data: Not available.

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Pestalotiopsis nattrassii: (a) colony on PDA; (b) cross section of acervulus; (c–d) conidia. Scale bars: $b = 50 \ \mu m$, c,d = 20 μm

Pseudopestalotiopsis theae (Sawada) Maharachch., K.D. Hyde & Crous, in Maharachchikumbura, Hyde, Groenewald, Xu & Crous, Stud. Mycol. 79: 183 (2014)

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Synonyms: *Pestalotia theae* Sawada, Spec. Report Agric. Exp. Station Formosa 11: 113 (1915); *Pestalotiopsis theae* (Sawada) Steyaert, Bull. Jard. bot. État Brux. 19(3): 327 (1949)

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Amphisphaeriales, Pestalotiopsidaceae, Pseudopestalotiopsis

Description: Conidiomata acervular, subepidermal, epiphyllous, sometimes hypophylous, 150–250 μ m diam, scattered to gregarious, sometimes in distinct concentric zone; releasing black, globose conidial masses. Conidiophores hyaline, cylindrical to doliiform, septate or aseptate, 5–18 × 2–4 μ m. Conidiogenous cells cylindrical, hyaline, smooth, proliferating 1–5 times percurrently. Conidia fusoid, straight to slightly curved, 4-septate, 24–33 × 5.5–8 μ m; basal cell hyaline, thin- and smooth-walled, three median cells 17–23 μ m long, concolourous, pale brown to brown; apical cell cylindrical, hyaline, thin- and smooth-walled, 2–4 (usually 3) apical appendages, 17–40 μ m long; apical appendages knobbed; basal appendage single, tubular, unbranched, centric, 3.5–9 μ m long (on natural substrate).

Colonies on PDA reaching average of 65 mm diam after 4 d at 25 °C, white, aerial mycelium abundant, conidiomata observed after 4 d as black spot. Conidia $26-36(-38) \times 6-8$ µm, three median cells 17-25 µm long.

Host and Distribution: On living leaves of *Camelia sinensis* (L.) Kuntze, Guilan province, Lahijan (GUM 180).

Molecular data: Not available

Note: *Pseudopestalotiopsis theae* is causal agent of grey spot of tea plant worldwide. This species is well known as *Pestalotiopsis theae* in literatures. However, recently phylogeny and taxonomy of the *Pestalotiopsis* revisited and based on morphological and DNA data two novel genera viz. *Neopestalotiopsis* and *Pseudopestalotiopsis* segregated from *Pestalotiopsis* (Guba 1961, Maharachchikumbura *et al.* 2014).

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Pseudopestalotiopsis theae: (a) cross section of acervulus; (b) conidia; (c–d) leaf spots. Scale bars: $a = 50 \ \mu m$, $b = 20 \ \mu m$



Pseudopestalotiopsis theae: (a) conidia (b) conidiogenous cells. Scale bars = $20 \ \mu m$

Seimatosporium vitis Y.P. Xiao, Camporesi & K.D. Hyde, Fungal Diversity 73: 103 (2015)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Amphisphaeriales, Discosiaceae, Seimatosporium

Description: Lignicolous. Teleomorph: Ascomata perithecial, solitary, partly to completely immersed in the host tissue, globose to subglobose, blackish brown to black, 200-400 µm in diam, 100-250 µm long. Paraphyses filiform, hyaline, unbranched, septate. Asci unitunicate, cylindrical, apex rounded, short stalked, 8-spored, $70-110 \times 9-11.5 \ \mu m \ (\bar{x} = 92.5 \times 10.4 \ \mu m, n)$ = 20). Ascospores uniseriate, elliptic to fusiform, hvaline, 2-celled, very rarely 3-4-celled, smooth, constricted at the septa when mature, $(11.5-)14-20(-21) \times 5-7(-7.5) \mu m$ ($\bar{x} = 17.3 \times$ 6.5 μ m, n = 20). Anamorph: Conidiomata acervular, solitary or gregarious, immersed or erumpent, circular or irregular, dark brown to black, opening by a split in the host tissue surface, 100-600 µm diam. Conidiomata wall multi-layered, outer wall thick, composed of brown cells of textura angularis, inner wall thin, hyaline. Conidiophore reduced to conidiogenous cells, arising at the base of the cavity of the conidiomata, sometimes branched at the base. Conidiogenous cells hyaline, smooth, cylindrical, $15-44 \times 1-1.5 \mu m$ long. Conidia ellipsoid to fusiform, straight to slightly curved, 3-septate on MEA and PDA 3(4-6)-septate, slightly constricted at the septa, $(11-)13-16(-17) \times 5-6$ ($\bar{x} = 14.7 \times 5.6$, n = 30) µm on natural substrate, on MEA; $15-25 \times 4.5-5.5 \mu m$, $\bar{x} = 18.4 \times 4.8 \mu m$, n = 20, basal cell obconic with a truncate base, with an appendage, hyaline to subhyaline, 2.5–3.7 ($\bar{x} = 3.1$) µm long; 2 median cells subcylindrical to doliiform, slightly thick-walled, smooth, brown to dark brown, with septa darker than the rest of the cell, together 7.3–9.8 ($\bar{x} = 8.6$) µm long, [the second cell from the base 3.3–5(\bar{x} = 3.7) µm long, the third cell 3.4–5.8 (\bar{x} = 4.2) µm long]; the apical cell conical with a rounded or acute apex, hyaline to subhyaline or concolorous with the central cells, 3-4 $(\bar{x} = 3.6)$ um long; with or without 1 tubular apical filiform appendage (on MEA and PDA always present), sometimes branched, arising from the apex of the apical cell, 10–22 ($\bar{x} = 16$) µm long, basal appendage present, filiform, tubular, single, sometime branched, eccentric, 7– 30 ($\bar{x} = 19.7$) µm long. Colony on MEA circular with regular margin, white to primrose (23"b), cottony, reverse sienna (13i), reaching 20 cm diam in 7 d at 24 °C. On PDA white to primrose (23"b) from above, white to primrose (23"b) from below, circular, cottony, with abundant black acervuli, reaching 10 cm in 7 d at 24 °C.

Host and Distribution: On dead branches of *Vitis* sp., East Azerbaijan provinve, Arasbaran (IRAN 16717F, IRAN 2427C, IRAN 2454C, IRAN 2455C).

Molecular data: IRAN 2427C (ITS = KU162941, LSU = KU162942), IRAN 2454C (ITS = KU648401), IRAN 2455C (ITS = KU648402).

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Seimatosporium vitis from Vitis sp.: (a) habit of ascomata on bark; (b) ascoma in longitudinal section; (c) habit of conidiomata on bark; (d) conidioma in longitudinal section; (e–f) asci; (g) Ascospore; (h) developing conidia attached to conidiogenous cells on natural substrate; (i–k) conidia on natural substrate; (l–o) conidia on MEA; (p) germinating spores on MEA; (q) colony morphology on MEA from above (left) and below (right); (r) colony morphology on PDA. Scale bars: $a = 500 \mu m$, $b, d = 100 \mu m$, c = 1 mm, $e-l = 10 \mu m$, $m-o = 5 \mu m$, $p = 10 \mu m$



Barriopsis iraniana Abdollahz., Zare & A.J.L. Phillips, Persoonia: 23 (2009)

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Classification: *Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Barriopsis*

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, superficial, dark brown to black, covered with dense mycelium, on pine needles mainly unilocular and up to 600 µm diam; on Populus twigs mostly multilocular, individual or aggregated, thick-walled, ostiolate. Ostiole central, circular, non-papillate. Paraphyses arising from the conidiogenous layer, extending above the level of developing conidia, up to 70 µm long, 3.5 µm wide, thinwalled, hyaline, usually aseptate, sometimes becoming up to 2–3-septate, not constricted at the septa, tip rounded, occasionally branched. Conidiophores absent. Conidiogenous cells $7-12 \times$ 3–5 µm, hyaline, thin-walled, smooth, cylindrical, holoblastic, proliferating at the same level, with visible periclinal thickening. Conidia thick-walled, initially hyaline, aseptate with longitudinal striations, striations visible on hyaline conidia even while attached to conidiogenous cells; oval, both ends broadly rounded, becoming brown, aseptate or 1-3septate, with prominent longitudinal striations, wall smooth, $(22.7-)24-30 \times (12.8-)14-18(-)$ 21.5) μ m, 95% confidence limits = 27–27.4 × 16.2–16.6 μ m (av. \pm S.D. = 27.2 \pm 1.8 × 16.4 \pm 1.3 μ m, l/w ratio = 1.7 \pm 0.16). Chlamydospores catenate, intercalary, brown, smooth, thickwalled, formed within the agar medium. Colonies with appressed mycelial mat and fluffy aerial mycelium in the middle, becoming dull green to olivaceous-black at the surface, and dull green to grey-olivaceous at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 45–50 mm diam on MEA after 4 d in the dark at 25 °C. Cardinal temperatures for growth; min 5 °C, max > 35 °C, opt 25–30 °C.

Host and Distribution: On twigs of *Citrus* sp., Hormozgan province, Minab (IRAN 1450C, IRAN 1451C, IRAN 1452C); *Mangifera indica*, Minab (IRAN 1448C = CBS 124698, IRAN 1453C); *Olea* sp., Rudan (IRAN 1449C = CBS 124699).

Molecular data: IRAN 1448C = CBS 124698 (SSU = KF766231, LSU = KF766318, ITS = FJ919663, TEF = FJ919652, TUB2 = KF766127, RPB2 = KX463949); IRAN 1449C = CBS 124699 (LSU = KX464241, ITS = FJ919665, TEF = FJ919654, TUB2 = KX464780, RPB2 = KX463950); IRAN 1450C (ITS = FJ919667, TEF = FJ919656); IRAN 1451C (ITS = FJ919668, TEF = FJ919657); IRAN 1452C (ITS = FJ919666, TEF = FJ919655); IRAN 1453C (ITS = FJ919664, TEF = FJ919653).

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Barriopsis iraniana: (a) conidiomata on pine needles in culture; (b, c) conidia developing on conidiogenous cells between paraphyses; (d) young conidium showing longitudinal striations while attached to a conidiogenous cell; (e) hyaline, striate conidia; (f–i) hyaline and brown, striate conidia, 1- and 3- septate conidia can be seen in f and g; (j) catenulate chlamydospores. Scale bars: $a = 250 \mu m$; b,c,e–i = 10 μm ; d = 5 μm ; j = 40 μm

Lasiodiplodia citricola Abdollahz., Javadi & A.J.L. Phillips, Persoonia: 25 (2010)

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Classification: Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Lasiodiplodia

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, produced on pine needles on WA within 2–4 wk, superficial, dark brown to black, covered with dense mycelium, mostly uniloculate, up to 2 mm diam, solitary, globose, thick-walled, non-papillate with a central ostiole. Paraphyses hyaline, cylindrical, thin-walled, initially aseptate, becoming up to 1-5 septate when mature, occasionally branched, rounded at apex, occasionally basal, middle or apical cells swollen, up to 125 µm long, 3–4 µm wide. Conidiophores absent. Conidiogenous cells holoblastic, discrete, hyaline, smooth, thin-walled, cylindrical, proliferating percurrently with 1–2 annellations, $11-16 \times 3-5 \mu m$. Conidia initially hyaline, aseptate, ellipsoid to ovoid, with granular content, both ends broadly rounded, wall $< 2 \mu m$, becoming pigmented, vertuculose, ovoid, 1-septate with longitudinal striations, $(20-)22-27(-31) \times (10.9-)12-17(-$ 19) μ m, 95% confidence limits = 24.1–24.9 × 15–15.7 μ m (av. ± S.D. = 24.5 ± 0.2 × 15.4 ± 1.8 μ m, l/w ratio = 1.6 ± 0.2). Colonies with abundant aerial mycelium reaching to the lid of Petri plate, aerial mycelium becoming smoke-grey (21""f) to olivaceous-grey (21""i) or iron-grey (23''''k) at the surface and greenish grey (33'''i) to dark slate blue (39'''k) at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 85 mm on MEA after 2 d in the dark at 25 °C. Cardinal temperatures for growth; min ≤ 10 °C, max ≥ 35 °C, opt 25–30 °C. This species produces a pink pigment in PDA cultures at 35 °C.

Host and Distribution: On twigs of *Citrus* sp., Mazandaran province, Chaboksar (IRAN 1522C = CBS 124707); Sari (IRAN 1521C = CBS 124706).

Molecular data: IRAN 1521C = CBS 124706 (ITS = GU945353, TEF = GU945339, TUB2 = KU887504, RPB2 = KU696350, CAL = KU886759); IRAN 1522C = CBS 124707 (ITS = GU945354, TEF = GU945340, TUB2 = KU887505, RPB2 = KU696351, CAL = KU886760).

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- Cruywagen, E.M., Slippers, B., Roux, J. and Wingfield, M.J., 2017. Phylogenetic species recognition and hybridisation in *Lasiodiplodia*: a case study on species from baobabs. *Fungal Biology*, 121(4), pp. 420–436.



Lasiodiplodia citricola: (a) conidiomata on pine needles in culture; (b) conidia developing on conidiogenous cells; (c) annellations on conidiogenous cell; (d) conidia developing on conidiogenous cells between paraphyses; (e) septate paraphyses; (f) hyaline, immature conidia; (g, h) mature conidia in two different focal planes to show the longitudinal striations. Scale bars: a = 1 mm; $b, c = 5 \mu \text{m}$; $d-h = 10 \mu \text{m}$

Lasiodiplodia gilanensis Abdollahz., Javadi & A.J.L. Phillips, Persoonia: 25 (2010)

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Classification: Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Lasiodiplodia

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, produced on pine needles on WA within 2–4 wk, superficial, dark brown to black, covered with dense mycelium, mostly uniloculate, up to 940 µm, solitary, globose, thick-walled, non-papillate with a central ostiole. Paraphyses hyaline, cylindrical, thin-walled, initially aseptate, becoming up to 1-3septate when mature, rarely branched, rounded at apex, up to 95 µm long, 2-4 µm wide. Conidiophores absent. Conidiogenous cells holoblastic, discrete, hyaline, smooth, thin-walled, cylindrical, $11-18 \times 3-5$ µm. Conidia initially hyaline, aseptate, ellipsoid to ovoid, with granular content, rounded at apex, base mostly truncate, wall $< 2 \mu m$, becoming pigmented, vertuculose, ellipsoid to ovoid, 1-septate with longitudinal striations, $(25.2-)28-35(-38.8) \times$ $(14.4-)15-18(-19) \mu m$, 95% confidence limits = $30.6-31.4 \times 16.5-16.7 \mu m$ (av. \pm S.D. = $31 \pm$ $2.4 \times 16.6 \pm 1 \mu m$, l/w ratio = 1.9 ± 0.2). Colonies with abundant aerial mycelia reaching to the lid of Petri plate, aerial mycelia becoming smoke-grey (21""f) to olivaceous-grey (21""i) at the surface and greenish grey (33""i) to dark slate blue (39"k) at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 80 mm on MEA after 2 d in the dark at 25 °C. Cardinal temperatures for growth; min ≤ 10 °C, max ≥ 35 °C, opt 25–30 °C. This species produces a pink pigment in PDA cultures at 35 °C.

Host and Distribution: On twigs of an unknown woody plant, Rahimabad-Garmabdost (IRAN 1501C = CBS 124705, IRAN 1523C = CBS 124704).

Molecular data: IRAN 1501C = CBS 124705 (ITS = GU945352, TEF = GU945341, TUB2 = KU887510, RPB2 = KU696356, CAL = KU886766); IRAN 1523C = CBS 124704 (ITS = GU945351, TEF = GU945342, TUB2 = KU887511, RPB2 = KU696357, CAL = KU886765).

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- Cruywagen, E.M., Slippers, B., Roux, J. and Wingfield, M.J., 2017. Phylogenetic species recognition and hybridisation in *Lasiodiplodia*: a case study on species from baobabs. *Fungal Biology*, 121(4), pp. 420–436.



Lasiodiplodia gilanensis: (a) conidiomata on pine needles in culture; (b) conidia developing on conidiogenous cells; (c) conidia developing on conidiogenous cells between paraphyses; (d) paraphyses; (e) hyaline, immature conidia; (f, g) mature conidia in two different focal planes to show the longitudinal striations. Scale bars: a = 1 mm; $b = 5 \mu\text{m}$; $c-g = 10 \mu\text{m}$

Lasiodiplodia hormozganensis Abdollahz., Zare & A.J.L. Phillips, Persoonia: 25 (2010)

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Classification: *Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Lasiodiplodia*

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, produced on pine needles on WA within 2–4 wk, superficial, dark-brown to black, covered with dense mycelium, mostly uniloculate, up to 950 µm, solitary, globose, thick-walled, non-papillate with a central ostiole. Paraphyses, hyaline, cylindrical, thin-walled, initially aseptate, becoming up to 1-7septate when mature, rarely branched, occasionally basal, middle or apical cells swollen, rounded at apex, up to 83 µm long, 2–4 µm wide. Conidiophores absent. Conidiogenous cells holoblastic, discrete, hyaline, smooth, thin-walled, cylindrical, $9-15 \times 3-5 \mu m$. Conidia initially hyaline, aseptate, ellipsoid to cylindrical, with granular contents, rounded at apex, base round or truncate, wall $< 2 \mu m$, becoming pigmented, vertuculose, ellipsoid to ovoid, 1-septate with longitudinal striations, $(15.3-)18-24(-25.2) \times 11-14 \mu m$, 95% confidence limits = 21.2-21.7 \times 12.4–12.6 µm (av. \pm S.D. = 21.5 \pm 1.9 \times 12.5 \pm 0.8 µm, l/w ratio = 1.7 \pm 0.2). Colonies with abundant aerial mycelium reaching to the lid of Petri plate, aerial mycelium becoming smokegrey (21^{'''}f) to olivaceous-grey (21^{'''}i) at the surface and greenish grey (33^{'''}i) to dark slate blue (39'''k) at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 83 mm on MEA after 2 d in the dark at 25 °C. Cardinal temperatures for growth; min \leq 10 °C, max \geq 35 °C, opt 25–30 °C.

Host and Distribution: On twigs of *Mangifera indica*, Rudan-Kheirabad (IRAN 1498C = CBS 124708, CJA 57); *Olea* sp., Rudan (IRAN 1500C = CBS 124709).

Molecular data: IRAN 1498C = CBS 124708 (ITS = GU945356, TEF = GU945344, TUB2 = KU887514, RPB2 = KU696360, CAL = KU886769); IRAN 1500C = CBS 124709 (ITS = GU945355, TEF = GU945343, TUB2 = KU887515, RPB2 = KU696361, CAL = KU886770); CJA 57 (ITS = GU945357, TEF = GU945345).

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Lasiodiplodia hormozganensis: (a) conidiomata on pine needles in culture; (b, c) conidia developing on conidiogenous cells between paraphyses; (d, e) paraphyses; (f) hyaline immature conidia; (g, h) mature conidia in two different focal planes to show the longitudinal striations. Scale bars: a = 1 mm; $b, c = 5 \mu\text{m}$; $d-h = 10 \mu\text{m}$

Lasiodiplodia iraniensis Abdollahz., Zare & A.J.L. Phillips, Persoonia: 25 (2010)

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Classification: *Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Lasiodiplodia*

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, produced on pine needles on WA within 2–4 wk, superficial, dark brown to black, covered with dense mycelium, mostly uniloculate, up to 980 µm, solitary, globose, thick-walled, non-papillate with a central ostiole. Paraphyses, hyaline, cylindrical, thin-walled, initially aseptate, becoming up to 1-6septate when mature, rarely branched, occasionally basal, middle or apical cells swollen, rounded at apex, up to 127 µm long, 2–4 µm wide. Conidiophores absent. Conidiogenous cells holoblastic, discrete, hyaline, smooth, thinwalled, cylindrical, $9-16 \times 3-5 \mu m$. Conidia initially hyaline, aseptate, subglobose to subcylindrical, with granular content, both ends rounded, wall $< 2 \mu m$, becoming pigmented, vertuculose, ellipsoid to ovoid, 1-septate with longitudinal striations, $(15.3-)17-23(-29.7) \times 11-14 \,\mu\text{m}$, 95% confidence limits = 20.6–20.8 × 13–13.1 μm (av. \pm S.D. = 20.7 \pm 2 \times 13 \pm 0.9 μ m, l/w ratio = 1.6 \pm 0.2). Colonies with abundant aerial mycelium reaching to the lid of Petri plate, aerial mycelium becoming smoke-grey (21""f) to olivaceous-grey (21''''i) at the surface and greenish grey (33'''i) to dark slate blue (39'''k) at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 80 mm on MEA after 2 d in the dark at 25 °C. Cardinal temperatures for growth; min ≤ 10 °C, max ≥ 35 °C, opt 25–30 °C. This species produces a pink pigment in PDA cultures at 35 °C.

Host and Distribution: On twigs of *Mangifera indica*, Hormozgan province (IRAN 921C), Minab-Hajikhademi (IRAN 1519C); *Citrus* sp., Minab-Hajikhademi (IRAN 1517C); *Salvadora persica*, Bandar Abbas-Geno mountain (IRAN 1520C = CBS 124710); *Juglans* sp., Gorgan-Toshan (IRAN 1502C = CBS 124711).

Molecular data: IRAN 921C (ITS = GU945346, TEF = GU945334); IRAN 1517C (ITS = GU945349, TEF = GU945337); IRAN 1519C (ITS = GU945350, TEF = GU945338); IRAN 1520C = CBS 124710 (LSU = MH874918, ITS = GU945348, TEF = GU945336, TUB2 = KU887516, RPB2 = KU696363, CAL = KU886771); IRAN 1502C = CBS 124711 (ITS = GU945347, TEF = GU945335, TUB2 = KU887517, RPB2 = KU696362, CAL = KU886772).

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Lasiodiplodia iraniensis: (a) conidiomata on pine needles in culture; (b) conidia developing on conidiogenous cells; (c, d) conidia developing on conidiogenous cells between paraphyses; (e) paraphyses; (f) hyaline, immature conidia; (g, h) mature conidia in two different focal planes to show the longitudinal striations. Scale bars: a = 1 mm; b, $c = 5 \mu \text{m}$, $d-h = 10 \mu \text{m}$

Lasiodiplodia pseudotheobromae A.J.L. Phillips, A. Alves & Crous, Fungal Divers.: 28.

(2008)

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Classification: Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Lasiodiplodia

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, produced on pine needles on WA within 2–4 wk, superficial, dark brown to black, covered with dense mycelium, mostly uniloculate, up to 700 μ m, solitary, globose, thick-walled, non-papillate with a central ostiole. Paraphyses, hyaline, cylindrical, thin-walled, initially aseptate, becoming up to 1–6 septate when mature, occasionally branched, up to 60 μ m long, 3–4 μ m wide. Conidiophores absent. Conidiogenous cells holoblastic, discrete, hyaline, smooth, thin-walled, cylindrical, 9– 15 × 3–6 μ m. Conidia initially hyaline, aseptate, ellipsoid to ovoid, with granular content, both ends rounded, wall < 2 μ m, becoming pigmented, vertuculose, 1-septate with longitudinal striations, (18–)21–27(–31.5) × (12.6–) 13–15 (–15.3) μ m, 95% confidence limits = 23.6–24.5 × 14–14.2 μ m (av. ± S.D. = 24 ± 2.3 × 14.1 ± 0.7 μ m, l/w ratio = 1.7 ± 0.2). Colonies with abundant aerial mycelium reaching to the lid of Petri plate, aerial mycelium becoming olivaceous-grey (21''''i) or iron-grey (23''''k) at the surface and greenish grey (33''''i) to dark slate blue (39''''k) at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 82 mm on MEA after 4 d in the dark at 25 °C. Cardinal temperatures for growth; min ≤ 10 °C, max ≥ 35 °C, opt 25–30 °C. This species produces a pink pigment in PDA cultures at 35 °C.

Host and Distribution: On twigs of *Citrus* sp., Hormozgan province, Minab-Hajikhademi (IRAN 1518C, CJA36).

Molecular data: IRAN 1518C (ITS = GU973874, TEF = GU973866); CJA36 (ITS = GU973875, TEF = GU973867).

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Lasiodiplodia pseudotheobromae: (a) conidiomata on pine needles in culture; (b, c) conidia developing on conidiogenous cells; (d, e) paraphyses; (f) hyaline and coloured, immature conidia; (h, i) mature conidia in two different focal planes to show the longitudinal striations. Scale bars: a = 1 mm; $b, c = 5 \mu \text{m}$, $d-i = 10 \mu \text{m}$

Lasiodiplodia theobromae (Pat.) Griffon & Maubl., Bull. Soc. Mycol. Fr.: 25 (1909)

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Synonym: *Botryodiplodia theobromae* Pat.; *Diplodia theobromae* (Pat.) W. Nowell; *Botryosphaeria rhodina* (Berk. & M.A. Curtis) Arx. Further synonyms are given by Phillips *et al.* (2013).

Classification: Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, produced on pine needles on WA within 2–4 wk, superficial, dark brown to black, covered with dense mycelium, mostly uniloculate, up to 960 µm, solitary, globose, thick-walled, non-papillate with a central ostiole. Paraphyses, hyaline, cylindrical, thin-walled, initially aseptate, becoming up to 1–4 septate when mature, unbranched, up to 58 µm long, 2–3 µm wide. Conidiophores absent. Conidiogenous cells holoblastic, discrete, hyaline, smooth, thin-walled, cylindrical, 9–13 × 3– 5 µm. Conidia initially hyaline, aseptate, ellipsoid to ovoid, with granular content, rounded at apex, base truncate, wall < 2 µm, becoming pigmented, verruculose, 1-septate with longitudinal striations, $(20.2-)22-25(-27.4) \times (11.5-)$ 12–14 (–15) µm, 95% confidence limits = 23.5–24.1 × 13.5–13.7 µm (av. ± S.D. = 23.8 ± 1.4 × 13.6 ± 0.7 µm, l/w ratio = 1.8 ± 0.1). Colonies with abundant aerial mycelium reaching to the lid of Petri plate, aerial mycelium becoming olivaceous-grey (21''''i) or iron-grey (23''''k) at the surface and greenish grey (33''''i) to dark slate blue (39''''k) at the reverse after 2 wk in the dark at 25 °C. Colonies reaching 80 mm on MEA after 4 d in the dark at 25 °C. Cardinal temperatures for growth; min ≤ 10 °C, max ≥ 35 °C, opt 25–30 °C. This species produces a pink pigment in PDA cultures at 35 °C.

Host and Distribution: On twigs of *Mangifera indica*, Hormozgan province, Minab-Hajikhademi (IRAN 1499C, IRAN 1496C); Unknown (IRAN 1233C, CJA198, CJA199); Fruits of *Cocos nucifera*, Tehran market (CJA279).

Molecular data: IRAN 1233C (ITS = GU973868, TEF = GU973860); IRAN 1496C (ITS = GU973869, TEF = GU973861); IRAN 1499C (ITS = GU973870, TEF = GU973862); CJA198 (ITS = GU973871, TEF = GU973863); CJA199 (ITS = GU973872, TEF = GU973864); CJA279 (ITS = GU973873, TEF = GU973865).

- Abdollahzadeh, J., Javadi, A., Goltapeh, E.M., Zare, R. and Phillips, A.J.L., 2010. Phylogeny and morphology of four new species of *Lasiodiplodia* from Iran. *Persoonia*, 25(1), pp. 1–10.
- Abdollahzadeh, J., 2009. Taxonomy and Phylogeny of the *Botryosphaeriaceae* in Iran. Ph. D. thesis. Tarbiat Modares University, 200 pp.



Lasiodiplodia theobromae: (a) conidiomata on pine needles in culture; (b) cross-section of pycnidia, (c, d) conidia developing on conidiogenous cells; (e) paraphyses; (f) hyaline, immature conidia; (g, h) mature conidia in two different focal planes to show the longitudinal striations. Scale bars: a = 1 mm; $b = 50 \text{ }\mu\text{m}$; $c = 5 \text{ }\mu\text{m}$, $d-h = 10 \text{ }\mu\text{m}$

Phaeobotryon cupressi Abdollahz., Zare & A.J.L. Phillips, Persoonia: 23 (2009)

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Classification: *Ascomycota, Pezizomycotina, Dothideomycetes, Botryosphaeriales, Botryosphaeriaceae, Phaeobotryon*

Description: Teleomorph: Unknown. Conidiomata stromatic, pycnidial, superficial, darkbrown to black, mostly unilocular on pine needles and up to 650 µm diam, mostly multilocular on Populus twigs, individual or aggregated, thick-walled, ostiolate. Ostiole central, circular, non-papillate. Paraphyses hyaline, thin-walled, arising from the conidiogenous layer, extending above the level of developing conidia, up to 42 μ m long, 4.8 μ m wide, usually aseptate, sometimes becoming up to 2-septate, tip rounded, occasionally branched. Conidiophores absent. Conidiogenous cells hyaline, smooth, thin-walled, cylindrical, 7–14 \times 2–5 μ m, holoblastic, phialidic, proliferating internally with visible periclinal thickening. Conidia thickwalled, initially hyaline, oval, both ends broadly rounded, aseptate, $(19.8-)21-28(-30) \times (10.2-)$ $11-15(-17) \mu m$, 95% confidence limits = 24.1-25 × 12.2-12.5 $\mu m (\chi - \pm S.D. = 24.8 \pm 1.9 \times 10^{-10})$ $12.4 \pm 1.3 \,\mu\text{m}$, l/w ratio = 2 ± 0.3), forming a single septum at germination, rarely becoming brown and 1-septate, internally verruculose when aged. Microconidiomata globose, dark-brown to black, superficial, occasionally immersed in pine needle or Populus tissue. Microconidiophores cylindrical, $7-13 \times 1.5-2.5 \mu m$, hyaline, aseptate becoming 1–2-septate, branched. Microconidiogenous cells hyaline, thin-walled, phialidic, proliferating internally, giving rise to periclinal thickening, $6-10 \times 1-2 \mu m$. Microconidia oval, thin-walled, hyaline, aseptate $2-4 \times 1-2$. Chlamydospores intercalary, brown, smooth, thick-walled, formed within the agar medium. Colonies with abundant aerial mycelium towards periphery, appressed in the centre, becoming grey-olivaceous to olivaceous-grey at the surface, and greyolivaceous in reverse after 2 wk in the dark at 25 °C. Colonies on MEA reaching 46–53 mm diam after 4 days in the dark at 25 °C. Cardinal temperatures for growth; min 5 °C, max > 35 °C, opt 25 °C.

Host and Distribution: On twigs and cones of *Cupressus sempervirens*, Golestan province, Gorgan (IRAN 1454C, IRAN 1455C, IRAN 1456C, IRAN 1457C, IRAN 1458C).

Molecular data: IRAN 1454C (ITS = FJ919673, TEF = FJ919662); IRAN 1455C = CBS 124700 (LSU = KX464538, ITS = FJ919672, TEF = FJ919661, TUB2 = KX465066, RPB2 = KX464055); IRAN 1456C (ITS = FJ919670, TEF = FJ919659); IRAN 1457C (ITS = FJ919669, TEF = FJ919658); IRAN 1458C = CBS 124701 (LSU = KX464539, ITS = FJ919671, TEF = FJ919660, TUB2 = KX465067, RPB2 = KX464056).

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- Phillips, A.J.L., Alves, A., Abdollahzadeh, J., Slippers, B., Wingfield, M.J., Groenewald, J.Z. and Crous, P.W., 2006. The *Botryosphaeriaceae*: genera and species known from culture. *Studies in Mycology*, 55(1), pp. 53–63.

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Phaeobotryon cupressi: (a) conidiomata formed on pine needles in culture; (b, c) c on conidiogenous cells; (d) paraphyses and developing conidia; (e, f) spermatogenous cells; (g) spermatia; (h) hyaline immature conidia; (i) mature and germinated, hyaline and septate or aseptate conidia; (j, k) mature, brown septate or aseptate conidia in two different focal planes to show vertuculose inner surface of the wall; (l) brown chlamydospores. Scale bars: $a = 500 \mu m$, b, d, h–j, $l = 10 \mu m$, c, g, $k = 5 \mu m$, e, $f = 2.5 \mu m$



Conidiocarpus guilanensis Khodap., in Khodaparast, Pourmoghaddam, Amirmijani & Byrami, Mycol. Progr. 19(2): 161 (2020)

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Classification: Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Capnodiales, Capnodiaceae, Conidiocarpus

Description: Saprobic on insect exudates and producing a black sooty-like covering on the surface of leaves. Thallus consisting of a hyphal network on plant leaves, composed of brown hyphae. Hyphae more or less cylindrical, conspicuously mucilaginous and anastomosing, closely septate with age, with subcylindric, globose, pyriform or irregular wider small cell, up to 12 μ m diameter. Pycnidia elongate, (225) 290–425 μ m high, with a long stalk measuring 75–150 (250) × 22–40 μ m, a lengthened neck, 20–100 μ m in height, 25–42 μ m in diameter, ostiolate and with a fimbriate apex. Pycnidial cavity ellipsoid, 100–150 × 40–70 μ m, bearing hyaline, continuous conidia. Conidia ellipsoid, subcylindric, subclavate, with two guttules, 4–5.5 (6.5) × 1.5–2 μ m. Colony up to 5 mm diam at 25 °C on MEA after 10 d in darkness; superficial, with entire edge, olivaceous to green; aerial hyphae with thin and inconspicuous septum, usually not constricted at septum, branched, clearly verrucose, pale brown to brown, cylindrical, becoming thick-walled, 2–4 μ m wide.

Host and Distribution: On living leaves of *Citrus sinensis* Pers., Guilan prov., Langaroud (GUM 1594), ex-holotype culture IRAN 2474 C.

Molecular data: IRAN 2474 C (ITS= MG906804, LSU = MG920032, *TEF1-a* = MG963905); IRAN 2475C (ITS = MG906805, LSU = MG920033).

Reference:

Khodaparast, S.A., Pourmoghaddam, M.J., Amirmijani, A. and Byrami, F., 2020. Phylogenetic structure of the Iranian capnodiaceous sooty mould fungi inferred from the sequences of rDNA regions and TEF1-a. *Mycological Progress*, *19*(2), pp. 155–169.



Conidiocarpus guilanensis: (a) network hyphae on plant leaves (holotype); (b) hyphae on MEA; (c) pycnidia; (d) conidia (ex-holotype strain IRAN 2474 C). Scale bars: a, b = 50 μ m; c = 100 μ m; d = 20 μ m
Scorias spongiosa (Schwein.) Fr., Syst. mycol. (Lundae) 3(2): 291 (1832)

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Classification: Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Capnodiales, Readerielliopsidaceae, Scorias

Description: Saprobic on insect exudates and producing a black sooty-like covering on the surface of leaves. Mycelium consisting of a network of cylindrical and septate hyphae. Conidiomata pycnidial, scattered, brown to blackish brown, wall synnematous, comprising mostly of cylindrical cells, tapering to the apex, flask-shaped, total pycnidium length 250–550 μ m, with a flattened stalk, stalks about 80-170 x 35–140 μ m, continue to a conidiogenous zone, conidiogenous zone sub-ellipsoid, darker than other parts, (50-) $75-112 \times 36-62 \mu m$, extended into a neck, neck subcylindrical, 92–275 µm long, about 12–20 µm wide at base, and 10-13 µm apex; ostiole surrounded by hyaline hyphae about 10–25 µm. Conidia gathered in a slimy mass around ostiole, hyaline, ellipsoid, cylindric to subcylindric, rounded at both ends or pointed at the base, smooth, 1-celled, 2 guttules, $3.5-5.5 \times 1.5-2 \mu m$. Colony becoming up to 7 mm diam at 25 °C on PDA after 10 d, about 17.3 mm on MEA after 14 d in the darkness; superficial, flat, with entire edge, olivaceous to green, producing a characteristic spreading red-purple pigment in plate, showed a color change of the medium away from the original plate after subculturing; aerial hyphae at fiest with thin and inconspicuous septa, usually not constricted, branched, smooth to slightly vertucose, pale brown to brown, cylindrical to sub-cylindrical, hyphae becoming thick-walled, pale broun to olivaceous, constricted at septa, about 3–5 µm wide. Total pycnidium length 450-900 µm, stalks 120–600 µm long, and 50–125 µm wide, conidiogenous zone usually conspicuous, darked, sub-ellipsoid, ellipsoid, $150-230 \times 55-150 \mu m$, neck 137– $375 \,\mu\text{m}$ long, 17-30 near the base, tapering toward the apex, apex about $11-18 \,\mu\text{m}$ wide, hyaline hyphae around ostioles about 17–37 µm long. Conidia gathered in a slimy mass around ostiole, hyaline, ellipsoid, cylindric, subcylindric, 2 guttules, (-2.5) $3-4 \times 1-2$ (-2.5) µm. Pycnidia produced abundantly on the surface of the MEA plate.

Host and Distribution: On living leaves of *Citrus sinensis* Pers., Guilan province, Langaroud (GUM 1301).

Molecular data: IRAN 2470C (ITS = MG920025, LSU = MG920049, *TEF1-a* = MG989708)



Scorias spongiosa: (a–c) pycnidia; (d) conidia; (e) pycnidium neck. Scale bars: a–c = 100 μ m; d = 20 μ m; e = 50 μ m



Scorias spongiosa: (a–d) different type of pycnidia produced on Malt Extract Agar; (e) conidia. Scale bars: $a-c = 200 \ \mu m$; $d = 100 \ \mu m$; $e = 5 \ \mu m$

Reference:

Khodaparast, S.A., Byrami, F., Pourmoghadam, M.J., Amirmijani, A.R. and Salimi, M., 2015. A furthercontribution to the knowledge of sooty mould fungi from Iran. *Mycologia Iranica*, *2*(1), pp. 46–58.



Knufia perfecta Mehrabi, B. Asgari & Hemmati, Nova Hedwigia 106 (3-4): 523 (2018)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Chaetothyriomycetidae, Chaetothyriales, Trichomeriaceae, Knufia*

Description: Saprobic on dead branches. Teleomorph: Ascomata sessile, spherical, brown, uniloculate, ostiolate (often conical or papillate, 20-32 µm wide), solitary, scattered to gregarious, partially immersed to superficial, globose to subglobose, black, opaque, $75-135 \mu m$ diam, occasionally covered with simple, hyaline, blunt-ended setae, $5-8 \times 2-3 \mu m$; a few light brown, septate hyphae are sometimes present on the lower half of ascomata. Peridium pale brown to brown, comprises several layers of cells of textura angularis, 5-8 µm diam. Hamathecium comprising a few filiform, evanescent pseudoparaphyses, $55-75 \times 0.7-1.2$ µm. Asci $50-70 \times (11-)13-16 \mu m$, clavate, cylindrical to obpyriform, bitunacate, sessile, 8-spored, with an ocular chamber, $3.3-5.3 \times 1.9-2.1 \mu m$. Ascospores overlapping, 2- to 4-seriate, thickwalled, ellipsoidal to fusiform, with rounded ends, $14-18 \times 5-6$ µm, 1- to 3-septate, smooth, hyaline or faintly pigmented, mostly constricted at the septa; without mucilaginous sheath. Anamorph: Hyphae hyaline, cylindrical, smooth, septate, sometimes anastomosing, 3-4 µm wide at first, then becoming light to dark brown, $4-6.5 \,\mu\text{m}$ wide, constricted at the septum, moniliform. Multicellular bodies, even present in the host peridermal region, developing from hyphal cells as well as detached conidia, 8-14(-18) µm diam. Chlamydospore like hyphal swellings developing intercalary and/or terminally, globose, ellipsoidal or irregularly-shaped, brown to dark brown, uni- or multi-cellular (up to 4 cells) $6-17.4 \mu m$ diam, sometimes with dark brown fragmented crusts on their surface. Conidia thallic-arthric, blastic or endogenous; thallic-arthric conidia formed by septum schizolysis, hyaline, 0-3-septate, cylindrical or moniliform, $6-15(-23) \times 3.3-4.8$ µm; blastic conidia arising holoblastically from undifferentiated hyphal cells or from apical cells of thallic-arthric conidia, hyaline to dark brown, globose to subglobose, (4-)7-10(-13) µm diam; endoconidia aseptate, globose to ellipsoidal, hyaline to pale brown, 3.5-5.5(-7) µm, 1-7 in each maternal cell, formed in undifferentiated apical or intercalary hyphal cells or in muriform, multicellular bodies. Colonies slow-growing, on PDA and MEA reaching 5–6 mm after 1 mt at 20 °C, first blackish-gray, then becoming blackish-brown, raised, velvety, often deeply immersed into the agar, margins irregular, reverse black.

Host and Distribution: On dead branches of *Juglans regia* L., East Azerbaijan province, Jolfa (holotype IRAN 16771F, ex-type culture IRAN 2553C).

Molecular data: IRAN 2553C (ITS = MF062036, LSU = MF062037, SSU = MF062038).

References:

Mehrabi, M., Asgari, B. and Hemmati, R., 2018. *Knufia perfecta*, a new black yeast from Iran, and a key to *Knufia* species. *Nova Hedwigia*, 106(3–4), pp. 519–534.

Hutchison, L.J., Untereiner, W.A. and Hiratsuka, Y., 1995. *Knufia cryptophialidica* gen. et sp. nov., a dematiaceous hyphomycete isolated from black galls of trembling aspen (*Populus tremuloides*). *Mycologia*, 87, pp. 902–908.



Knufia perfecta (Teleomorph): (a–d) ascomata on dead branches of *Juglans regia*; (e) seta; (f, g) outer surface of peridium; (h) multicellular bodies at the base of ascomata on natural substrate; (i–k) asci and pseudoparaphyses; (l) ascus tip with an ocular chamber; (m–o) ascospores. Scale bars: a, b 200 = μ m; c, d = 100 μ m; i = 40 μ m; j, k = 20 μ m; e–h, l–o = 10 μ m



Knufia perfecta (Aanamorph): (a) colony on MEA, incubated for 2 months at 20 °C; (b) reverse; (c) colony on PDA, incubated for 2 months at 20 °C; (d) reverse; (e) cylindrical, branched hyphae; (f) anastomosing hyphae; (g) catenate, moniliform hyphae; (h) thallic-arthric conidia seceding by septum schizolysis (arrow); (i) blastic conidia arising terminally or laterally from hyphae; (j) chlamydospore-like hyphal swellings; (k, l) endoconidia developed within intercalar and terminal cells (m, n) darkly pigmented, muriform, multicellular bodies containing endoconidia; (o, p) ruptured multicellular bodies and endoconidia. Scale bars: e–g = 20 μ m; h–p = 10 μ m



Cladosporium cladosporioides (Fresen.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 57 (1952)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores arising terminally and laterally from hyphae, solitary, erect, straight to slightly flexuous, cylindrical-oblong, non-nodulose, unbranched or rarely branched, $27-160(-170) \times (2.5-)3-4 \mu m$, with up to 8 septa, pale to medium olivaceous-brown, smooth to verruculose-verrucose, walls slightly thickened. Conidiogenous cells integrated, mostly terminal, sometimes intercalary with short lateral denticulate outgrowths just below a septum, cylindrical-oblong, sometimes slightly geniculate, up to $40(-42) \mu m \log$, with $1-4(-5) \log a$ the apex, sometimes subdenticulate to denticulate, protuberant, 1-2(-2.5) µm diam, thickened. Ramoconidia cylindrical-oblong, $20-40(-44) \times (2.5-)3-4 \mu m$, 0-1-septate, base broadly truncate 2–3.5 µm wide. Conidia catenate, in branched chains, branching in all directions, up to 9–10 conidia (mostly up to 6 conidia) in the unbranched terminal part of the chain, small terminal conidia obovoid, occasionally subglobose, $3.5-5 \times (2-)2.5-3$ µm, aseptate, apex usually broadly rounded, intercalary conidia ovoid, limoniform to ellipsoid-ovoid, $5-11 \times 2.5-$ 3.5(-4) µm, aseptate, with 1–3 distal hila, rarely up to 4, apex and base often rounded or attenuated, secondary ramoconidia ellipsoid, ovoid, subcylindrical to cylindrical-oblong or somewhat irregular, $8-30(-32) \times (2.5-)3-4(-4.5) \mu m$, with 0–2-septa, not constricted at septa, with 2-4(-5) distal hila crowded at the apex, sometimes olivaceous-brown, almost smooth or coarsely vertuculose to vertucose, hila more or less conspicuous, subdenticulate to denticulate, (0.5–)1–1.5 µm diam, thickened, occasionally microcyclicconidiogenesis occurring. Colonies on PDA attaining 6–7 cm diam after 14 d, surface olivaceous-grey and reverse olivaceous black with white margin, regular, aerial mycelium abundant, sporulation profuse. On MA reaching 8 cm diam after 14 d, surface pale olivaceous-grey and reverse iron-grey with white margins, aerial mycelium loose to dense, sporulation profuse. On SNA plates mycelia immersed and superficial, loosely branched, $1-4 \mu m$ wide, septate, mostly without swellings and constriction at septa but sometimes distinctly constricted due to swellings, subhyaline to pale or medium olivaceous-brown, smooth to minutely vertuculose or vertuculose, walls unthickened, sometimes anastomosing of few hyphae.

Host and Distribution: On living leaves of *Dianthus* sp., Markazi province, Mahalat (IRAN 2874C); on decaying bulb of *Allium cepa* L., Kerman province, Jiroft (IRAN 2875C); on *Glycine max* (L.) Merr., Golestan province, Gland (IRAN 2876C); on *Glycine max* (L.) Merr.; KordKoy (IRAN 2877C).

Molecular data: Not available.

Note: Cladosporium cladosporioides s. lat. is one of the largest complexes among Cladosporium species. The members of this group are very common and widespread saprobes (Bensch *et al.* 2010). C. cladosporioides s. str. is well-distinguished from other Cladosporium species by its long branched chain of conidia in the unbranched terminal part of the chain and wider ramoconidia (3–5 μ m) (Bensch *et al.* 2010, 2012). According to Bensch *et al.* (2012) conidiogenous cell attaining up to 30 μ m but in the Iranian specimens examined had longer conidiogenous cells (up to 42 μ m).

- Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus Cladosporium. Studies in Mycology, 72, pp. 1–401.
- Bensch, K., Groenewald, J.Z., Dijksterhuis, J., Starink-Willemse, M., Andersen, B., Summerell B.A., Shin, H-D., Dugan, F.M., Schroers, H.-J., Braun, U. and Crous, P.W., 2010. Species and ecological diversity within the *Cladosporium cladosporioides* complex (Davidiellaceae, Capnodiales). *Studies in Mycology*, 67, pp. 1–94.



Cladosporium cladosporioides: (a) conidiophore; (b) Ramoconidia; (c–d) denticulate loci at the apex of conidiophore; (e) small terminal conidia. Scale bars = $10 \ \mu m$

Cladosporium halotolerans Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 172 (2007)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores solitary, arising laterally and terminally from hyphae, erect, straight to somewhat flexuous, narrowly cylindrical-oblong, non-nodulose, rarely attenuated towards the apex, usually unbranched, $(28-)30-140(-150) \times (2-)2.5-3 \mu m$, with up to 4 septa, septa often appearing darkened, septa not constricted, pale olivaceous-brown, smooth to minutely verruculose, walls unthickened. Conidiogenous cells integrated, terminal or sometimes also intercalary, cylindrical, (8-)9-25(-30) µm long, usually neither geniculate nor nodulose, up to three protuberant, subdenticulate or denticulate conidiogenous loci, 1-1.5 µm diam. Ramoconidia rarely occurring, $16-20 \times 2.5(-3) \mu m$, with three septa, base truncate, about 2.5 µm wide. Conidia catenate, in branched chains, conidial chains branching in all directions, terminal chains with up to 5-6 conidia, small terminal conidia globose or subglobose, 2-2.5(-3) $\times 2-3$ µm, aseptate, intercalary conidia subglobose, ovoid or ellipsoid, (3-)4-10 \times (2-)2.5-3 µm, aseptate or rarely one septate, pale to medium brown, minutely vertuculose or verruculose, secondary ramoconidia ellipsoid, fusiform, $8-24(-27) \times 2-2.5(-3) \mu m$, 0-1(-3)septate, mostly 1-septate, not constricted at septa, septa often somewhat darkened, pale to medium brown, almost smooth or minutely verruculose, walls unthickened, with 3-4 distal hila, hila protuberant, subdenticulate or denticulate, $(0.5-)1-1.5 \mu m$ diam, thickened and darkened, microcyclicconidiogenesis not occurring. Colonies on PDA attaining 5-6 cm diam after 14 d, surface olivaceous-grey and reverse olivaceous-black, margins white, regular, aerial mycelium absent, growth flat with a somewhat elevated colony centre, sporulation profuse. On MA attaining 5 cm diam after 14 d, surface pale olivaceous-grey and reverse olivaceous-grey, margins white, colony centre furrowed, aerial mycelium absent, sporulation profuse. On SNA plates mycelia slightly superficial and sparingly branched, (1-)2-3(-4) µm wide, pluriseptate, pale brown or pale olivaceous-brown, almost smooth or minutely vertuculose, walls unthickened.

Host and Distribution: On leaves of Aloe sp., Guilan province, Rasht (IRAN 2878C).

Molecular data: Not available.

Note: Cladosporium halotolerans is possibly cosmopolitan (Zalar *et al.* 2007 & Bensch *et al.* 2012). This species belongs to the *C. sphaerospermum* complex and morphologically is very close to this species but it differs from *C. sphaerospermum* by having slender conidia (2.5–3 μ m).

References:

Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *Cladosporium. Studies in Mycology*, 72, pp. 1–401.

Zalar, P.D., De Hoog, G.S., Schroers, H.J., Crous, P.W., Groenewald, J.Z. and Gunde-Cimerman, N., 2007. Phylogeny and ecology of the ubiquitous saprobe *Cladosporium sphaerospermum*, with descriptions of seven new species from hypersaline environments. *Studies in Mycology*, 58, pp. 157–183.



Cladosporium halotolerans (a) conidiophore; (b–c) small terminal conidia and secondary ramoconidia. Scale bars = $10 \ \mu m$

Cladosporium herbarum (Pers.: Fr.) Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 7: 37. 1816: Fr., Syst. Mycol. 3(2): 370 (1832)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores mostly arising terminally and sometimes laterally from hyphae, solitary, straight to distinctly geniculate, with several uni- and bilateral swellings, unbranched, $20-190(-211) \times 3-5 \ \mu\text{m}$, swellings $5-8(-9) \ \mu\text{m}$ wide, with several septa, brown, smooth to minutely verruculose, walls somewhat thickened, sometimes appearing two-layered. Conidiogenous cells integrated, terminally or intercalary, geniculate-sinous, conidiogenous loci confined to swellings, up to 27 μ m long, with several loci per cell, $(1-)1.5-2 \ \mu\text{m}$ diam, somewhat darkened. Ramoconodia not observed. Conidia numerous and catenate, up to 3 conidia in the unbranched terminal part of the chain, small terminal conidia subglobose, obovoid, $5-9 \times 3-6 \ \mu\text{m}$, aseptate, intercalary conidia obovoid, ellipsoid, limoniform, $8-14(-17) \times (-4)5-6(-7) \ \mu\text{m}$, 0(-1)-septate; secondary ramoconidia ellipsoid, cylindrical, $13-25(-28) \times (3.5-)5-8(-9) \ \mu\text{m}$, 0-1(-3)-septate, septa somewhat appearing two-layered and slightly sinuous, brown, distinctly vertuculose, walls thickened. Microcyclic conidiogenes is occurring.

Colonies on PDA attaining 3.5 cm diam after 14 d, surface olivaceous-grey and reverse olivaceous-black, margins white, regular, aerial mycelium low, sporulation profuse. On SNA plates mycelia slightly immersed and superficial, unbranched or rarely branched, $1.5-4.5 \mu m$ wide, septate, sometimes slightly constricted at septa, pale brown, smooth to minutely verruculose, walls unthickened.

Host and Distribution: On leaves of *Olea europaea* L., Guilan province, Roudbar (IRAN 2879C).

Molecular data: Not available.

Note: According to Schubert *et al.* (2007) *Cladosporium herbarum* is one of the most common and widespread cosmopolitan hyphomycetes in the word. *C. herbarioides* is morphologically similar to *C. herbarum* but easily distinguishable from it by having longer and wider conidia.

- Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *cladosporium. Studies in Mycology*, 72, pp. 1–401.
- Schubert, K., Groenewald, J.Z., Braun, U., Dijksterhuis, J., Starink, M., Hill, C.F., Zalar, P., De Hoog, G.S. and Crous, P.W., 2007. Biodiversity in the *Cladosporium herbarum* complex (*Davidiellaceae*, *Capnodiales*), with standardisation of methods for *Cladosporium* taxonomy and diagnostics. *Studies in Mycology*, 58, pp. 105–156.



Cladosporium herbarum: (a) conidiophore; (b) microcyclic conidiation;(c) conidia. Scale bars = $10 \ \mu m$

Cladosporium macrocarpum Preuss, in Sturm, Deutsch. Fl. 3(26): 27 (1848)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores mostly arising terminally and sometimes laterally from hyphae, solitary (in vivo fasciculate), straight to distinctly geniculate, with several uni- and bilateral swellings in short and irregular distances, unbranched, up to 300 μ m long and 4–5.5(–6) μ m wide, swellings 6-10(-11) µm wide, with several septa, brown, smooth to minutely verruculose, walls somewhatthickened, sometimes appearingtwo-layered. Conidiogenous cells integrated, terminally or intercalary, geniculate-sinous, conidiogenous loci confined to swellings, up to 49 µm long, with up to 10(-11) loci per cell, (1-)1.5-2 µm diam, somewhat darkened. Ramoconodia not observed. Conidia numerous and catenate, up to 4 conidia in the unbranched terminal part of the chain, small terminal conidia subglobose, obovoid or ellipsoid, $5-7(-9) \times 4-6 \mu m$, aseptate, intercalary conidia ellipsoid, fusiform, $10-16(-18) \times (-5)6-9 \mu m$, 0-1(-2)-septate; secondary ramoconidia ellipsoid, subcylindrical to cylindrical, $14-25(-27) \times$ (5-)6-8(-9) µm, 0-3-septate, septa somewhat appearing two-layered and slightly sinuous, brown, distinctly verticulose, walls thickened, with 2-3 apical hila, hila protuberant, 1-2µmdiam, somewhat thickened and darkened. Microcyclicconidiogenesis occurring. Colonies on MEA, up to 3 cm diam after 1 wk, dark olive green, margins white, reverse black, aerial mycelium low; sporulation abundant. On SNA plates mycelia immersed and superficial, unbranched or rarely branched, $2-5 \mu m$ wide, septate, sometimes slightly constricted at septa, pale brown, smooth, walls unthickened.

Host and Distribution: Saprobic on fruit of *Lycopersicon esculentum* Mill., Guilan province, Rasht (IRAN 2880C).

Molecular data: Not available.

Note: This species is morphologically close to *C. herbarum*, but is finely distinguished by having wider swellings of conidiophores (5–10 μ m) and broader, more frequently septate conidia.

References:

Amirmijani, A.R., Khodaparast, S.A. and Zare, R., 2015. Additions to the knowledge of the genus *Cladosporium* in Iran. *Mycologia Iranica*, 2(1), pp. 11–21.

Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *Cladosporium. Studies in Mycology*, 72, pp. 1–401.



Cladosporium macrocarpum: (a) conidiophores *in vivo*; (b) conidiophores *in vitro*; (c) microcyclic conidiogenesis; (d) colony on fruit of *Lycopersicon esculentum*; (e) protuberant hila of conidiogenous cell; (f) branched chains of conidia. Scale bars = $10 \mu m$

Cladosporium oxysporum Berk. & M.A. Curtis, J. Linn. Soc., Bot. 10: 362 (1869)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores solitary, arising terminally and laterally from hyphae, erect, straight to slightly flexuous, distinctly torulose and nodulose, up to 7 nodes per conidiophore, swellings (4-)4.5-6 µm wide, unbranched, sometimes with short lateral denticulate or long branches (up to 30 µm long), conidiophores long, (30–)50–610(–700) µm, (2.5–)3–4 µm wide, at the base up to 5 μ m wide, occasionally slightly attenuated towards the apex, pluriseptate, not constricted at septa, olivaceous-brown, sometimes dark brown, often paler at the apex, smooth, walls somewhat thick-walled, about $0.5(-1) \mu m$ wide. Conidiogenous cells integrated, terminal and intercalary, with a single node, conidiogenous loci confined to these swellings, with 1-4(-5) loci per node, (11-)13-37(-48) µm long, loci conspicuous, subdenticulate, (<1-)1-1.5 μ m diam, somewhat thickened. Ramoconidia rarely occurring, $35-44 \times 3-4.5$ with 0-3 septa, base broadly truncate, 3-4 um wide. Conidia catenate in branched, chains, up to seven conidia in the terminal unbranched part of the chain, branching in all directions, small terminal conidia subglobose to obovoid, $(1.5-)2-3 \times 3-4(-5)$ µm, aseptate, apex rounded, intercalary conidia ovoid, limoniform to ellipsoid, $(6-)8-11(-14) \times 3-4(-4.5) \mu m$, aseptate, rarely 1-septate, with 2-4(-6) distal hila, attenuated towards apex and base, secondary ramoconidia ellipsoid to subcylindrical, $(9-)11-22(-27) \times 3-4(-4.5) \mu m$, 0-1(2)-septate, not constricted at septa, pale olivaceous to pale olivaceous-brown, smooth, walls unthickened, with up to 4-5 distal hila, subdenticulate, 1-1.5(-2) µm diam thickend. Microcyclic conidiogenesis occurring with conidia forming secondary short or long conidiophores. Colonies on PDA attaining 7-8 cm diam after 14 d, surface pale olivaceous-grey and reverse olivaceous-black, margins white and glabrous, aerial mycelium abundant, sporulation profuse. Colonies on MA attaining 7 cm diam after 14 d, surface pale olivaceous-grey and reverse olivaceous-grey to black, margins colorless to whitish, glabrous, regular, aerial mycelium abundant, sporulation more or less profuse. On SNA plates mycelium internal and superficial, hyphae loosely branched, 1-3.5(-5) µm wide, septate, rarely constricted at septa, subhyaline to pale olivaceous, darker towards the base of the conidiophores, pale olivaceous-brown, smooth to verrucose specially at the base of conidiophores, walls unthickened.

Host and Distribution: On leaves of *Citrus* sp. infected with sooty mould, Guilan province, Komoleh (IRAN 2881C); on leaves of *Citrus* sp. Guilan province, Komoleh (IRAN 2882C).

Molecular data: Not available.

Note: Based on Bensch *et al.* (2010, 2012) *Cladosporium oxysporum* is close to *C. herbarum* complex by having torulose and nodulose conidiophores but it is easily distinguishable from this complex by its relatively small, smooth to slightly vertucose conidia. Morphologically it belongs to the *C. cladosporioides* s. lat. species complex that is distinguishable from other members of this group by its small terminal, subglobose conidia.

- Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *Cladosporium. Studies in Mycology*, 72, pp. 1–401.
- Bensch, K., Groenewald, J.Z., Dijksterhuis, J., Starink-Willemse, M., Andersen, B., Summerell B.A., Shin, H-D., Dugan, F.M., Schroers, H.-J., Braun, U. and Crous, P.W., 2010. Species and ecological diversity within the *Cladosporium cladosporioides* complex (Davidiellaceae, Capnodiales). *Studies in Mycology*, 67, pp. 1–94.



Cladosporium oxysporum: (a) conidiophore; (b) conidia and microcyclic conidiogenesis; (c) branches of conidiophore; (d) ramoconidium. Scale bars: a = 50; $b-d = 10 \mu m$

Cladosporium perangustum Bensch, Crous & U. Braun, Stud. Mycol. 67: 65 (2010)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores solitary, arising terminally and laterally from hyphae, erect, straight or slightly flexuous, narrowly cylindrical-oblong, without any torulose or nodulose, unbranched, occasionally branched, once or several times, branches short, peg-like or up to 44 μ m long, conidiophores 17–138(–160) × (2–)2.5–3.5(–4) μ m, 0–6-septate, usually not constricted at septa, occasionally septa darkened, subhyaline, pale olivaceous, walls at the base of conidiophores, vertuculose and towards the apex smooth or almost so, walls unthickened or slightly thickened, about 0.5 µm wide. Conidiogenous cells integrated, mainly terminal, narrowly cylindrical-oblong, sometimes geniculate-sinuous, non-nodulose, up to 42 µm long, with up to 4–5 apically crowded loci, conspicuous, subdenticulate to denticulate, 1-1.5(-2) µm diam, thickened. Ramoconidia cylindrical-oblong, $(17-)25-29(-36) \times 2.5-3 \mu m$, aseptate, rarely 1-septate, base truncate, 2-2.5(-3) µm wide, sometimes slightly darkened. Conidia numerous, catenate, in branched chains, branching in all directions, 1-4(-5) conidia in the terminal unbranched part of the chain, small terminal conidia, subglobose or ovoid to obovoid, $3-4(-4.5) \times 2-2.5(-3)$ µm, apex broadly rounded or slightly attenuated, intercalary conidia ovoid, limoniform to ellipsoid, somewhat fusiform or subcylindrical, $(4-)5-12(-15) \times$ $2-3(-3.5) \mu m$, 0(-1)-septate, attenuated towards apex and base, with 1–3 distal hila, secondary ramoconidia narrowly ellipsoid to cylindrical-oblong, $(8-)9-30(-33) \times 2-3(-4)$, 0-1(-2)septa, with up to 4-5 distal hila, pale olivaceous-brown, smooth or almost so to finely vertuculose, thin-walled, hila conspicuous, subdenticulate to denticulate, $(<1-)1-1.5(-2) \mu m$ diam, microcyclicconidiogenesis occurring. Colonies on PDA attaining up to 7 cm diam after 14 d, surface grey-olivaceous and reverse iron-grey to olivaceous-black, margins white and glabrous, aerial mycelium diffuse, sporulation profuse. Colonies on MA reaching up to 8 cm diam after 14 d, surface grey-olivaceous and reverse olivaceous-grey to iron-grey, margins white and glabrous, aerial mycelium abundant, sporulation profuse. On SNA plates mycelium internal and superficial, hyphae filiform, loosely branched, (1-)1.5-3(-4) µm wide, septate, sometimes slightly constricted at septa, sometimes irregular due to intercalary swellings and constrictions, occasionally slightly geniculate-sinuous, subhyaline to pale olivaceous, smooth to vertuculose specially at the base of conidiophores, walls unthickened.

Host and Distribution: On dead leaves of *Citrussp*, Guilan province, Malat (IRAN 2883C); on dead leaves of *Citrus* sp. Guilan province, Pareshkooh (IRAN 2884C); On dead parts of stem of *Phragmites* sp., Guilan province, Siahroud (IRAN 2885C).

Molecular data: Not available.

Note: According to Bensch *et al.* (2010) *Cladosporium perangustum* is a common and widespread saprobic species that belongs to *C. cladosporioides* s. lat. Due to its globose or subglobose terminal conidia *C. perangustum* is close to *C. sphaerospermum*, but it is distinct by its slender conidiophores, ramoconidia and secondary ramoconidia (Zalar *et al.* 2007).

- Bensch, K., Groenewald, J.Z., Dijksterhuis, J., Starink-Willemse, M., Andersen, B., Summerell B.A., Shin, H-D., Dugan, F.M., Schroers, H.-J., Braun, U. and Crous, P.W., 2010. Species and ecological diversity within the *Cladosporium cladosporioides* complex (Davidiellaceae, Capnodiales). *Studies in Mycology*, 67, pp. 1–94.
- Zalar, P.D., De Hoog, G.S., Schroers, H.J., Crous, P.W., Groenewald, J.Z. and Gunde-Cimerman, N., 2007. Phylogeny and ecology of the ubiquitous saprobe *Cladosporium sphaerospermum*, with descriptions of seven new species from hypersaline environments. *Studies in Mycology*, 58, pp. 157–183.



Cladosporium perangustum: (a) conidiophore; (b) conidia; (c) secondary ramoconidia. Scale bars = $10 \ \mu m$

Cladosporium pseudocladosporioides Bensch, Crous & U. Braun, Stud. Mycol. 67: 71 (2010)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores solitary, arising terminally and laterally from hyphae, erect, straight, cylindrical-oblong, non-nodulose, sometimes geniculate-sinuous, unbranched or branched, branches often short denticle-like lateral outgrowth just below a septum or long about 70 µm, conidiophores (20–)52–137(–178) × (2–)2.5–3.5 µm, up to 5 septa, pale to pale medium olivaceous-brown, sometimes paler towards the apex, smooth, at the base finely verruculose, walls slightly thickened, about 0.5 µm wide. Conidiogenous cells integrated, terminal, seldom intercalary, narrowly cylindrical-oblong, sometimes geniculate, (8-)17-40 um long, with up to seven loci crowded at or towards the apex, in intercalary cells loci situated on small lateral peg-like outgrowths, 1–2loci, conspicuous, subdenticulate, 1–1.5(–2) µm diam, thickened. Ramoconidia cylindrical-oblong, $17-46 \times (2.5-)3-4 \mu m$, 0-2-septate, pale olivaceous-brown, smooth, base broadly truncate, 2.5-3.5 µm wide, unthickened or slightly thickened. Conidia very numerous, catenate, in branched chains, branching in all directions with 4-5 conidia in the terminal unbranched part of the chain, small terminal conidia obovoid, ovoid to ellipsoid, sometimes subglobose, $3-5(-5.5) \times (1.5-)2-3 \mu m$, apex rounded or attenuated towards apex and base, intercalary conidia ovoid, limoniform to ellipsoid or subcylindrical, $5-11(-14) \times (2-)2.5-3(-4) \mu m$, 0(-1)-septate, slightly attenuated towards apex and base, with 2-3(-4) distal hila, secondary ramoconidia ellipsoid-ovoid to subcylindrical or cylindrical-oblong, $(7-)8-24(-31) \times (2-)2.5-3.5(-4) \mu m$, 0-1(-2)-septate, septum often somewhat in the lower half, pale olivaceous to pale olivaceous-brown, smooth or almost so, walls unthickened, with up to 5 distal hila, conspicuous, subdenticulate, 1-1.5(-2) µm diam, microcyclic conidiogenesis rarely occurring. Colonies on PDA attaining 7-8 cm diam after 14 d, surface grey-olivaceous and reverse iron-grey to olivaceous-black, margins regular, glabrous, aerial mycelium abundant, sporulation profuse. Colonies on MA attaining 8.5 cm diam after 14 d, surface grey-olivaceous and reverse iron-grey, margins white and glabrous, aerial mycelium abundant, sporulation profuse. On SNA plates mycelium immersed and superficial; hyphae unbranched or sparingly branched, 1-4(-4.5) µm wide, septate, sometimes constricted at septa, subhyaline to pale olivaceous, smooth to minutely vertucose, mainly at the base of conidiophores, sometimes irregular in outline due to swellings and constrictions, sometimes cells swollen, up to 5.5 µm wide.

Host and Distribution: On fallen leaves of *Citrus* sp., Guilan province, Malat (IRAN 2886C); from air, Guilan province, Rasht (IRAN 2887C); on necrotic tissues of living leaves of *Robinia* sp., Guilan province, Sangar (IRAN 2888C); On leaf spot of *Rubus* sp., Guilan province, Sangar (IRAN 2889C).

Molecular data: Not available.

Note: Cladosporium pseudocladosporioides differs from C. cladosporioides in having shorter and somewhat narrower, 0-1(-2)-septate secondary ramoconidia, narrower conidiogenous loci and hila (Bensch *et al.* 2010, 2012).

- Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *Cladosporium. Studies in Mycology*, 72, pp. 1–401.
- Bensch, K., Groenewald, J.Z., Dijksterhuis, J., Starink-Willemse, M., Andersen, B., Summerell B.A., Shin, H-D., Dugan, F.M., Schroers, H.-J., Braun, U. and Crous, P.W., 2010. Species and ecological diversity within the *Cladosporium cladosporioides* complex (*Davidiellaceae*, *Capnodiales*). *Studies in Mycology*, 67, pp. 1–94.



Cladosporium pseudocladosporioides: (a) conidiophore; (b) conidia; (c) branches; (d) ramoconidia and secondary ramoconidium. Scale bars: $a = 50 \ \mu m$; $b-d = 10 \ \mu m$

Cladosporium sphaerospermum Penz., Michelia 2(8): 473 (1882)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores solitary, arising terminally and laterally from hyphae, erect or ascending, straight, slightly attenuated to the apex, cylindrical-oblong, neither geniculate nor nodulose, unbranched or branched, $(8-)23-120(-186) \times 2.5-3.5(-4.5) \mu m$, up to four septa or occasionally pluriseptate, branches denticulate or short, up to 10 µm, septa darkened and somewhat thickened, pale medium to medium olivaceous-brown, smooth to minutely verruculose. Conidiogenous cells integrated, terminal, occasionally intercalary, cylindrical, up to 32 μ m long, with 2–3(–4) apical scars, loci protuberant, denticulate, (<1–)1–1.5 μ m diam, thickened. Ramoconidia often formed, cylindrical, $20-33(-47) \times 3 \mu m$, up to two septa, base broadly truncate, 2-3 µm wide, slightly thickened. Conidia catenate, in branched chains, branching in all directions, with 4-5 conidia in the unbranched parts, small terminal conidia globose to subglobose, seldom ovoid, $(2.5-)3-4(-4.5) \times (2.5-)3-3.5(4) \mu m$, aseptate, minutely vertuculose to vertucose, rounded or slightly narrower at both ends, intercalary conidia, (4-)6- $8(-9) \times (2.5-)3-4 \mu m$, aseptate, sometimes with one septate, attenuated towards apex and base, with up to 2(-3) apical hila, subglobose, ovoid to ellipsoid. secondary ramoconidia ellipsoid to cylindrical, $9-29(-33) \times (2.5-)3-4$ µm, 0-2(-3)-septate, not constricted at septa, but septa somewhat darkened and thickened, pale to usually medium olivaceous-brown, smooth to minutely verticulose, with 4-5 pronounced, denticulate distal hila, $1-1.5 \,\mu\text{m}$ diam, thickened and darkened, microcyclic conidiogenesis not observed. Colonies on PDA reaching 6 cm diam after 14 d, surface grey-olivaceous and reverse dark grey-olivaceous, margins white, regular, aerial mycelium absent or sparse, growth flat with an elevated colony centre, sporulation profuse. Colonies on MA attaining 4 cm diam, surface grey-olivaceous and reverse iron-grey to olivaceous-black, margins colorless or white, regular, radially furrowed, aerial mycelium almost absent, sporulation profuse. On SNA plates mycelium immersed and superficial, hyphae sparingly branched, $(1-)1.5-3 \mu m$, rarely 4 μm wide, septate, often with chlamydospore-like structures, pale medium olivaceous, smooth to sometimes minutely verruculose, sometimes irregular in outline due to swellings and constrictions, walls slightly thickened.

Host and Distribution: On necrotic tissue and dead leaves of *Ficus carica* L., Guilan province, Paresh Kooh (IRAN 2890C).

Molecular data: Not available.

Note: *Cladosporium sphaerospermum* complex differs from *C. cladosporioides* s. lat. and other species of the *Cladosporium* s. str. by having globose to subglobose terminal conidia, obclavate, short rostrate, sometimes "alternarioid" conidia (Zalar *et al.* 2007, Bensch *et al.* 2012). *C. halotolerans* is also similar to this species but the conidiophores in *C. sphaerospermum* are often wider and usually branched and it has wider secondary ramoconidia.

References:

- Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *Cladosporium. Studies in Mycology*, 72, pp. 1–401.
- Zalar, P.D., De Hoog, G.S., Schroers, H.J., Crous, P.W., Groenewald, J.Z. and Gunde-Cimerman, N., 2007. Phylogeny and ecology of the ubiquitous saprobe *Cladosporium sphaerospermum*, with descriptions of seven new species from hypersaline environments. *Studies in Mycology*, 58, pp. 157–183.



Cladosporium sphaerospermum: (a) conidiophore; (b) ramoconidia and conidia; (c) secondary ramoconidium; (d) unusual chlamydospore-like structure in hyphae. Scale bars = $10 \mu m$

Cladosporium tenuissimum Cooke, Grevillea 6(40): 140 (1878)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Cladosporiales, Cladosporiaceae, Cladosporium*

Description: Conidiophores solitary, arising terminally and laterally from hyphae; straight or slightly flexuous, cylindrical-oblong to almost filiform, often with a swelling at the apex (on SNA) and a few additional swellings on a lower level (on PDA), swellings quite distant from the apex and from each other; most conidiophores neither geniculate nor nodulose, unbranched or branched, branches sometimes only as short denticle-like prolongations just below a septum, rarely long, conidiophores $(40-)65-255(-340) \times (2.5-)3-4(-4.5) \mu m$, 6-7-septate or sometimes pluriseptate, pale to medium brown or olivaceous-brown, smooth, sometimes slightly rough-walled at the base, walls somewhat thickened, sometimes slightly attenuated towards the apex. Conidiogenous cells integrated, terminal and intercalary, cylindrical-oblong, often nodulose, swellings 4-5(-7) µm wide, cells (7-)16-46(-50) µm long, loci often situated on swellings but not restricted to them, in terminal cells apex usually head-like uni- or multilaterally swollen with up to six pronounced, subdenticulate to denticulate loci crowded at the tip, loci 1–1.5(–2) µm diam, thickened and darkened. Ramoconidia occasionally formed, subcylindrical or cylindrical-oblong, $19-37(-40) \times 3-4(-4.5) \mu m$, 0-1(-2)-septate, base broadly truncate, 2-3.5(-4) µm wide. Conidia catenate, in densely branched chains, up to five conidia in the terminal unbranched part of the chain, branching in all directions, small terminal conidia subglobose, obovoid, seldom globose, $3-5.5(-6) \times (2-)2.5-3 \mu m$, aseptate, apex broadly rounded, intercalary conidia ovoid, ellipsoid or subcylindrical, $(4-)5-13(-18) \times$ (2-)3-4(-4.5) µm, 0(-1)-septate, with 3-5(-6) distal hila, secondary ramoconidia ellipsoid, fusiform to subcylindrical or cylindrical, $7-23(-32) \times 3-4(-4.5) \mu m$, 0-1-septate, with up to six distal hila, sometimes with 1-2 hila at the basal end, pale brown or pale olivaceous-brown, smooth, walls unthickened or almost so, hila conspicuous, subdenticulate to denticulate, (0.5-)1-1.5 µm diam, microcyclic conidiogenesis occasionally occurring. Colonies on PDA attaining up to 9-9.5 cm diam after 14 d, surface grey-olivaceous and reverse iron-grey to olivaceous-black, margins glabrous, white, aerial mycelium abundant, sporulation profuse. Colonies on MA attaining about 7.5 cm diam after 14 d, surface greenish-olivaceous and reverse olivaceous-grey, margins narrow, glabrous and white, aerial mycelium abundant, sporulation profuse. On SNA plates mycelium immersed and superficial, hyphae branched, $1-4.5(-5) \mu m$ wide, septate, sometimes constricted at septa, pale to medium brown and finally olivaceousbrown to brown at the base of conidiophores, smooth to sometimes minutely vertuculose, walls unthickened or very slightly thickened, seldom forming ropes.

Host and Distribution: On decaying parts of root of *Phaseolus* sp., Guilan province, Pirbazar (IRAN 2891C). On leaves of *Citrus* sp. infected with sooty mould, Guilan province, Pareshkooh (IRAN 2892C). On lesions and leaf spot of *Nerium oleander* L., Guilan province, Rasht (IRAN 2893C). On fallen leaves of *Citrus* sp. Guilan province, Pareshkooh (IRAN 2894C). On decaying leaves of *Citrus* sp. Guilan province, Pirbazar (IRAN 2895C).

Molecular data: Not available.

Note: This species is distinguishable from other species of *C. cladosporioides* species complex by having long conidiophores with a head-like swelling on the apex. On PDA plates

conidiophores of this species are very long and darker, forming several nodules. The formation of such swellings in the *C. tenuissimum* is similar to those of *C. oxysporum* but the latter species does not form such nodose conidiophores on PDA (Bensch *et al.* 2010, 2012).

- Bensch, K., Braun, U., Groenewald, J.Z. and Crous, P.W., 2012. The genus *Cladosporium. Studies in Mycology*, 72, pp. 1–401.
- Bensch, K., Groenewald, J.Z., Dijksterhuis, J., StarinkWillemse, M., Andersen, B., Summerell B.A., Shin, H-D., Dugan, F.M., Schroers, H.-J., Braun, U. and Crous, P.W., 2010. Species and ecological diversity within the *Cladosporium cladosporioides* complex (*Davidiellaceae*, *Capnodiales*). *Studies in Mycology*, 67, pp. 1–94.



Cladosporium tenuissimum: (a) conidiophore in PDA; (b) conidiophore in SNA; (c) conidia (ramoconidium, secondary ramoconidia, terminal conidia); (d) head-like swollen. Scale bars = $10 \ \mu m$



Coniochaeta velutinosa Asgari & Zare, Nova Hedwigia 82: 232 (2006)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Diaporthomycetidae, Coniochaetales, Coniochaetaceae, Coniochaeta*

Description: Ascoma initials arising as distinct loops or coils from side branches of the mycelium, soon becoming increasingly coiled and contorted. Perithecia maturing on Leonian's agar in 4–5 wk after inoculation, numerous, solitary or aggregated, superficial or rather submerged, black, globose to oval, 250–410 µm high, 190–320 µm diam, with a globose venter and a broad short neck, 70-85 µm long; the ostiole covered with blunt, brown to dark brown, undulate setae measuring $20-27 \times 2.5-3.5 \mu m$. Peridium brown to black, pseudoparenchymatous. Paraphyses numerous, filiform, septate, simple, hyaline, with refractive septa, as long as or longer than the asci. Asci cylindrical, 8-spored, non-amyloid in Melzer's reagent, rounded apically, short-stipitate, $70-85 \times 8-12$ µm. Ascospores obliquely uniseriate, measuring $10-12.5 \times 7.5-11.5 \times 6-7 \mu m$, hyaline at first, later becoming brown or dark brown, smooth, without sheaths, discoid (lenticular), face views broad-elliptical to circular, side views narrow elliptical with a longitudinal germ slit; non-guttulate; ascospores exude as a small globose mass at the mouth of ostiole. Colonies slow-growing, reaching 20 mm diam in 9 d, first white, soon turning yellowish-green to green, with zonate growth and reduced aerial mycelium; colony reverse with yellowish green pigmentation also diffusing into the agar; mycelium composed of hyaline, smooth-walled, septate, often anastomosing, $3-4 \mu m$ wide hyphae; chlamydospores abundant after 3 wk, mostly in chains, variable in shape, spherical, ellipsoidal or cylindrical, hyaline, $6.5-9.5 \times 5.5-8.5 \mu m$.

Host and Distribution: Isolated from leaves of *Hordeum vulgare* L., East Azerbaijan province, Osku (holotype IRAN 12364F, ex-type culture IRAN 843C = CBS 117678).

Molecular data: IRAN 843C = CBS 117678 (ITS = GU553327, LSU = GU553330).

- Asgari, B. and Zare, R., 2006. Two new *Coniochaeta* species from Iran. *Nova Hedwigia*, 82, pp. 227-236.
- Zare, R., Asgari, B. and Gams, W., 2010. The species of *Coniolariella (Xylariales)*. *Mycologia*, 102, pp. 1383–1388.



Coniochaeta velutinosa and its anamorph: a–k. teleomorph: (a) ascoma initial (hyphal coils); (b, c) ascomata; (d, e) setae, f. immature ascus; (g) immature ascospores (hyaline); (h–j) mature ascospores (black); (k) germ slit. l–s. Anamorph: (m) chlamydospores; (n) conidia formed on the initial ascoma coil; (l, o–q) conidiophores and conidiogenous loci; (p, q) primary conidia; (r, s) endoconidia. Scale bars: a, d–s = 10 μ m; b = 100 μ m; c = 50 μ m



Caudospora iranica Mehrabi & Voglmayr, Sydowia: 70: 74 (2018)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Diaporthales, Sydowiellaceae, Caudospora*

Description: Pseudostromata 1–3.5 mm diam, immersed in the bark of dead branches (ca. 1.5 cm thick), erumpent, circular to irregular, separate, scattered, sometimes confluent, delimited from surrounding bark by a black line, the latter visible on the bark surface. Ectostromatic discs white, convex, circular to oval, tissue between ostiolar necks distinctly grey to dark grey, powdery. Central column whitish to grey.Ostioles dark, at the same level as the disc surface, rarely projecting, opening separately. Perithecia 2–7 per stroma, 300–700 µm diam, subglobose to ovoid, black, monostichous, arranged circinately in brown entostromata, with long ostiolar necks converging towards the ectostromatic disc. Paraphyses elongate, hyaline, filiform, septate, evanescent. Asci (170)181–211(230) × 15–18 µm ($\bar{x} = 196 \times 16.7$ µm; n = 420), cylindrical, with short or obsolete stalks and a conspicuous apical ring, containing eight uniseriate ascospores. Ascospores (18)21–27(32) × (8)10.5–13(15) µm ($\bar{x} = 23.7 \times 11.7$ µm; n = 42), 1/w = (1.6)1.8–2.3(2.5), broadly ellipsoid, two-celled, constricted at the septum, hyaline or pale yellowish, coarsely verrucose, in SEM with isolated warts 0.4–1 µm diam, with a tubular gelatinous appendage 10–17 × 1–1.3 µm long at each end and 2–3 (rarely 4) similar median tubular gelatinous appendages arising from near the septum.

Host and Distribution: On dead branches of *Quercus* sp., East Azerbaijan province, Arasbaran (holotype IRAN 16716F, isotype WU 39950, ex-type culture IRAN 2552 C, ex-isotype culture CBS 143507).

Molecular data: IRAN 2552C = CBS 143507 (ITS = MG495960, LSU = MG495960, SSU = MG495960, CAL = MG495951, MS204 = MG495970, RPB1 = MG495979, RPB2 = MG495988, TEF1 = MG495997, TUB2 = MG496004

Note: *Caudospora iranica* resembles *C. taleola* in stroma and ascoma morphology and ascospore appendages. However, there are pronounced differences between these species in the ascospore ornamentation.

Reference:

Voglmayr, H. and Mehrabi, M., 2018. Molecular phylogeny and a new Iranian species of *Caudospora (Sydowiellaceae, Diaporthales)*. *Sydowia*, 70, pp. 67–80.



Caudospora iranica (holotype): (a) stromata on dead branch of *Quercus* sp.; (b) ectostromatic disc; (c) transverse sections of a pseudostroma; (d) vertical section of a pseudostroma; (e, f) asci; (g) paraphyses; (h–j) ascospores, showing coarsely vertucose ornamentation; (k) culture on PDA. Scale bars: a = 3 mm; b = 300 µm, c, d = 1 mm; e-g 30 = µm; h-j 10 = µm

Caudospora taleola (Fr.) Bih. K. Svenska Vetensk Akad. Handl., Afd. 15(2): 11 (1889)

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Basionym: Sphaeria taleola Fr., Syst. mycol. (Lundae) 2(2): 391 (1823)

Synonyms: *Aglaospora taleola* (Fr.) Tul. & C. Tul., Select. Fung. Carpol. (Paris) 2: 168 (1863); *Chorostate taleola* (Fr.) Traverso, Fl. ital. crypt. 1(2): 212 (1906); *Diaporthe taleola* (Fr.) Sacc., Atti Soc. Veneto-Trent. Sci. Nat., Padova, Sér. 4, 4: 112 (1875). Further synonyms are given by Voglmayr and Mehrabi (2018).

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Diaporthales, Sydowiellaceae, Caudospora*

Description: Pseudostromata 1–4 mm diam, immersed in the bark of dead branches (1–3 cm diam), flat or erumpent, circular to irregular, separate, scattered, sometimes confluent, delimited from surrounding bark by a black line. Ectostromatic discs white, flat, circular to ovoid, tissue between ostiolar necks distinctly grey to dark grey, powdery. Central column whitish to greyOstioles dark, at the same level as the disc surface, rarely projecting, opening separately, sometimes necks of perithecia united below the disc and discharging through a single ostiole. Perithecia 2–16 per stroma, 300–700 µm diam, subglobose to ovoid, black, monostichous, arranged circinately in brown entostromata, with long ostiolar necks converging towards the ectostromatic disc. Paraphyses elongate, hyaline, filiform, septate, evanescent. Asci (140)145– $180(207) \times 10-13 \ \mu m \ (\bar{x} = 163 \times 12.1 \ \mu m; n = 20)$, cylindrical, with short or obsolete stalks and a conspicuous apical ring, containing eight uniseriate ascospores. Ascospores (17)20- $28(31) \times (6.5)8-10(11) \ \mu m \ (\bar{x} = 23.9 \times 9 \ \mu m; n = 30), 1/w = (2.1)2.3-3.0(3.4), ellipsoid, two$ celled, constricted at the septum, hyaline, appearing smooth in light microscopy but distinctly vertucose in SEM with densely disposed warts $0.1-0.4 \mu m$ diam, with a hyaline tubular gelatinous appendage $6-17 \times 1-1.5 \mu m$ long at each end and 2-3 (rarely 4) similar median tubular gelatinous appendages arising from near the septum. Anamorph on natural substrate acervular, phomopsis-like. Conidiomata ca. 1 mm diam, visible as darker spots in surface view, showing the same organisation as the teleomorph, i.e. a central whitish stromatic column with a white ectostromatic disc and a brown pseudostroma delimited from surrounding bark by a black line, preceding the teleomorph; conidiogenous region in section pale olivaceous green. Conidiophores branched, hyaline, septate, formed on the upper margin of the central column. Conidiogenous cells phialidic, (6.5)11.5–18.5(26) × (1.4)1.7–2.5(3.5) μ m ($\bar{x} = 14.8 \times 2.1 \mu$ m; n = 70), hyaline, smooth. Conidia (15)17–25 (32) × 0.7–1.1(1.6) μ m ($\bar{x} = 21 \times 0.9 \mu$ m; n = 50), 1/w = (14.8)18.2 - 29.7(37.2), filiform with variable shape from more or less straight, sigmoid, falcate, semicircular to circular, unicellular, hyaline, smooth.

Host and Distribution: On dead branches of *Quercus* sp., East Azerbaijan province, Arasbaran (IRAN 16715F, WU 39954, IRAN 2551C).

Molecular data: IRAN 2551C =CBS 143507 (ITS = MG495964, LSU = MG495964, SSU = MG495964, CAL = MG495955, MS204 = MG495974, RPB1 = MG495983, RPB2 = MG495992, TEF1 = MG496001, TUB2 = MG496008

Note: For comparison with C. iranica (see above Note).

Reference:

Voglmayr, H. and Mehrabi, M., 2018. Molecular phylogeny and a new Iranian species of *Caudospora (Sydowiellaceae, Diaporthales)*. *Sydowia*, 70, pp. 67–80.



Caudospora taleola (IRAN 16715F): (a) stromata on dead branch of *Quercus* sp.; (b) ectostromatic disc; (c) transverse sections of a pseudostroma; (d) vertical section of a pseudostroma (showing two united necks under ectostromatic disc); (e, f) asci; (g, h) ascospores; (i) culture on PDA. Scale bars: a = 3 mm; $b = 300 \text{ }\mu\text{m}$; c, d = 1 mm; e, $f = 30 \text{ }\mu\text{m}$; g, $h = 10 \text{ }\mu\text{m}$



SEM pictures of ascospores of *Caudospora iranica* (a, b, e) and *C. taleola* (c, d, f), showing the coarsely and finely vertucose ascospore ornamentation in *C. iranica* and *C. taleola*, respectively; the median smooth circular areas in c, d. represent the scars of median gelatinous appendages. g–m. Anamorph of *C. taleola*: (g, h) conidiomata in transverse section, showing the central stromatic column and olive-green conidial masses; (i) conidiomata in vertical section, showing pseudostromata delimited by a black line, the central stromatic column and the olive-green conidial masses produced on the stromatic column; (j–l) branched conidiophores with phialides producing filiform conidia; (in j. with released elongate and circular conidia); (m) conidia. a, b, e. IRAN 16716F (holotype of *C. iranica*). c, d, f–m. WU 39951 (neotype of *C. taleola*). Scale bars: a–d = 5 µm; e, f=1 µm; g = 500 µm; h, i = 200 µm; j–m =10 µm

Microthia havanensis (Bruner) Gryzenhout & M.J. Wingf., Studies in Mycology 55: 44 (2006)

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Classification: Fungi, Dikarya, Ascomycota, Pezizomycotina, Sordariomycetes, Diaporthomycetidae, Diaporthales, Cryphonectriaceae, Microthia

Description: Ascostroma on natural substrate semi-immersed to superficial, pulvinate, orange. Perithecia spherical to ovoid, $82-145 \times 57-62 \mu m$, in groups of 2 to 12, surrounded by a host tissue. Asci fusiform to cylindrical, with 8 ascospores, $20-35 \times 4-6 \mu m$. Ascospores hyaline, ellipsoid to fusoid, $6-7.5 \times 1.5-3 \mu m$. Anamorphic stromata semi-immersed to superficial, orange, uni- to multilocular, often occurring in the same stroma that contains perithecia, $47-75 \times 30-35 \mu m$. Conidiophores cylindrical with long paraphyses between them and $30-60 \times 1 \mu m$ in length. Conidia hyaline, cylindrical to ellipsoid, aseptate, $2.5-3 \times 1 \mu m$. On PDA after 4 d at 25 °C, $5-18 \mu m$, after 7 d at 25 °C, colonies, white mycelium with and few pycnidium produced. Pycnidium orange, slimy, subglobose. Conidia yellow, $4-6 \times 1-2 \mu m$. On corn meal after 7 wk at 25 °C, no pigmentation observed.

Host and Distribution: On the barks and Branches of *Pterocarya fraxinifolia* (Poir.) Spach, Guilan province, Fouman (Roudkhan castle) (Gum 1561).

Molecular data: Not available.

Reference:

Mousavi, N., Mousanejad, S. and Khodaparast, S.A., 2020. New or less known ascomycete species associated with trunk and branches of trees in Guilan province, Iran. *Mycologia Iranica*, 7(1), pp. 115–123.


Microthia havanensis: (a) stromata containing ascomata on bark; (b) longitudinal section of conidioma; (c) conidioma paraphyses; (d) asci and ascospores; (e) colony morphology in 90 mm dishes after 2 weeks at 25 °C in the dark on PDA; (f) colony on corn meal after 7 weeks. Scale bars: $a = 100 \mu m$; $b = 40 \mu m$; c, $d = 20 \mu m$



Aspergillus aurantiobrunneus (G.A. Atkins, Hindson & A.B. Russell) Raper & Fennell, The Genus Aspergillus: 511 (1965)

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Basionym: *Emericella nidulans* var. *aurantiobrunnea* G.A. Atkins, Hindson & A.B. Russell, Transactions of the British Mycological Society 41: 504 (1958)

Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Ascomata ovate to globose, purpleblack, 250–450 µm diam; hülle cells forming the structure of stromata, globose to ellipsoidal, 18–28 µm diam. Asci 8-spored, globose to ellipsoidal, 9–11.5 µm diam. Ascospores bright purple-red, lenticular, smoothwalled, 5–6.5 × 3.5–4.5 µm, with two pleated sinuous and entire equatorial rings, 1–1.3 µm wide. Conidial heads radiating to nearly globose, dull buff; stipes pale brown, smoothwalled, (55–)75–100(– 130) × 3–4.5 µm. Vesicles globose to subglobose, 9–11(–15) µm diam; biseriate. Metulae covering almost the entire surface of vesicles, 3.5–4.5 × 2.5–3 µm. Phialides 5–6 × 2–2.5 µm. Conidia globose to subglobose, smooth-walled, 3–3.5 µm. Colonies reaching 6–8 mm diam on MEA and 5–10 mm on CYA in 7 d at 25 °C, dense, plane, forming pale bluish-white crusts of stromata surrounding the ascomata; reverse dull orange-brown on MEA and dark brown on CYA.

Host and Distribution: On seed of *Hordeum vulgare* L., East Azerbaijan province, Ahar (IRAN 2042C and IRAN 2043C).

Molecular data: IRAN 2042C (ITS = KC473928, BenA = KC473912), IRAN 2043C (ITS = KC473927, BenA = KC473911).

Reference:



Aspergillus aurantiobrunneus: (a–d) teleomorph, (e–g) anamorph: (a) stromata containing ascomata; (b) hülle cells; (c) asci (d) ascospores; (e, f) conidiophores; (g) conidia. Scale bars: a = 1000μ m; e = 50μ m; b, f = 20μ m; c, d, g = 10μ m

Aspergillus calidoustus Varga, Houbraken & Samson, Eukaryot. Cell 7(4): 636 (2008)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Conidial heads small, loosely columnar; stipes brown, smooth-walled, $(40-)70-160(-190) \times 3-4.5 \ \mu\text{m}$. Vesicles pyriform or broadly spatulate, 7.5–12 $\ \mu\text{m}$ diam; biseriate. Metulae covering the upper half of the vesicles, $5-7 \times 2.5-3.5 \ \mu\text{m}$. Phialides $5-7 \times 2.3-3 \ \mu\text{m}$. Conidia globose, coarsely roughened to echinulate, $3.3-4 \ \mu\text{m}$ diam. Hülle cells were not formed on the tested media. Colonies reaching 45 mm diam on MEA and 25 mm on CYA in 7 d at 25 °C, brownish-grey, low, plane, floccose; reverse yellow with olive-brown centre on both media.

Host and Distribution: On Hordeum vulgare seed, Alborz province, Karaj (IRAN 227C).

Molecular data: IRAN 227C (ITS = KC473932, BenA = KC473909).

Reference:



Aspergillus calidoustus: (a–f) conidiophores; (g) conidia. Scale bars: a–c = 20 μ m; d–g = 10 μ m

Aspergillus flavipes (Bainier & R. Sartory) Thom & Church, Manual of the Aspergilli: 179 (1926)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Conidial heads radiating to loosely columnar; stipes yellow-brown, thick-walled, smooth-walled to finely roughened, $(650-)1000-1300(-1500) \times 5-7.5 \ \mu\text{m}$. Vesicles subglobose to spatulate, $14-20 \times (11.5-)13-18 \ \mu\text{m}$; biseriate. Metulae covering the upper one-third of the vesicle in small heads, but in large heads the whole vesicle, $5-8 \times 2-3 \ \mu\text{m}$. Phialides $6-8 \times 1.5-2.5 \ \mu\text{m}$. Conidia globose to subglobose, smooth-walled, $2-3 \ \mu\text{m}$ diam. Colonies reaching 25–30 mm diam on MEA and 20–25 mm on CYA in 7 d at 25 °C, white to very pale buff on CYA, but dull pinkish-buff on MEA, velutinous to slightly granular, occasionally forming sectors of sterile, floccose mycelia; exudate yellow to brown when present; reverse golden-brown on MEA and uncoloured to yellow-brown on CYA.

Host and Distribution: On *Triticum aestivum* straw, Ardebil province, Moghan (IRAN 2062C); on *Musa sapientum* L., Sistan-o-Baluchestan province (IRAN 939C).

Molecular data: IRAN 2062C (ITS = KC473934, BenA = KC473913), IRAN 939C (BenA = KC473914)

Reference:



Aspergillus flavipes: (a–d) conidiophores; (e) conidia. Scale bars: a = 100 μ m; b = 20 μ m; c–d = 10 μ m; e = 5 μ m

Aspergillus üzukae Sugiy., J. Fac. Sci. Tokyo Univ., Section 3, 9(11): 390 (1967)

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Description: Conidial heads radiating to columnar; stipes yellow-brown, thick-walled, smooth-walled, $(500-)600-1000(-1300) \times 7-9 \mu m$. Vesicles spatulate, $22-25 \times 17-21 \mu m$; biseriate. Metulae mostly covering the whole vesicles, $4-6 \times 1.7-2.5 \mu m$. Phialides $6-7 \times 1.5-2 \mu m$. Conidia globose, smooth-walled, $2.3-3 \mu m$ diam. Colonies reaching 25 mm diam on MEA and 20 mm on CYA in 7 d at 25 °C, pale buff, velutinous to slightly granular; soluble pigment orange-brown; exudate yellow; reverse dark reddish-brown on MEA and pale brown on CYA.

Host and Distribution: On *Hordeum vulgare* seed, East Azerbaijan province, Kaleibar (IRAN 2063C).

Molecular data: IRAN 2063C (BenA = KC473915).

Reference:



Aspergillus iizukae: (a–e) conidiophores (f) conidia. Scale bars: a = 100 μ m, b, c = 20 μ m; d, e = 10 μ m; f = 5 μ m

Aspergillus insuetus (Bainier) Thom & Church, Manual of the Aspergilli: 153 (1929)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Conidial heads small, radiating to hemispherical; stipes brown, smooth-walled, (160–)180–300 × 5–7 μ m. Vesicles subglobose to hemispherical, (11.5–)13–22 μ m diam; biseriate. Metulae covering half of the vesicles, 4.5–6 × 2.5–3.5 μ m. Phialides 6–7 × 2.5–3 μ m. Conidia globose, distinctly roughened, tuberculate, 3–3.7 μ m. Hülle cells in scattered groups, straight or slightly curved, 25–60(–80) × 13.5–18(–20) μ m. Colonies reaching 40 mm diam on MEA and 30 mm on CYA in 7 d at 25 °C, dark grey at the centre, shading through white, with sterile, floccose marginal area; reverse orange-brown on MEA and yellowolivaceous on CYA.

Host and Distribution: On *Hordeum vulgare* straw, East Azerbaijan province, Sarab (IRAN 2055C).

Molecular data: IRAN 2055C (ITS = KC473933, BenA = KC473908).

Reference:



Aspergillus insuetus: (a–f) conidiophores; (g) conidia; (h) hülle cells. Scale bars: a–c, h = 20 µm; d-f = 10 µm; g = 5 µm

Aspergillus iranicus Arzanlou, Houbraken & Samadi, Mycological Progress 15: 1085 (2016)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Stipes $(375-)550-625(-800) \times (2.5-)4-5(-7) \mu m$, smooth, aseptate to occasionally septate, walls yellow-pigmented, thick walled (1 µm). Foot cell in two forms: symmetric and asymmetric. Conidial heads radiate on MEA, YES, CZ and radiate to loosely columnar on CYA. Vesicles $(14.5-)20-23(-32) \times (7-)11-13(-16) \mu m$, spathulate, wall thickness less than 1 µm, uncolored. Conidiophores biseriate; the fertile part covering 1/3 to 1/4 upper part of the vesicle, sometime stipe under the vesicle swells, occasionally small conidiophores with diminutive heads present. Metulae $(5-)6-7(-8) \times (2-)3(-4) \mu m$, cylindrical, walls smooth, uncolored. Phialides, 1–3 on each metula, $(5-)6-7(-9) \times 2-3 \mu m$, cylindrical tapering to a distinct collulum. Conidia $2-2.5 \times 1.8-2.5 \mu m$ in diam, globose to subglobose, smooth walled, hyaline (Fig. 2). Accessory conidia abundant, sessile or on the short, hyaline, micronematous conidiophores bearing conidia, globose, subglobose, elliptical, clavate, commonly truncate (4-)5-6(-7) µm. Colony diam (mm): 7 days (d), 25 °C, Czapek Yeast extract Agar (CYA) 28-32; Czapek Agar (CZ) 24-28; Malt Extract Agar (MEA) 30-34; Yeast extract sucrose Agar (YES) 23–27; 7 d, 37 °C, CYA 34–38; CZ 37–39; MEA 36–40; YES 36– 40. On CYA 25 °C, 7 d: mycelium white; sclerotia absent; sporulation dense; conidial mass white, colour of the colony changed to peach after 3 weeks; soluble pigment absent; colonies felt, centrally velutinuse with 9 sulcae in center and 6 sulcae at the margin; reverse honey with small part of sulphur yellowin the sector parts. On YES 25 °C, 7 d: mycelium white; sclerotia absent; sporulation moderate; conidial mass white; soluble pigment absent; exudate sparse, amber; colony texture velvety, floccose in center; sulcate; reverse pale luteous to luteous. On CZ 25 7 d: mycelium white in margin to greenish yellow in the center; sclerotia absent; sporulation moderate in center, conidial mass white; colonies felt, centrally floccose with 8 sulcae in center and 7 sulcae at the margin; soluble pigment absent; greenish yellow exudate produced after 14 days; reverse citrine. On MEA 25 °C, 7 d: mycelium white; sclerotia absent; sporulation dense; conidial mass white; soluble pigment absent; exudate absent; colonies velutinous to lightly floccose; sulcate; reverse pale luteous.

Host and Distribution: On soil, West Azerbaijan, Urmia, Aspear Island (holotype CBS H-22338, ex-type culture CCTU 756 = CBS 139561 = IBT 32596 = DTO 203-D7); Jade Darya (seaside), Urmia, (CCTU 750 = CBS 139560 = IBT 32595 = DTO 203-D1).

Molecular data: CCTU 750 = DTO 203-D1 = CBS 139560 = IBT 32595 (BenA = KP987044, CaM = KP987059, RPB2 = KP987033, ITS = KP987076). CCTU 756T = DTO 203-D7 = CBS 139561 = IBT 32596 (BenA = KP987045, CaM = KP987060, RPB2 = KP987034, ITS = KP987077)

Note: Aspergillus iranicus is phylogenetically related to A. carneus, A. niveus, A. allahabadii and A. neoindicus; however, it can be differentiated from these species by a combination of cultural and micro-morphological characteristics. Aspergillus neoindicus produces yellow-

green mycelial tufts and the mycelium of *A. iranicus* is white. Furthermore, the conidial color *en masse* of *A. iranicus* is in shades of yellow and this feature is not shared with *A. niveus* (white) and *A. carneus* (vinaceous fawn). *Aspergillus iranicus* produces accessory conidia which were also reported in *A. terreus*, *A. carneus*, *A. niveus* and *A. alabamensis*.

Reference:

Arzanlou, M., Samadi, R., Frisvad, J.C., Houbraken, J. and Ghosta, Y., 2016. Two novel Aspergillus species from hypersaline soils of The National Park of Lake Urmia, Iran. Mycological Progress, 15(10), pp. 1081–1092.



Aspergillus iranicus CCTU 756: colonies after 7 days at 25 °C: (a, e) CYA; (b, f) MEA; (c, g) CZ; (d, h) YES. (i) details of colony on MEA; (j) exudate; (k, l) conidial heads; (m, n) accessory conidia; (o) conidia; (p, q) conidiophores. Scale bars = $10 \mu m$

Aspergillus kassunensis Baghd., Nov. sist. Niz. Rast., 5: 113 (1968)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Conidial heads poorly developed, small, loosely radiating, formed on short stalks from aerial hyphae; stipes uncoloured, smooth-walled, $15-35 \times 2.5-4 \mu m$. Vesicles variable in shape, ranging from globose to flattened or dome-shaped, $3-6 \mu m$ diam; biseriate. Metulae covering only the upper third to half of the vesicles, $4-6 \times 2-3 \mu m$. Phialides $4-6 \times 2-2.5 \mu m$. Conidia globose to subglobose, smooth-walled, $2-3 \mu m$. Hülle cells abundant, scattered through the mycelial felt, globose, $27-34 \mu m$ diam. Colonies reaching 20 mm diam on MEA and 10 mm on CYA in 7 d at 25 °C, floccose, consisting of tough basal felt, raised and irregularly wrinkled in central area, white at first, soon becoming pale grey with the development of a limited number of inconspicuous conidial heads on aerial mycelium; reverse pale greybrown on MEA and orange-brown on CYA.

Host and Distribution: On soil, Fars province, Shiraz (IRAN 1280C).

Molecular data: IRAN 1280C (BenA = KC473910).

Reference:



Aspergillus kassunensis: (a–e) conidiophores; (f, g) conidia; (h) hülle cells. Scale bars: h = 20 µm; a-g = 10 µm

Aspergillus osmophilus Asgari & Zare, Mycoscience 55: 58 (2014)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Ascomata maturing in 3-4 wk, solitary or aggregated, yellow, globose to subglobose, 160-320 µm diam. Peridium membranaceous, thin, onelayered, consisting of thick-walled, polygonal, pseudoparenchymatous cells, 18–35 µm diam. Asci 8-spored, globose to subglobose, evanescent, 17–21 µm diam. Ascospores hyaline to pale olive-yellow in mass, lenticular, $8.5-10 \times 6.8-8 \mu m$, with a distinct furrow and two pronounced, broad, rounded and regular equatorial crests, convex walls covered with lobate-reticulate echines. Conidiophores smooth-walled, hyaline, $(180-)300-950(-1400) \times 8-12 \mu m$. Vesicles globose to spathulate, 25–45 mm diam. Phialides flaskshaped, with a short, but distinct neck, $(6.5-)8-12 \times 5-6.5 \mu m$, covering at least the upper two-third of the vesicles. Conidia hyaline at first, soon turning green, spinulose (aculeate), of various shapes and dimensions, mostly globose, subglobose, ovoid or ellipsoidal, 5–7.5 µm diam, partly elongate-ellipsoidal or cylindrical, sometimes slightly constricted, (7–) 8.5–15(–16.5) \times 4.5–7 $\mu m,$ without distinctive connectives. Diminutive conidial heads occasionally produced. Colony growth on CZ and MEA very restricted, reaching 3-4 mm diam in 7 days at 25°C, irregular, velvety, slightly wrinkled, with inconspicuous mycelium, white to pale orange-red; reverse uncolored on CZ and pale orange-red on MEA. No ascomata or conidial heads were produced on both media. Colonies on CZ20S slowgrowing, reaching 7 mm diam in 7 d at 25 °C, loosely flocculent, consisting of a limited number of ascomata mainly obscured by an overgrowth of hyaline mycelium soon turning pale orange, with irregular margins; reverse pale reddish-brown. Conidial heads absent. Colonies on M40Y reaching 23 mm diam in 7 d at 25 °C, spreading irregularly, velutinous, consisting of abundant ascomata densely overgrown by aerial hyphae encrusted with pale orange-red granules; reverse orange; exudates yellow. Conidial heads absent. Colonies on CZ70S growing more rapidly than on other media, reaching 42 mm diam in 7 d at 25 °C, pale orangebrown, velutinous, consisting of a dense felt of numerous, mainly aggregated ascomata obscured by an overgrowth of slightly pigmented aerial mycelium from which a few conidiophores arise; reverse pale reddish-brown. Conidial heads sparsely produced in very old cultures of CZ70S, small, bluegreen, uniseriate, loosely columnar to radiate.

Host and Distribution: On *Triticum aestivum* leaf, East Azerbaijan province, Marand (holotype IRAN 16110F, ex-type cultureIRAN 2090C = CBS 134258).

Molecular data: IRAN 2090C = CBS 134258 (ITS = KC473921, BenA = KC473924, CaM = KC473918)

Note: Aspergillus osmophilus resembles *A. xerophilus*, teleomorph known as *Eurotium xerophilum* Samson & Mouch., by its strong osmophily and surface with ornamentation of ascospores. However, *A. xerophilus* is distinguished from *A. osmophilus* by possessing smaller conidia, ascospores, and fruiting bodies.

Reference:

Asgari, B., Zare, R., Zamanizadeh, H.R. and Rezaee, S. 2013. *Aspergillus osmophilus* sp. nov., and a new teleomorph for *A. proliferans*. *Mycoscience*, 55, pp. 53–62.



Aspergillus osmophilus: cultures incubated for 10 days at 25 °C (a) CZ20S; (b) M40Y; (c) CZ70S; (d) ascomata; (e) peridium; (f) asci; (g) ascospores; (h) SEM of ascospores; (i, j) conidiophores; (k, l) conidia. Scale bars: $d = 100 \mu m$; e, $I = 20 \mu m$; f, g, $j-l = 10 \mu m$; $h = 5 \mu m$

Aspergillus proliferans G. Sm., Trans. Br. Mycol. Soc. 26: 24 (1943)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Ascomata solitary or mainly clustered at the agar surface and less commonly from aerial hyphae within a felt of orange-red encrusted hyphae, maturing within 2 wk, yellow to orange, globose to subglobose, 100-200 µm diam. Peridium membranaceous, thin, one-layered, consisting of thin-walled, polygonal or irregularly-shaped, pseudoparenchymatous cells, 12-23 µm diam. Asci 8-spored, globose to subglobose, evanescent, 9.5-13 mm diam. Ascospores hyaline, lenticular, $5-6 \times 3.7-4.6 \,\mu\text{m}$, with a shallow or distinct furrow and finely roughened to irregular equatorial crests, convex wall delicately roughened (tuberculate or finely reticulate). The surface ornamentation is hardly visible under light microscope. Conidial heads pale greygreen, uniseriate, loosely columnar or radiate, but usually without definite shape owing to the proliferation of phialides and the irregular branching of the sub-vesicular area and conidiophores. Conidiophores smooth-walled, hyaline, simple or 2-4 times branched especially in the upper one-third, $150-600(-1000) \times (4-)6-10(-14) \mu m$. Vesicles subglobose to spathulate, 15–35 µm diam, sometimes irregularly branched in sub-vesicular area. Phialides normally flask-shaped, with a short and distinct neck, $8-12.5 \times 4-6 \mu m$; sometimes elongated, septate and producing small secondary heads resembling heads of monoverticillate penicillia, or with the upper portion strongly swollen, almost suggesting very large, thick-walled conidia, up to 20 µm diam. Conidia globose to subglobose, in shades of green, spinulose (aculeate), 5-8(-9.5) µm diam, mostly with a short but distinct connective. Colonies on CZ slow-growing, reaching 12–13 mm diam in 7 d at 2°C5 °C, largely submerged at first, then turning floccose with orange-red to brown-yellow aerial mycelium, producing a few abortive ascomata and a few atypical, grey-green conidial heads; reverse brown with tinges of red. Colonies on MEA slow-growing, reaching 11–17 mm diam in 7 d at 25 °C, plane or somewhat raised at the center, velutinous to floccose, containing numerous sterile mycelial masses, occasionally deeply sulcate at the margin; reverse yellow to pale yellow-brown. No ascomata or conidial heads produced. Colonies on CZ20S spreading broadly, reaching 32–38 mm diam in 7 d at 25 °C, plane or raised, granular or loosely floccose, consisting of a thin mycelial felt producing abundant ascomata of granular appearance, loosely overgrown by orange-red hyphae from which a few, scattered conidial heads arise; colonies in some strains consisting of fasciculate hyaline hyphae producing conidial heads in the manner of loose divergent synnemata; reverse reddish-brown. Diminutive conidial heads commonly produced. Colonies on M40Y spreading rapidly and broadly, reaching 55-62 mm diam in 7 d at 25 °C, predominantly in orange-red shades due to pigmented mycelium, with abundant ascomata evenly scattered over the whole surface and dull greygreen conidial heads in the localized area; reverse deep orange with tinges of red. Colonies on CZ70S fast-growing, reaching 46-48 mm diam in 7 d at 2°C5 °C, forming abundant ascomata with granular appearance, loosely overgrown by pale orange-red hyphae from which abundant conidial heads arise; colony appearance occasionally influenced by a dense felt of white mycelium producing abundant synnema-like bodies; reverse hyaline to white, but yellow to orange at the position of ascomata.

Host and Distribution: On *Hordeum vulgare* seed, East Azerbaijan province, Shabestar (teleotype IRAN 16111F; ex-teleotype culture IRAN 2088C = CBS 134256); on *Hordeum vulgare* seed, East Azerbaijan province, Shabestar (IRAN 2089C = IRAN 16112F = CBS 134257).

Molecular data: IRAN 2088C = CBS 134256 (ITS = KC473922, BenA = KC473925, CaM= KC473919), IRAN 2089C = CBS 134257 (ITS = KC473923, BenA = KC473926, CaM= KC473920)

Reference:

Asgari, B., Zare, R., Zamanizadeh, H.R. and Rezaee, S., 2013. *Aspergillus osmophilus* sp. nov., and a new teleomorph for *A. proliferans. Mycoscience*, 55, pp. 53–62.



Aspergillus proliferans: cultures incubated for 10 days at 25°C (a) CZ20S; (b) M40Y; (c) CZ70S. (d) ascomata; (e) peridium; (f) asci; (g) ascospores; (h) SEM of ascospores; (i–k) conidiophores; (l, m) conidia. Scale bars: $d = 50 \ \mu\text{m}$; e, i–k = 20 μm ; f, g, l, m = 10 μm ; h = 5 μm

Aspergillus quadrilineatus Thom & Raper, Mycologia 31: 660 (1939)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Ascomata developing separately throughout the colony, globose to subglobose, partially embedded in the mycelial felt, appearing pale brown due to surrounding hülle cells, 200–300 µm diam; hülle cells globose, 15–18.5 µm diam. Asci 8-spored, globose to ellipsoidal, 9.5-12 µm diam. Ascospores red, lenticular, regularly ornamented with colourful projections, $4.5-5.5 \times 3.5-4$ µm, with four equatorial crests (less than 1 µm wide), two of these very obvious and the other two quite indistinct. Conidial heads radiating to columnar; stipes dull brown, sinuous, smooth-walled, mostly covered with colourful projections, $(25-)60-100 \times 3-4$ µm. Vesicles pyriform, 8-11.5 µm diam; biseriate. Metulae covering only the upper third to half of the vesicles, $5-6.5 \times 2-3$ µm. Phialides $4-6 \times 2-3$ µm. Conidia globose, finely roughened (2.5–)3–3.5 µm. Colonies reaching 45 mm diam on MEA and 50 mm on CYA in 7 d at 25 °C, dull green, plane, spreading, slightly wrinkled, velutinous with fimbriate margins; mycelium white, inconspicuous; reverse dull brownish yellow on MEA and orange-brown on CYA.

Host and Distribution: On Arachis hypogaea seed, Kerman province, Jiroft (IRAN 235C).

Molecular data: IRAN 235C (ITS = KC473929, BenA (β -tubulin) = KC473907).

Reference:



Aspergillus quadrilineatus: a–e. teleomorph, f–h. anamorph: (a) ascomata surrounded by hülle cells; (b) hülle cells; (c) asci; (d, e) ascospores; (f, g) conidiophores; (h) conidia. Scale bars: a = 1000 μ m; b, f = 20 μ m; c–e, g = 10 μ m; h = 5 μ m

Aspergillus urmiensis Arzanlou, Houbraken & Samadi, Mycological Progress 15: 1089 (2016)

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Classification: Fungi, Ascomycota, Pezizomycotina, Eurotiomycetes, Eurotiomycetidae, Eurotiales, Aspergillaceae, Aspergillus

Description: Stipes mostly hyaline close to the vesicle and light brown to brown closer to the base, $(350-)700-850(-1330) \times (5-)8-10(-12) \mu m$, smooth walled, wall thickening 1 μm , aseptate, rarely have one septum, foot cell in two forms of symmetric or asymmetric, amber (47). Conidial heads radiate; vesicles $(17-)20-23(-30) \times (16-)19-22(-30) \mu m$, subglobose to globose, wall thickness less than 0.8 µm, uncolored. Conidiophores biseriate or uniseriate; Metulae $(4-)5-6(-7.5) \times (1.5-)2-3(-4) \mu m$, wedge shaped, walls smooth, uncolored, covering 4/5 upper part of the vesicle. Phialides 2–5 on each metula, $(2-)5-7(-8) \times (1-)1.5-2(-3) \mu m$, cylindrical, with distinct collulum. Conidia 2–3 µm, globose, smooth walled, hyaline (Fig. 3). Accessory conidia present in relatively small numbers, sessile or on the short, hyaline, micronematous conidiophores bearing conidia, globose, subglobose, clavate, commonly truncate (4-)5-6(-7) µm. No ascomata, ascospores or Hülle cells observed. Colony diam (mm): 7 d, 25 °C, CYA 28–32; CZ 20–24; MEA 23–27; YES 21–24; 7 d, 37 °C, CYA 21–23; CZ 16– 20; MEA 17-19; YES 18-20. On CYA 25 °C, 7 d: mycelium white; sporulation strong; conidial mass ochreoussclerotia absent; soluble pigment luteous; exudate after 21 d produced; umber colored; colony texture floccose in center to felt in margin; sulcate with low umbonate in center; reverse sienna and one umber line present in middle of colony. On YES 25 °C, 7 d: submerged mycelium at the margin of colony ochreous; aerial white mycelium appeared after 28 d; sporulation strong; conidial mass ochreous; sclerotia absent; soluble pigment luteous; exudate absent; colony texture lanose in center to feltin margin; sulcate with umbonate in center; reverse luteous in center pale luteous in margin of colony. On CZ 25 °C, 7 d: mycelium white; sporulation strong, conidial mass ochreous; sclerotia absent; colony texture lanose; sulcate with lightly umbonate in center; soluble pigment slightly produced, luteous; exudate absent; reverse orange. On MEA 25 °C, 7 d: mycelium ochreous; sporulation strong; conidial mass ochreous; sclerotia absent; orange uncolored exudate after 14 d frequently produced; colony texture lanose; sulcate; reverse luteous.

Host and Distribution: On soil, West Azerbaijan, Urmia, Jade Darya (seaside), 2011 (holotype CBS H-22671, ex-type culture CCTU 742 = CBS 139558 = IBT 32593 = DTO 203-C2); on soil, ; 2011, CCTU 734 = CBS 139557 = DTO 203-B3; CCTU 743 = CBS 139766 = IBT 32598 = DTO 203-C3.

Molecular data: CCTU 734 = DTO 203-B3 = CBS 139557 = IBT 32597 (BenA = KP987039, CaM = KP987055, RPB2 = KP987029, ITS = KP987072). CCTU 742T DTO 203-C2 = CBS 139558 = IBT 32593 (BenA = KP987041, CaM= KP987056, RPB2 = KP987030, ITS = KP987073). CCTU 743 DTO 203-C3 = CBS 139766 = IBT 32598 (BenA = KP987042, CaM = KP987057, RPB2 = KP987031, ITS = KP987074)

Note: Aspergillus urmiensis is phylogenetically most closely related to A. templicola. The former species produces globose vesicles, and those of A. templicola are predominantly elongate. Aspergillus urmiensis can be differentiated from A. luppii, A. movilensis, A. polyporicola and A. spelaeus by by a faster growth rate on CYA incubated at 37 °C. This new species can be differentiated from A. ardalensis based on the diam of the vesicles (A. ardalensis, 18.5 μ m; A. urmiensis, 22 μ m). A. neoflavipes produces bright yellow colonies on CYA and MEA, and has teleomorph; both features are not observed in A. urmiensis. A. micronesiensis and A. iizukae generally produce Hülle cells and these structures were not detected in A. urmiensis (Hubka et al. 2015, Visagie et al. 2014).

Reference:

Arzanlou, M., Samadi, R., Frisvad, J.C., Houbraken, J. and Ghosta, Y., 2016. Two novel Aspergillus species from hypersaline soils of The National Park of Lake Urmia, Iran. Mycological Progress, 15, pp. 1081–1092.



Aspergillus urmiensis CCTU 742: colonies after 7 d at 25 °C (a, b) CYA; (c, d) CZ; (e, f) MEA; (g, h) YES. Colonies after 14 d at 25 °C (i, j) OA. Conidial heads; (k) CYA; (l) MEA. (m) conidiophores; (n, o) accessory conidia; (p) conidia. Scale bars = $10 \mu m$



Pseudonectria buxi (DC.) Seifert, Gräfenhan & Schroers, in Gräfenhan et al., Stud. Mycol. 68: 107 (2011)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Hypocreomycetidae Hypocreales, Nectriaceae, Pseudonectria

Description: Sporodochia nonstromatic, variable in size, $25-150 \times 25-175 \mu m$, pink-red, with hyaline septate setae, $80-180 \times 3-5.5 \mu m$, distributed on recently decayed leaves and easily removed from the surface, conidia ellipsoid with rounded end, $7-14 \times 2-3 \mu m$, hyaline, aseptate and smooth (Fig 1). Colonies on PDA, 8–9 mm in diam after 5 d, with scattered white mycelium, became pale due to the production of slimy conidia. Conidiophores simple, as single monophialides or in sporodochia.

Host and Distribution: On *Buxus sempervirens* L., Guilan province, Rasht (GUM1592), IRAN 3645C.

Molecular data: IRAN 3645C (ITS = MW349710)

Reference:

Mousavi, S.A., Mousanejad, S., Rouhibakhsh, A. and Khodaparast, S.A., 2020. New record of boxwood volutella blight fungal agents in Iran. *Mycologia Iranica*, 7(2), pp. 181–186.



Pseudonectria buxi: (a) sporodochia on leaf surface; (b) a close-up of a sporodochia bearing setae on leaf surface; (c) sporodochia with setae; (d) colony on PDA after 10 days; (e) conidia. Scale bars: $c = 100 \mu m$; $e = 10 \mu m$

Sarocladium subulatum A. Giraldo, Gené & Guarro, in Giraldo, Gené, Sutton, Madrid, de Hoog, Cano, Decock, Crous & Guarro, Persoonia 34: 20 (2014)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Hypocreomycetidae Hypocreales, Nectriaceae, Sarocladium

Description: Colonies on OA at 25 °C attaining 20–22 mm diam in 14 d, yellowish-white, powdery, flat, margin diffuse; reverse dark. On PDA colonies reaching 16–17 mm diam in 14 d at 25 °C, yellowish-white, margin lobulated; reverse honey. Vegetative hyphae: septate, hyaline, smooth, 1.5–2.5 μ m wide. Conidiophores: erect, simple, hyaline, smooth. Phialides: arising directly from vegetative hyphae, straight or slightly flexuous, subulate, 17.5–35 μ m long, 2–2.5 μ m wide at the base, adelophialides sometimes present on OA. Conidia: unicellular, fusiform, 4– 9 × 1–2 μ m, hyaline, thin- and smooth-walled, sometimes arranged in chains with shorter length. Chlamydospores and sexual morphs were not observed.

Host and Distribution: On merged rotten leaves, Guilan province, Anzali lagoon, Anzali (IRAN 3324C).

Molecular data: IRAN 3324C (SSU = MK400436, ITS = MH367057, LSU = MH367075, *tub2* = MK400692, *tef1* = MK400705).

Referene:

Rezakhani, F., Khodaparast, S.A., Masigol, H., Roja-Jimenez, K., Grossart, H.P. and Bakhshi, M., 2019. A preliminary report of aquatic hyphomycetes isolated from Anzali lagoon (Gilan province, North of Iran). *Rostaniha*, 20(2), pp. 123–143.



Sarocladium subulatum: (a) colony on OA after 14 days at 25 °C; (b) colony on PDA after 14 days at 25 °C; (c-e) phialides arising directly from hyphae; (f) Conidia; (g) Conidia in chain. Scale bars = $10 \ \mu m$

Thyronectria austroamericana (Speg.) Seeler, Journal of the Arnold Arboretum 21: 405 (1940)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Hypocreomycetidae Hypocreales, Nectriaceae, Thyronectria

Description: Ascomata and pycnidia formed on same or discrete stroma. Stromata variable in size, average ca. $35 \times 3 \times 30$ µm, partly immersed, reaction to KOH and Lactic Acid (LA) negative. Perithecia are subglobose to globose, aggregated in groups of 4–160, 20–48 \times 20–33 µm, dark brown to black, shining apical region, not collapsing or rarely cupulate when dry. Ascinarrowly clavate, $57.6-68.4 \times 7 \times 7.2-12 \mu m$, 8-spored, ascospores subglobose to ellipsoidal, muriform, light yellow, (11)12–19 x 7–10(11–12) μ m. Pycnidial stromata erumpent through epidermis or developing in stroma with ascomata, orange to peach. Pycnidia dimorphic, superficial and immersed in stroma, Superficial pycnidia multilocular, brown. immersed pycnidia multilocular, irregular multiple chambers with shared walls, solitary or aggregated in groups of 2-4. Conidiophores 2–5 times branched, $8-13.5 \times 1-2 \mu m$. Sterile hyphae mixed with phialides and acicular, straight or slightly curved, unbranched, sometimes 1–2 branched, aseptate, $20-45 \times 1 \times 10^{-10}$ $1-1.5 \,\mu\text{m}$. Conidia light yellow, ellipsoidal to obovate, aseptate, $2-3 \times 1 \times 1-1.5 \,\mu\text{m}$. On PDA after 7 d at 25 °C, colonies 35–45 mm. Colony surface with radial growth and sometimes wavy, peach. Sporulation on SNA rare. Conidiophores abundant, unbranched, $12.5-31 \times 1 \times 1-2 \mu m$. Conidia hyaline, KOH +, LA- oblong or ellipsoidal, straight or slightly curved, rounded at both ends, not germinating and budding on media, $2-3(-4) \times 4 \times 4.5 - 13.5(-17) \mu m$.

Host and Distribution: On the branches and barks of *Gleditsia caspia* Desf. (= *Gleditsia caspica* Desf.), Guilan province, Fouman (Alian) (GUM 1544), IRAN 2953C.

Molecular data: IRAN 2953C (ITS = MW325661).

Reference:

Mousavi, N., Mousanejad, S. and Khodaparast, S.A., 2020. New or less known ascomycete species associated with trunk and branches of trees in Guilan province, Iran. *Mycologia Iranica*, 7(1), pp. 115–123.



Thyronectria austroamericana: (a) teleomorph on natural substrata; (b) cross section of superficial pycnidia; (c) asci; (d) ascospores; (e) colony morphology in 90 mm dishes after 2 weeks at 22 °C on PDA; (f) conidia on SNA media. Scale bars: $a = 100 \ \mu m$; $b-f = 20 \ \mu m$

Volutella citrinella (Cooke & Massee) Seifert, in Gräfenhan, Schroers, Nirenberg & Seifert, Stud. Mycol. 68: 110 (2011)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Hypocreomycetidae Hypocreales, Nectriaceae, Volutella

Description: Colonies on PDA at 25 °C attaining 20–23 mm diam in 7 d, olivaceous at first then turning into white, conidial mass was produced on surface. Synnemata: lightly colored, 300–1450 μ m tall and 25–50 μ m wide. Marginal hyphae: vertucose near capitulum. Conidiogenous cells: phialidic, 13–25 × 1.5–2 μ m. Conidia: ellipsoidal to oblong-ellipsoidal, 3–5 × 1–2 μ m, conidial mass yellow-white, no aerial mycelium or chlamydospore were produced on PDA.

Host and Distribution: On merged rotten leaves, Guilan province, Anzali lagoon, Anzali (IRAN 3327C).

Molecular data: IRAN 3327C (SSU = MK400429, ITS = MH367055, LSU = MH367073, *tef1* = MK410643).

Reference:

Rezakhani, F., Khodaparast, S.A., Masigol, H., Roja-Jimenez, K., Grossart, H.P. and Bakhshi, M., 2019. A preliminary report of aquatic hyphomycetes isolated from Anzali lagoon (Gilan province, North of Iran). *Rostaniha*, 20(2), pp. 123–143.


Volutella citrinella: (a) colony on MEA after 20 days at 25 °C; (b) colony on PDA after seven days at 25 °C; (c) synnema; (d–e) conidiophores and phialides; (f) conidia. Scale bars: $c = 40 \mu m$; $d-f = 10 \mu m$



Kirschsteiniothelia arasbaranica Mehrabi, R. Hemmati & Asgari, Cryptogamie Mycologie 38 (1): 18 (2017)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Pleosporomycetidae, Kirschsteiniotheliales, Kirschsteiniotheliaceae, Kirschsteiniothelia*

Description: Saprobic on dead branch. Teleomorph: Ascomata 189–380 μ m high \times 350–480 μ m diam, superficial with the base remaining slightly immersed in the substrate, subglobose to globose, scattered or loosely clustered in small groups, black, inside white, with apex papilla or plane. Peridium 50-80 µm thick, comprising several layers of cells of textura angularis; inner layer cells hyaline, outer layer cells pale brown to dark. Hamathecium comprising numerous filiform pseudoparaphyses 2–2.7 mm wide, hyaline, branched, embedded in a gelatinous matrix. Asci $120-180 \times 30-40 \mu m$, cylindrical-clavate, 8-spored, occasionally 4- or 6-spored, bitunicate, fissitunicate, with a short stalk up to 10 µm long, apically rounded, with an apical ocular chamber $5-8 \mu m$ wide. As cospores arranged 2- to 4-seriate in the lower 2/3 and 1-seriate in the upper 1/3 of asci, $(30-)34-42(-44) \times (12-)13-16(-18) \mu m$ ($\bar{x} = 36.6 \times 15.2$, n = 40), brown to dark brown at maturity, narrowly to broadly ellipsoidal with rounded apex, thick-walled, vertucose to finely spinulose, covered with a mucilaginous sheath, 1-septate, septum deeply constricted and submedian, the upper cell distinctly larger than the lower cell, each cell containing a distinct large guttule. Anamorph undetermined. Ascospores germinating on PDA within 24-48 h. Colonies on PDA dense, reaching 5 mm diam in 7 d at 25 °C and 20–23 mm diam within a month, first grayish blue (45,...,b), surface covered with a white mat of aerial hyphae, becoming dark brick (7,k) with white margin at 3 mo, composed of brown to dark brown, septate, smooth or verruculose hyphae up to 6 μ m wide and hyaline to pale brown hyphal elements at the periphery, with abundant anastomosis, up to 4 µm wide; reverse at first dark bluish green with hyaline margin, then becoming black at 3 months. No conidiogenous structures observed.

Host and Distribution: On dead branch of *Quercus petraea*, East Azerbaijan province, Arasbaran forests (holotype IRAN 16767F, ex-type culture IRAN 2508C); Ibid. (isotype IRAN 16768F, ex-isotype culture IRAN 2509C).

Molecular data: IRAN 2508C (ITS = KX621983, LSU = KX621984, SSU = KX621985), IRAN 2509C (ITS = KX621986, LSU = KX621987, SSU = KX621988).

Note: *Kirschsteiniothelia arasbaranica* is close to *K. dolioloides* and *to K. thujina* in ascospore size and septation, and in lacking an anamorph. However, it can be distinguished from these by having wider asci and ellipsoidal ascospores with rounded apex, covered by a distinct mucilaginous sheath.

References:

Mehrabi, M., Hemmati, R. and Asgari, B., 2017. *Kirschsteiniothelia arasbaranica* sp. nov., and an emendation of the *Kirschsteiniotheliaceae*. *Cryptogamie Mycologie*, 38(1), pp. 13–25.
Hawksworth, D.L., 1985. *Kirschsteiniothelia*, a new genus for the *Microthelia incrustans* group (Dothideales). *Botanical Journal of the Linnean Society*, 91, pp. 181–202.



Kirschsteiniothelia arasbaranica (holotype): (a–d) ascomata on dead branch of *Quercus petraea*; (e, f) section through ascomata; (g) section through peridium, comprising several layers of cells of *textura angularis*; (h) pseudoparaphyses; (i–l) asci; m. apical inner layer of an ascus with small ocular chamber; (n–u) ascospores; (v) culture on PDA incubated for 2 wk at 25°C. Scale bars: a– $d = 200 \mu m$; e, f = 100 μm ; g, i–l, n, o = 20 μm ; h, m, p–u = 10 μm



Nakataea oryzae (Catt.) J. Luo & N. Zhang, Mycologia 105(4): 1025 (2013)

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Synonyms: Helminthosporium sigmoideum Cavara, Mat. Lomb.:15. 1889; Nakataea sigmoidea (Cavara) Hara, as "sigmoideum", Nippongaikingaku: 318. 1936. nom. nud.; Nakataea sigmoidea (Cavara) Hara, as "sigmoideum", The diseases of the rice-plant 2nd ed.: 185. 1939; Leptosphaeria salvinii Catt., Arch. Labor. Bot. Critt. Univ. Pavia 2, 3: 126. 1879; Magnaporthe salvinii (Catt.) R.A. Krause & R.K. Webster, Mycologia 64: 110. 1972, Sclerotium oryzae Catt., Arch. Triennale Lab. Bot. Crittog. 1: 10. 1877

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Magnaporthaceae, Nakataea

Description: Conidiophores solitary, erect, branched, brown to pale brown, smooth, 130–460 μ m. Conidiogenous cells integrated, terminal and intercalary, pale brown, smooth, denticles. Conidia solitary, falcate to sigmoid, smooth, 3-septate, 45–76 × 10–15 μ m, widest in the middle, end cells hyaline, median cells medium brown. Sclerotia spherical, black, on the host and in culture. Colonies grown on PDA after 1 wk at 23–25 °C grey to pale grey.

Host and Distribution: On infected leaves of Oryza sativa, Guilan province.

Molecular data: UTFC-MO1 (ITS = KP144444); UTFC-MO2 (ITS = KP144445).

Note: The genus *Nakataea* has some similarity to *Pyricularia* in general morphology, but differs in having falcate conidia with darker median cells (Luo & Zhang 2013, Klaubauf *et al.*, 2014).

- Klaubauf, S., Tharreau, D., Fournier, E., Groenewald, J. Z., Crous, P. W., De Vries, R. P., & Lebrun, M. H. 2014. Resolving the polyphyletic nature of *Pyricularia (Pyriculariaceae)*. *Studies in Mycology*, 79, pp. 85–120.
- Luo, J. and Zhang, N., 2013. *Magnaporthiopsis*, a new genus in *Magnaporthaceae* (Ascomycota). *Mycologia*, 105, pp. 1019–1029.



Nakataea oryzae: (a–c) conidiophores solitary, erect, branched, unbranched; (d–e) conidiogenous cells; (f–g) conidia. Scale bars = $10 \ \mu m$

Pseudopyricularia cyperi Klaubauf, M.-H. Lebrun & Crous, Studies in Mycology 79: 110 (2014)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Pyriculariaceae, Pseudopyricularia*

Description: Conidiophores solitary, erect, straight or curved to geniculate, branched, medium brown, smooth, $40-100 \times 3-4 \mu m$. Conidiogenous cells integrated, terminal and intercalary, pale brown, smooth, forming a rachis with several protruding, flat-tipped denticles. Conidia solitary, obclavate, medium brown, smooth to finely roughened, 2-septate, $22-29 \times 5-6 \mu m$; hilum truncate, slightly protruding, unthickened, not darkened. Colonies grown on PDA after 1 wk at 23-25 °C white, reaching 40 mm diam.

Host and Distribution: On infected leaves of *Cyperus* sp. Mazandaran province, Amol (UTFC-PO8, UTFC-PO16, UTFC-O17).

Molecular data: UTFC-PO8 (Cy2k) (ITS = KP144446), UTFC-PO16 (cy4-1) (ITS = MF768983), UTFC-O17 (cy2k1) (ITS = MF768984).

Note: Morphology of the specimens examined in this study was concordant with the protologue description of *Pseudopyricularia cyperi* (Klaubauf & al. 2014). This species is morphologically similar to *P. higginsii* (Luttr.) Klaubauf *et al.*, which differs by its longer and slightly wider conidia [17.5–36.5 × 5.3–6.5 µm (Luttrell 1955), 20–36 × 5–6 µm (Ellis 1976)]. This is the first report of *P. cyperi* from Iran.

- Klaubauf, S., Tharreau, D., Fournier, E., Groenewald, J. Z., Crous, P. W., De Vries, R. P., & Lebrun, M. H. 2014. Resolving the polyphyletic nature of *Pyricularia (Pyriculariaceae)*. *Studies in Mycology*, 79, pp. 85–120.
- Pordel, A., Amirmijani, A. and Javan-Nikkhah, M., 2019. Pseudopyricularia cyperi; a new record for Iran. Mycotaxon, 134, pp. 447–455.
- Ellis, M.B., 1976. Dematiaceous hyphomycetes. Commonwealth Mycological Institute, Kew, Surrey, England.



Pseudopyricularia cyperi: (a–c) conidiophores solitary, erect, branched, unbranched; (d–f) conidia. Scale bars = $10 \ \mu m$

Pseudopyricularia hyrcaniana Pordel & Jav.-Nikkh., Mycological Progress 16 (7): 731 (2017)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Pyriculariaceae, Pseudopyricularia*

Description: Conidiophores scattered, solitary, erect, pale brown to brown, swollen at the base, wall somewhat thickened, macronematous, mononematous, typically unbranched, sometimes branched, straight, consisting of 2-3(-5) cells, $65-125(-140) \times 4-5 \mu m$. Conidiogenous cells integrated, terminal, intercalary, sympodial, cylindrical, geniculate, denticulate; denticles cylindrical, thin-walled, pale brown, $3-4 \mu m$ long. Conidia solitary, dry, obclavate, hyaline, $(17-)20-29(-31) \times (5-)6-8 \mu m$, smooth, 1-septate, hilum often protuberant. Teleomorph undetermined. Colonies on OA transparent, olivaceous buff, reaching 50 mm diam after 1 wk at 23–25 °C; on PDA with grey olivaceous surface and olivaceous grey reverse, reaching 40 mm diam after 1 wk at 23–25 °C. Mycelium on SNA, WA-sterile barley seed, and WA-sterile rice leaf consisting of smooth, hyaline, branched, septate hyphae.

Host and Distribution: On infected leaves of *Cyperus alternifolius*, Golestan province, Gorgan region (IRAN2758C, IRAN 2759C, IRAN 2760C).

Molecular Data: IRAN2758C (ITS = KP144447, LSU = KP144452, RPB1 = KY457270, CAL = KY457260); IRAN 2759C (ITS = KP144448, LSU = KY457266, RPB1 = KY457271, CAL = KY457261); IRAN 2760C (ITS = KM207211, LSU = KY457267, RPB1 = KY457272, CAL = KY457262).

Notes: This species is similar to *Pyricularia caffera*, *Py. didyma*, *Py. juncicola*, *Py. vandalurensis*, and *Dactylaria madrasensis* in having 1-septate conidia. However, the conidia of *Pseudopyricularia hyrcaniana* are larger than those of *Py. vandalurensis*, and *Py. juncicola*. It differs from *Dactylaria madrasensis* in conidial shape and shape of conidiogenous cells and from *Py. didyma* and *Py. caffera* in conidial shape. *Pseudopyricularia hyrcaniana* differs from *Ps. cyperi*, *Ps. kyllingae*, and *Ps. higginsii* in conidial septation.

Reference:

Pordel, A., Khodaparast, S.A., McKenzie, E.H.C. and Javan-Nikkhah, M., 2017. Two new species of *Pseudopyricularia* from Iran. *Mycological Progress*, 16, pp. 729–736.



Pseudopyricularia hyrcaniana: (a) conidiophores solitary, erect, unbranched; (b) branched conidiophore; (c) conidiogenous cell; (d–k) conidia. Scale bars = $10 \ \mu m$

Pseudopyricularia iraniana Pordel & Jav.-Nikkh., Mycological Progress 16(7): 732 (2017)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Pyriculariaceae, Pseudopyricularia*

Description: Conidiophores solitary, erect, pale brown to brown, swollen and thick at the base, macronematous, mononematous, sometimes with additional branches typically without septa, rarely consisting of 2 or 3 cells, $87-140(-170) \times 5-6 \mu m$. Conidiogenous cells sympodial, cylindrical, geniculate, denticulate; each denticle tapered, thin-walled, long, narrow, pale brown, 3–4 µm long. Conidia solitary, dry, fusiform or cylindrical, hyaline, $(20-)22-30 \times 5-8 \mu m$, smooth, 2-septate, hilum often protuberant. Teleomorph undetermined. Colonies on OA transparent, pale grey, reaching 40 mm diam after 1 wk at 23–25 °C; on PDA, surface grey olivaceous, reverse greyish sepia, reaching 40 mm diam after 1 wk at 23–25 °C. Mycelium on SNA, WA-sterile barley seed, and WA-sterile rice leaf consisting of smooth, hyaline, branched, septate hyphae.

Host and Distribution: On infected leaves of *Juncus* sp. Golestan province, Kordkuy region (UTFC-PO12, IRAN 2761C, IRAN 2762C).

Molecular Data: UTFC-PO12 (ITS = KM207210, LSU = KP144454, CAL = KY457263). IRAN 2761C; (ITS = KY457258, LSU = KY457268, RPB1 = KY457273, CAL = KY457264); IRAN 2762C (ITS = KY465726, LSU = KY457269, RPB1 = KY457274, CAL = KY457265).

Note: This species is similar to *Pyricularia caffera* and *Pseudopyricularia hyrcaniana* in conidial size but its conidia are 2-septate and fusiform. The conidia are similar in size to those of *Pyricularia angulata* but differ in shape (Ellis 1971, 1976; Matsushima 1993). Conidial shapes encountered in *P. iraniana* and characters related to conidial secession differ from patterns observed in *Pyricularia* because conidia are fusiform and cylindrical and they show no cut-off. This species differs from *Pseudopyricularia cyperi*, *Ps. kyllingae*, and *Ps. higginsii* in conidial shape.

Reference:

Pordel, A., Khodaparast, S.A., McKenzie, E.H.C. and Javan-Nikkhah, M., 2017. Two new species of *Pseudopyricularia* from Iran. *Mycological Progress*, 16, pp. 729–736.



Pseudopyricularia iraniana: (a–e) conidiophores solitary, erect; (f) branched conidiophore; (g–k) conidia. Scale bars = $10 \ \mu m$

Pseudopyricularia persiana G. Ghorbani, Pordel & Jav.-Nikkh., Persoonia 41: 399 (2018)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Pyriculariaceae, Pseudopyricularia*

Description: Mycelium on SNA, and OA, consisting of smooth, hyaline, branched, septate hyphae. Conidiophores scattered, solitary, erect, pale brown, swollen at the base, macronematous, mononematous, typically unbranched, sometimes branched, straight, typically consisting of without or four cells $137-332(-380) \times 5-7$ µm. Conidiogenous cells integrated, terminal, intercalary, sympodial, cylindrical, geniculate, denticulate; denticles cylindrical, thin-walled, pale brown. Conidia solitary, dry, obclavate, hyaline, $(30-)36-52(-65) \times 10-13$ µm, 2-septate (rarely 3-septate), hilum often protuberant, conidia produce secondary conidiophore. Teleomorph undetermined. Colonies on OA transparent, buff, reaching 42 mm diam after 1 wk at 23–25 °C; on PDA transparent, white, and straw reverse, reaching 26 mm diam after 1 wk at 23–25 °C.

Host and Distribution: On infected leaves of *Cyperus* sp., Guilan province, Lasht-e Nesha (UTFC-PO20, UTFC-PO21, UTFC-PO22).

Molecular Data: UTFC-PO20 (ITS = MH780926, LSU = MH780974, RPB1 = MH699975, CAL = MH699978); UTFC-PO21 (ITS = MH699979, RPB1 = MH699976), UTFC-PO22; (ITS = MH699980, RPB1 = MH699977).

Notes: This species is similar to *Ps. higginsii*, *Ps. cyperi*, *Ps. iraniana Ps. kyllingae*, and *Ps. hagahagae* in having 2-septate conidia (Klaubauf *et al.* 2014, Pordel *et al.* 2017). However, the conidia and conidiophores of *Pseudopyricularia persiana* are larger than those of *Ps. higginsii*, *Ps. cyperi*, *Ps. kyllingae*, and *Ps. hagahagae* and having 3-septate. It differs from *Ps. iraniana* in conidial shape and size.

Reference:

Crous, P.W., Luangsa-ard, J.J., Wingfield, M.J., Carnegies, A.J., Hernández-Restrepo, M., Lombard, L., Roux, J. *et al.*, 2018. Fungal planet description sheets: 785–867. *Persoonia*, 41, pp. 238–417.



Pseudopyricularia persiana: (a–d) conidiophores solitary erect, unbranched, branched; (e–i) conidia. Scale bars = $10 \ \mu m$

Pyricularia grisea Sacc., Michelia 2(6): 20 (1880)

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Synonym: Ceratosphaeria grisea T.T. Hebert, Phytopathology 61(1): 86. 1971, Magnaporthe grisea (T.T. Hebert) M.E. Barr, Mycologia 69(5): 954. 1977

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Pyriculariaceae, Pyricularia*

Description: Conidiophores solitary, erect, straight or curved to geniculate, unbranched, pale brown, smooth, $70-175 \times 4-5 \mu m$. Conidiogenous cells integrated, terminal and intercalary, pale brown, smooth, denticles. Conidia solitary, obpyriform, brown, smooth, 2-septate, $26-31 \times 6-8 \mu m$; hilum protuberant. Colonies grown on PDA after 1 wk at 23–25 °C grey, reaching 50 mm diam.

Host and Distribution: On infected leaves of *Digitaria* sp. Guilan, Mazandaran and Golestan provinces.

Molecular data: UTFC-PO6 (ITS = KP144438)

Note: This species is morphologically similar to *Pyricularia oryzae* Cavara which differs by its shorter and slightly wider conidia $(16-25 \times 7-10 \ \mu m)$.

- Klaubauf, S., Tharreau, D., Fournier, E., Groenewald, J. Z., Crous, P. W., De Vries, R. P., & Lebrun, M. H. 2014. Resolving the polyphyletic nature of *Pyricularia (Pyriculariaceae)*. *Studies in Mycology*, 79, pp. 85–120.
- Pordel, A., Javan-Nikkhah, M. and Khodaparast, S.A., 2015. Revision of *Pyricularia oryzae* and occurrence of new hosts for the pathogen Iran. *Iranian Journal of Plant Pathology*, 52, pp. 67–83.



Pyricularia grisea: (a–c) conidiophores solitary, erect, branched, unbranched; (d–f) conidia. Scale bars = $10 \ \mu m$

Pyricularia oryzae Cavara, Fungi Longobardiae exsiccati sive Mycetum specimina in Longobardia collecta, exsiccata et speciebus novis vel criticis, iconibus illustrata Pug. I: no. 49 (1891)

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Synonym: Magnaporthe oryzae B.C. Couch, Mycologia 94(4): 692. 2002

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Magnaporthales, Pyriculariaceae, Pyricularia

Description: Conidiophores solitary, erect, straight or curved to geniculate, unbranched, pale brown, smooth, $100-250 \times 4-5 \mu m$. Conidiogenous cells integrated, terminal and intercalary, pale brown, smooth, denticles. Conidia solitary, obpyriform, medium brown, smooth, 2-septate, 16–25 \times 7–10 μm ; hilum protuberant. Colonies grown on PDA after 1 wk at 23–25 °C grey, reaching 50 mm diam.

Host and Distribution: On infected leaves of *Oryza sativa*, *Echinochloa crus-galli*, *Zea mays*, *Setaria viridis*, *Setaria glauca*, *Setaria italica*, *Cynodon dactylon*, *Paspalum distichum*, *Eleusine indica*, Guilan, Mazandaran and Golestan provinces.

Molecular data: IR0125 (ITS = MH188319, RPB1 = MH188330, CAL = MH188335); IR0129 (ITS = KP144439, RPB1 = MH188331, CAL = MH188345); IR0148 (ITS = MH188322, RPB1 = MH188334, CAL = MH188346).

Note: This species is morphologically similar to *Pyricularia grisea* Sacc. which differs by its longer and slightly wider conidia $(26-31 \times 6-8 \ \mu m)$.

- Klaubauf, S., Tharreau, D., Fournier, E., Groenewald, J. Z., Crous, P. W., De Vries, R. P., & Lebrun, M. H. 2014. Resolving the polyphyletic nature of *Pyricularia (Pyriculariaceae)*. *Studies in Mycology*, 79, pp. 85–120.
- Pordel, A., Javan-Nikkhah, M. and Khodaparast, S.A., 2015. Revision of *Pyricularia oryzae* and occurrence of new hosts for the pathogen Iran. *Iranian Journal of Plant Pathology*, 52, pp. 67–83.



Pyricularia oryzae: (a) conidia; (b) conidiophores solitary, erect, branched, unbranched. Scale bars = $10 \ \mu m$



Cercospora althaeina Sacc., Michelia 1: 269 (1878)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots distinct, angular to irregular, mostly vein-limited, olivaceous-brown, sometimes grey-brown with dark brown margin, center becoming pale grey with black dots (= stroma with conidiophores). Caespituli amphigenous, mostly epiphyllous. Mycelium internal. Stromata well-developed, emerging through stomatal openings or erumpent through the cuticle. Conidiophores in divergent fascicles (6–18), pale olivaceous-brown at the base, paler upwards, 2–8-septate, straight to mildly curved, (50–)130–170(–250) × 3.5–6 μ m, conically narrowed at the apex; loci conspicuous, apical or on shoulders formed by geniculation, 1.5–2 μ m. Conidia solitary, obclavate-cylindrical to filiform, not acicular, straight to mildly curved, hyaline, 4–12-septate, obtuse at the apex, subtruncate or obconically truncate at the base, (40–)70–95(–145) × 3–5 μ m.

Host and Distribution: On leaves of *Althaea rosea* (L.) Cav., Guilan province, Talesh (CCTU 1001) (CCTU 1026) (CCTU 1152), Guilan province, Sowme'eh Sara (CCTU 1028); on leaves of *Malva sylvestris*, Talesh (CCTU 1071) (CCTU 1222), East Azerbaijan province, Kaleibar (CCTU 1194 = IRAN 2674C) (CCTU 1249); on leaves of *Malva* sp., Mazandaran, Amol, 36°28'31.21" N, 52°27'56.69" E (IRAN 3920C, IRAN 17716F).

Molecular data: CCTU 1001 (ITS = KJ886392, TEF = KJ886231, ACT = KJ885909, CAL = KJ885748, HIS = KJ886070); CCTU 1026 (ITS = KJ886393, TEF = KJ886232, ACT = KJ885910, CAL = KJ885749, HIS = KJ886071); CCTU 1028 (ITS = KJ886394, TEF = KJ886233, ACT = KJ885911, CAL = KJ885750, HIS = KJ886072); CCTU 1071 (ITS = KJ886395, TEF = KJ886234, ACT = KJ885912, CAL = KJ885751, HIS = KJ886073); CCTU 1152 (ITS = KJ886396, TEF = KJ886235, ACT = KJ885913, CAL = KJ885752, HIS = KJ886074); CCTU 1194 = IRAN 2674C (ITS = KJ886397, TEF = KJ886236, ACT = KJ885914, CAL = KJ885753, HIS = KJ886075); CCTU 1224 (ITS = KJ886398, TEF = KJ886237, ACT = KJ885915, CAL = KJ885754, HIS = KJ886076); CCTU 1249 (ITS = KJ886399, TEF = KJ886238, ACT = KJ885916, CAL = KJ885755, HIS = KJ886077), IRAN 3920C (TEF = MT843584, ACT = MT843607, CAL = MT843631, HIS = MT843658, GAPDH = MT843686).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86.
- Bakhshi, M. and Zare, R., 2020. Development of new primers based on gapdh gene for Cercospora species and new host and fungus records for Iran. *Mycologia Iranica*, 7(1), pp. 63–82.
- Groenewald, J.Z., Nakashima, C., Nishikawa, J., Shin, H.D., Park, J.H., Jama, A.N., Groenewald, M., Braun, U. and Crous, P.W., 2013. Species concepts in *Cercospora*: spotting the weeds among the roses. *Studies in Mycology*, 75, pp. 115–170.



Cercospora althaeina: (a, b) leaf spots; (c) fasciculate conidiophores; (d–g) conidia. Scale bars = 10 µm

Cercospora apii Fresen., emend. Groenewald et al., Phytopathology 95: 954 (2005)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, distinct, circular to subcircular, 1–9 mm diam, whitegrey in centre, surrounded by a dark purple-brown border. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in moderately dense fascicles (4–15), arising from the upper cells of a well-developed brown stroma, to 50 µm wide; conidiophores brown, becoming pale brown towards the apex, 1–6-septate, straight to variously curved, unbranched, uniform in wide, (45–)80–95(–125) × 4–5.5 µm. Conidiogenous cells integrated, lateral or terminal, unbranched, brown, smooth, proliferating sympodially, 20–40 × 3.5–5 µm, multilocal; loci thickened, darkened, refractive, apical or lateral, 2–3.5 µm diam. Conidia solitary, smooth, obclavate-cylindrical to acicular, straight to slightly curved, hyaline, distinctly 3–9(– 15)-septate, apex subacute or subobtusely rounded, base subtruncate to obconically truncate, (30–)65–80(–115) × 3–5 µm; hila thickened, darkened, refractive, 2–3.5 µm diam.

Host and Distribution: On leaves of *Cynanchum acutum* L., Ardabil province, Moghan (CCTU 1069) (CCTU 1086 = IRAN 2655C = CBS 136037) (CCTU 1215) (CCTU 1219).

Molecular data: CCTU 1069 (ITS = KJ886410, TEF = KJ886249, ACT = KJ885927, CAL = KJ885764, HIS = KJ886086); CCTU 1086 = IRAN 2655C = CBS 136037 (ITS = KJ886411, TEF = KJ886250, ACT = KJ885928, CAL = KJ885765, HIS = KJ886087); CCTU 1215 (ITS = KJ886412, TEF = KJ886251, ACT = KJ885929, CAL = KJ885766, HIS = KJ886088); CCTU 1219 (ITS = KJ886413, TEF = KJ886252, ACT = KJ885930, CAL = KJ885767, HIS = KJ886089).

Reference:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z. and Crous, P.W., 2018. Novel primers improve species delimitation in *Cercospora*. *IMA fungus*, 9, pp. 299–332.



Cercospora apii: (a) leaf spots; (b, c) fasciculate conidiophores; (d–h) conidia. Scale bars = $10 \ \mu m$

Cercospora beticola Sacc., emend. Groenewald et al., Phytopathology 95: 954 (2005)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, distinct, circular to subcircular, 1–7 mm diam, whitegrey, with grey dots (stroma with conidiophores), surrounded by distinct brown border. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in loose to dense fascicles, emerging through stomatal openings or erumpent through the cuticle, arising from the upper cells of a moderately to well-developed brown stroma, to 110 μ m diam; conidiophores brown, becoming paler towards apex, 2–8-septate, thick walled, straight to geniculate-sinuous, unbranched, uniform in width, (30–)80–110(–185) × 4–5(–6) μ m. Conidiogenous cells integrated, terminal or lateral, unbranched, brown, smooth, proliferating sympodially, 10–30 × 3.5–5.5 μ m, mostly multi-local, sometimes mono-local; loci apical or formed on shoulders caused by geniculation, thickened, darkened, refractive, 1.5–2 μ m diam. Conidia solitary, subcylindrical, fliform to acicular, straight to variously curved, hyaline, 3– 15(–29)-septate, apex subacute to acute, base truncate to subtruncate, (40–)90–140(–300) × 2– 5 μ m; hila thickened, darkened, refractive, 1.5–2.5 μ m diam.

Host and Distribution: On leaves of *Beta vulgaris* L., Guilan province, Talesh, Khotbe sara (CCTU 1135), Ardabil province, Moghan, 39°30'08.27"N, 48°02'38.62"E (IRAN 3923C, IRAN 17720F), Mazandaran province, Kelardasht, Goharkela, 36°28'59.04"N, 51°14'58.68"E (IRAN 3924C, IRAN 17721F), Mazandaran province, Marzanabad, Foshkour, 36°21'29.2" N 51°11'43.0" E (P 656 R2, IRAN 17722F); on leaves of *Plantago lanceolata* L., Zanjan province, Tarom, Mamalan (CCTU 1108), Ardabil province, Moghan (CCTU 1089 = CPC 24911); on leaves of *Chenopodium* sp., Ardabil province, Moghan (CCTU 1057 = IRAN 2651C) (CCTU 1065) (CCTU 1087); on leaves of *Sonchus asper* (L.) Hill, Ardabil province, Moghan (CCTU 1088 = CBS 138582), on leaves of *Raphanus sativus*, Khuzestan province, Shush-Dezful, 32°15'14.5" N 48°22'46.9" E (IRAN 3925C, IRAN 17723F)

Molecular data: CCTU 1135 (ITS = KJ886432, TEF = KJ886271, ACT = KJ885949, CAL = KJ885788, HIS = KJ886110); CCTU 1108 (ITS = KJ886430, TEF = KJ886269, ACT = KJ885947, CAL = KJ885786, HIS = KJ886108); CCTU 1089 = CPC 24911 (ITS = KJ886429, TEF = KJ886268, ACT = KJ885946, CAL = KJ885785, HIS = KJ886107); CCTU 1057 = IRAN 2651C (ITS = KJ886424, TEF = KJ886263, ACT = KJ885941, CAL = KJ885780, HIS = KJ886102); CCTU 1065 (ITS = KJ886425, TEF = KJ886264, ACT = KJ885942, CAL = KJ885781, HIS = KJ886103); CCTU 1087 (ITS = KJ886427, TEF = KJ886266, ACT = KJ885944, CAL = KJ885783, HIS = KJ886105); CCTU 1088 = CBS 138582 (ITS = KJ886428, TEF = KJ886267, ACT = KJ885945, CAL = KJ885784, HIS = KJ886106); IRAN 3923C (CAL = MT843636, HIS = MT843663, GAPDH = MT843691); IRAN 3924C (ACT = MT843610, CAL = MT843635, HIS = MT843662, GAPDH = MT843690) ; IRAN 3925C (TEF = MT843587; ACT = MT843612, CAL = MT843638, HIS = MT843665, GAPDH = MT843693).

References:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z. and Crous, P.W., 2018. Novel primers improve species delimitation in *Cercospora*. *IMA fungus*, 9, pp. 299–332.

Bakhshi, M. and Zare, R., 2020. Development of new primers based on gapdh gene for Cercospora species and new host and fungus records for Iran. *Mycologia Iranica*, 7(1), pp. 63–82.



Cercospora beticola: (a) leaf spots; (b) fasciculate conidiophores; (c–g) conidia. Scale bars = $10 \ \mu m$

Cercospora chenopodii Fresen., Beitr. Mykol. 92 (1863)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, distinct, circular to subcircular, 2–6 mm diam, pale brown with black dots (stroma with conidiophores), definite margin, surrounded by a dark pink border. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in dense fascicles (5–35), arising from the upper cells of a moderately developed brown stroma, up to 70 μ m wide; conidiophores medium brown, becoming pale brown towards the apex, 2–8septate, straight to variously curved, unbranched, (40–)62–72(–90) × 4–6 μ m, width of conidiogenous cells immediately behind the fertile region is often narrower. Conidiogenous cells intercalary and terminal, unbranched, pale brown, smooth, proliferating sympodially, 20– 50 4 × 4–6 μ m, mostly mono-local, sometimes multi-local; loci thickened, darkened, protuberant, refractive, apical or lateral, 2–3.5 μ m diam. Conidia solitary, smooth, subcylindrical, straight to slightly curved, hyaline, distinctly (0–)2–4(–5)-septate, apex obtuse, base obconically truncate, sometimes constricted at the septa, (20–)27–32(–40) × 5–6(–7) μ m; hila thickened, darkened, refractive, 2–4 μ m diam.

Host and Distribution: On leaves of *Chenopodium album* L., Guilan province, Talesh (CCTU 1033); Guilan province, Bandar-e Anzali (CCTU 1060 = IRAN 2652C); Guilan province, Langroud (CCTU 1157); Guilan province, Lahijan (CCTU 1163).

Molecular data: CCTU 1033 (ITS = KJ886437, TEF = KJ886276, ACT = KJ885954, CAL = KJ885793, HIS = KJ886115); CCTU 1060 = IRAN 2652C (ITS = KJ886438, TEF = KJ886277, ACT = KJ885955, CAL = KJ885794, HIS = KJ886116); CCTU 1157 (ITS = KJ886439, TEF = KJ886278, ACT = KJ885956, CAL = KJ885795, HIS = KJ886117); CCTU 1163 (ITS = KJ886440, TEF = KJ886279, ACT = KJ885957, CAL = KJ885796, HIS = KJ886118).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia*, 34(1), pp. 65–86.
- Groenewald, J.Z., Nakashima, C., Nishikawa, J., Shin, H.D., Park, J.H., Jama, A.N., Groenewald, M., Braun, U. and Crous, P.W., 2013. Species concepts in *Cercospora*: spotting the weeds among the roses. *Studies in Mycology*, 75, pp. 115–170.



Cercospora chenopodii: (a) leaf spots; (b, c) fasciculate conidiophores; (d–g) conidia. Scale bars = $10 \ \mu m$

Cercospora convolvulicola M. Bakhshi, Arzanlou, Babai-ahari, Crous & U. Braun, Persoonia 34: 77 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spotscircular to subcircular, 2–8 mm, grey-brown to brown, not surrounded by margin of different colour. Myceliuminternal. Caespituliamphigenous, brown. Conidiophores straight or sinuously geniculate, in dense fascicles, arising from the upper cells of a well-developed, intraepidermal and substomatal, brown stroma, up to 40 μ m diam; conidiophores pale brown to brown, simple, rarely branched, moderately thick-walled, irregular in width, attenuated at the upper portion, often constricted at septa and proliferating point, 35– $50(-70) \times (3-)4-6 \mu$ m, 2–5-septate. Conidio genous cells intercalary and terminal, proliferating sympodially, 10–20 × 3–5.5 μ m, multi-local; loci distinctly thickened, apical, lateral or formed on the shoulders caused by geniculation, sometimes circumspersed, protuberant, 1.5–2.5 μ m. Conidia solitary, hyaline, subcylindrical to obclavate, straight or slightly curved, truncate to somewhat obconically truncate at the base, subacute or subobtusely rounded at the apex, 35– $50(-65) \times (2.5-)3.5-4.5 \mu$ m, 3–8-septate, guttulate; hila thickened, darkened, refractive, 1.5– 2.5 μ m diam.

Host and Distribution: On leaves of *Convolvulus arvensis*L., Ardabil province, Moghan (holotype IRAN 16454F, ex-type culture CCTU 1083 = CBS 136126) (CCTU 1083.2).

Molecular data: CCTU 1083 = CBS 136126 (ITS = KJ886441, TEF = KJ886280, ACT = KJ885958, CAL = KJ885797, HIS = KJ886119); CCTU 1083.2 (ITS = KJ886442, TEF = KJ886281, ACT = KJ885959, CAL = KJ885798, HIS = KJ886120).

Note: Cercospora convolvulicola differs morphologically from *C. ipomoea* (otherspecies known from *Convolvulus arvensis*), by having dense conidiophores and shorter, guttulate, subcylindrical to obclavate conidia (Bakhshi *et al.* 2015).

Reference:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia*, 34(1), pp. 65–86.



Cercospora convolvulicola: (a) leaf spots; (b, c) fasciculate conidiophores; (d–j) conidia. Scale bars = $10 \ \mu m$

Cercospora conyzae-canadensis M. Bakhshi, Arzanlou, Babai-ahari, Crous & U. Braun, Persoonia 34: 77 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, circular, 1–4 mm diam, grey to pale brown with dark brown margins. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in loose fascicles (3–15), arising from a weakly developed, intraepidermal and substomatal, dark brown stroma, up to 30 μ m diam; conidiophores brown to dark brown, 2–6-septate, straight to geniculate-sinuous due to sympodial proliferation, simple, thick-walled, uniform in width, often constricted at the proliferating point, (57–)97–112(–140) × 4.5–5.5 μ m. Conidiogenous cells intercalary and terminal, pale brown to brown, proliferating sympodially, 20–40 × 4–5.5 μ m, multi-local; loci distinctly thickened, darkened and somewhat refractive, apical or formed on shoulders caused by sympodial proliferation, 2–3.5 μ m diam. Conidia solitary, filiform to obclavate-cylindrical, straight to slightly curved, hyaline, (32–)60–94(–170) × 3.5–5.5 μ m, (3–)7–12(–17)-septate, with subobtusely rounded apices and truncate to obconically truncate bases; hila thickened, darkened, refractive, 1.5–2.5 μ m diam.

Host and Distribution: On leaves of *Conyza canadensis* (L.) Cronquist, Guilan province, Talesh (holotype IRAN 16455F, culture ex-type CCTU 1119 = CBS 135978) (CCTU 1008), Zanjan province, Tarom (IRAN 2657C = CCTU 1105), Mazandaran province, Sangdeh, 36°08'05.72"N, 53°12'49.12"E (IRAN 3927C, IRAN 17725F), Amol, Baudeh, 36°34'52.46"N, 52°20'59.88"E (IRAN 3928C, IRAN 17726F).

Molecular data: CCTU 1119 = CBS 135978 (ITS = KJ886445, TEF = KJ886284, ACT = KJ885962, CAL = KJ885801, HIS = KJ886123); CCTU 1008 (ITS = KJ886443, TEF = KJ886282, ACT = KJ885960, CAL = KJ885799, HIS = KJ886121); IRAN 2657C = CCTU 1105 (ITS = KJ886444, TEF = KJ886283, ACT = KJ885961, CAL = KJ885800, HIS = KJ886122); IRAN 3927C (GAPDH = MT843695); IRAN 3928C (GAPDH = MT843696).

Note: Three species of *Cercospora*, including *C. bidentis*, *C. erigeronicola* and *C. nilghirensis*, have been reported from *Conyza*. *Cercospora conyzae-canadensisis* morphologically distinguished from those species by its moderately developed stroma, loose fascicles and dark brown conidiophores. *Cercospora erigeronicola* is distinct in having shorter and narrower, 0– 3-septate conidia, $15-45 \times 2-3.5 \mu m$. *Cercospora conyzae-canadensis* is morphologically close to *C. nilghirensis* in conidial shape and size. However, *C. nilghirensis*, described from India on *Conyza ambigua*, lacks stromata and has numerous longer conidiophores that are densely fasciculate. *Cercospora conyzae-canadensis* appears to be specific to *Conyza Canadensis* (Bakhshi *et al.* 2015).

References:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86. Bakhshi, M. and Zare, R., 2020. Development of new primers based on gapdh gene for Cercospora species and new host and fungus records for Iran. *Mycologia Iranica*, 7(1), pp. 63–82.



Cercospora conyzae-canadensis: (a) leaf spots; (b, c) fasciculate conidiophores; (d–h) conidia. Scale bars = $10 \ \mu m$

Cercospora cylindracea M. Bakhshi, Arzanlou, Babai-ahari, Crous & U. Braun, Persoonia 34: 78 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots distinct, circular to subcircular, sometimes angular, pale brown, with broad brown margin, sometimes appearing as an eye spot, 1–7 mm diam. Mycelium internal. Caespituli amphigenous, brown. Conidiophores in divergent fascicles (4–25), arising from the upper cells of a moderately to well-developed, intraepidermal and substomatal, brown stroma, up to 30 μ m diam; conidiophores pale brown to brown, thick-walled, 1–6-septate, straight, sinuous to distinctly geniculate, flexuous, (35–)55–65(–90) × 4–5.5 μ m, irregular in wide, conically narrowed at the apex. Conidiogenous cells terminal or intercalary, unbranched, pale brown, smooth, proliferating sympodially, 15–30 × 3.5–5 μ m, multi-local; loci thickened, darkened, refractive, protuberant, apical, lateral or circumspersed, 1.5–2.5 μ m diam. Conidia solitary, subcylindrical to cylindrical, straight to mildly curved, hyaline, distinctly 1–10-septate, obtuse at the apex, subtruncate at the base, (30–)45–60(–90) × 3.5–5.5 μ m; hila thickened, darkened, refractive, 1.5–2.5 μ m diam.

Host and Distribution: On leaves of *Lactuca serriola* L., Ardabil province, Moghan (holotype IRAN 16468F, culture ex-type CCTU 1081 = CBS 138580 = IRAN 2654C) (CCTU 1207), West Azerbaijan province, Khoy (CCTU 1044 = CBS 136021) (CCTU 1049) (CCTU 1183) (CCTU 1189); on leaves of *Cichorium intybus* L., West Azerbaijan province, Khoy (CCTU 1016), Zanjan, Tarom (CCTU 1114), Mazandaran province, Galugah-Sefidchah (IRAN 3929C, IRAN 17727F), North Khorasan province, Eshghabad, Raz, 37°41'47.6" N 56°55'08.7" E (IRAN 3930C, IRAN 17728F).

Molecular data: CCTU 1016 (ITS = KJ886446, TEF = KJ886285, ACT = KJ885963, CAL = KJ885802, HIS = KJ886124); CCTU 1044 = CBS 136021 (ITS = KJ886447, TEF = KJ886286, ACT = KJ885964, CAL = KJ885803, HIS = KJ886125); CCTU 1049 (ITS = KJ886448, TEF = KJ886287, ACT = KJ885965, CAL = KJ885804, HIS = KJ886126); CCTU 1081 = CBS 138580 = IRAN 2654C (ITS = KJ886449, TEF = KJ886288, ACT = KJ885966, CAL = KJ885805, HIS = KJ886127); CCTU 1114 (ITS = KJ886450, TEF = KJ886289, ACT = KJ885967, CAL = KJ885968, CAL = KJ886128); CCTU 1183 (ITS = KJ886451, TEF = KJ886290, ACT = KJ885968, CAL = KJ885807, HIS = KJ886129); CCTU 1189 (ITS = KJ886452, TEF = KJ886291, ACT = KJ885969, CAL = KJ885970, CAL = KJ886130); CCTU 1207 (ITS = KJ886453, TEF = KJ886292, ACT = KJ885970, CAL = KJ885809, HIS = KJ886131); IRAN 3929C (TEF = MT843589; ACT = MT843614, CAL = MT843640, HIS = MT843667, GAPDH = MT843697); IRAN 3930C (ITS = MT804379; TEF = MT843590; ACT = MT843615, CAL = MT843641, HIS = MT843668, GAPDH = MT843698).

Note: Three species of *Cercospora* including *C. apii*, *C. lactuca-sativae* and *C. cichorii*, are known from *Lactuca serriola* and *Cichorium intybus*. *Cercospora cylindraceais* separated in the combined gene tree from *C. apii* and *C. lactucae-sativae* (Bakhshi *et al.* 2015). *Cercospora cylindracea* differs from *C. cichorii* and *C. lactucae-sativae* by its cylindrical to subcylindrical

conidia. Furthermore, the conidiogenous loci in *C. lactucae-sativae* are broader, 2.5–3.5 μm, than in *C. cylindracea* (Bakhshi *et al.* 2015).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86.
- Bakhshi, M. and Zare, R., 2020. Development of new primers based on gapdh gene for Cercospora species and new host and fungus records for Iran. *Mycologia Iranica*, 7(1), pp. 63–82.



Cercospora cylindracea: (a, b) leaf spots; (c–e) fasciculate conidiophores; (f–k) conidia. Scale bars = $10 \ \mu m$

Cercospora iranica M. Bakhshi, Arzanlou, Babai-ahari, Crous & U. Braun, Persoonia 34: 79 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, circular, 1–7 mm, first appearing as red-brown spots, later centre becoming grey with red-brown borders on upper and lower surface. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in moderately dense fascicles (8–20), arising from a well-developed, erumpent, dark brown stroma, up to 40 μ m diam; conidiophores brown, becoming pale brown towards the apex, 2–6-septate, straight to geniculate-sinuous due to sympodial proliferation, simple, uniform in width, sometimes constricted at the proliferating point, (30–)62–71(–90) × 4–5.5(–6) μ m. Conidiogenous cells intercalary and terminal, pale brown to brown, proliferating sympodially, 15–35 × 4–5 μ m, multi-local; loci distinctly thickened, darkened and somewhat refractive, apical, lateral or formed on shoulders caused by geniculation, 2–3.5 μ m diam. Conidia solitary, obclavate when smaller, longer ones filiform to acicular, straight to slightly curved, hyaline, (27–)52–67(–95) × 2–4 μ m, (3–)7–10(–14)-septate, with subobtusely rounded apices and truncate or long obconically truncate bases; hila thickened, darkened, refractive, 1.5–2 μ m diam.

Host and Distribution: On leaves of *Vicia faba* L., Guilan province, Astara (holotype IRAN 16466F, culture ex-type CCTU 1137 = CBS 136124) (CCTU 1137.2); on leaves of *Hydrangea* sp., Mazandaran province, Ramsar (CCTU 1196 = CBS 136123); on leaves of *Bidens tripartita*, Guilan province, Siahkal, 37°11'58.61" N, 49°55'20.78" E (IRAN 3948C, IRAN 17745F).

Molecular data: CBS 136124 (ITS = KJ886513, TEF = KJ886352, ACT = KJ886030, CAL = KJ885869, HIS = KJ886191); CCTU 1137.2 (ITS = KJ886514, TEF = KJ886353, ACT = KJ886031, CAL = KJ885870, HIS = KJ886192); CBS 136123 (ITS = KJ886515, TEF = KJ886354, ACT = KJ886032, CAL = KJ885871, HIS = KJ886193); IRAN 3948C (TEF = MT843592; ACT = MT843619, CAL = MT843647, HIS = MT843672, GAPDH = MT843714).

Note: Cercospora zonata, the causal agent of Cercospora leaf spot of faba beans (Kimber 2011) is morphologically quite distinct from *C. iranica* in having much broader (3–6 μ m) obclavate-cylindrical conidia with short obconical base and larger hila, 2–2.5 μ m wide (various collections examined, including topotype material of *C. zonata*: on *Vicia faba*, Portugal, May 1884, F. Moller, Rabenh., Fung. Eur. Exs. 3294, B, HAL). Caespituli that arise from a well-developed, erumpent stroma on the leaf surface is a unique morphological character of this species on *Vicia faba* (Bakhshi *et al.* 2015).

References:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86.

- Bakhshi, M. and Zare, R., 2020. Development of new primers based on gapdh gene for Cercospora species and new host and fungus records for Iran. *Mycologia Iranica*, 7(1), pp. 63–82.
- Kimber, R.B.E., 2011. *Epidemiology and management of cercospora leaf spot (Cercospora zonata)* of faba beans (*Vicia faba*) (Doctoral dissertation, Faculty of Sciences, University of Adelaide).



Cercospora iranica: (a) leaf spots; (b) fasciculate conidiophores; (c–h) conidia. Scale bars = $10 \mu m$
Cercospora pseudochenopodii M. Bakhshi, Arzanlou, Babai-ahari & Crous, Persoonia 34: 81 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, circular to irregular, 5–12 mm diam, pale brown, with concentric rings on adaxial and abaxial surface (stroma with conidiophores), indefinite margin, not surrounded by a border of different color. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in dense fascicles (8–40), emerging through stomatal openings or erumpent through the cuticle, arising from the upper cells of a moderately developed brown stroma, up to 60 μ m wide; conidiophores pale brown to brown, 2–5-septate, thick-walled, mainly straight, sometimes geniculate in upper part, unbranched, almost uniform in width, (32–)39–45(–60) × (3.5–)4.5–5(–6.5) μ m. Conidiogenous cells terminal, unbranched, pale brown, smooth, tapering to flat-tipped apical loci, proliferating sympodially, 10–30 3 × 3.5–6.5 μ m, mostly mono-local, sometimes multi-local; loci apical or formed on shoulders caused by geniculation, thickened, darkened, protuberant, somewhat refractive, 2–4 μ m diam. Conidia solitary, guttulate, cylindrical to subcylindrical, straight to slightly curved, hyaline, (0–)2–4(–5)-septate, apex obtuse, base obconically truncate, (25–)37–44.5(–70) × (4–)5–5.5(–7) μ m; hila thickened, darkened, refractive, 2–4 μ m diam.

Host and Distribution: On leaves of *Chenopodium* sp., Zanjan province, Tarom (holotype IRAN 16467F, ex-type culture CCTU 1038 = CBS 136022 = IRAN 2649C), West Azerbaijan province, Khoy (CCTU 1045); on leaves of *C. album* L., West Azerbaijan, Khoy (CCTU 1176).

Molecular data: CBS 136022 (ITS = KJ886516, TEF = KJ886355, ACT = KJ886033, CAL = KJ885872, HIS = KJ886194); CCTU 1045 (ITS = KJ886517, TEF = KJ886356, ACT = KJ886034, CAL = KJ885873, HIS = KJ886195); CCTU 1176 (ITS = KJ886518, TEF = KJ886357, ACT = KJ886035, CAL = KJ885874, HIS = KJ886196).

Reference:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia*, 34(1), pp. 65–86.



Cercospora pseudochenopodii: (a) leaf spots; (b, c) fasciculate conidiophores; (d–h) conidia. Scale bars = $10 \ \mu m$

Cercospora rumicis Pavgi & U.P. Singh, Mycopathol. Mycol. Appl. 23: 191 (1964)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots circular to subcircular, with grey center and purple-brown margin, 2– 8 mm diam. Mycelium internal. Caespituli amphigenous, brown. Conidiophores in divergent fascicles, arising from the upper cells of a moderately to well-developed, intraepidermal and substomatal, brown stroma; conidiophores pale brown to brown, 1–6-septate, straight, sinuous to distinctly geniculate, $(40-)58-70 \times 4-5 \mu m$, irregular in width, constricted at the parts of proliferation or at the septa. Conidiogenous cells terminal or intercalary, unbranched, pale brown, smooth, proliferating sympodially, multi-local; loci thickened, darkened, refractive, apical or formed on the shoulders caused by geniculation. Conidia solitary, subcylindrical to filiform, straight to mildly curved, hyaline, distinctly 2–15-septate, subobtuse at the apex, truncate at the base, $(37-)80-110(-160) \times 2.5-5 \mu m$; hila thickened, darkened, refractive, 1.5– 2.5 µm diam.

Host and Distribution: On leaves of *Urtica dioica* L., Guilan province, Talesh (CCTU 1121); on leaves of *Rumex crispus* L., Guilan province, Talesh (CCTU 1123) (CCTU 1129 = IRAN 2662C); on leaves of *Rumex* sp., Mazandaran province, Amol, Najarmahalleh, 36°26'39.88"N, 52°27'11.02"E, (IRAN 3953C, IRAN 17750F).

Molecular data: CCTU 1121 (ITS = KJ886520, TEF = KJ886359, ACT = KJ886037, CAL = KJ885876, HIS = KJ886198); CCTU 1123 (ITS = KJ886521, TEF = KJ886360, ACT = KJ886038, CAL = KJ885877, HIS = KJ886199); CCTU 1129 = IRAN 2662C (ITS = KJ886522, TEF = KJ886361, ACT = KJ886039, CAL = KJ885878, HIS = KJ886200); IRAN 3953C (GAPDH = MT843718).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia–Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86.
- Bakhshi, M. and Zare, R., 2020. Development of new primers based on gapdh gene for Cercospora species and new host and fungus records for Iran. *Mycologia Iranica*, 7(1), pp. 63–82.
- Groenewald, J.Z., Nakashima, C., Nishikawa, J., Shin, H.D., Park, J.H., Jama, A.N., Groenewald, M., Braun, U. and Crous, P.W., 2013. Species concepts in *Cercospora*: spotting the weeds among the roses. *Studies in Mycology*, 75, pp. 115–170.



Cercospora rumicis: (a) leaf spots; (b, c) fasciculate conidiophores; (d–f) conidia. Scale bars = $10 \ \mu m$

Cercospora solani Thüm., Hedwigia 19: 135 (1880)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, subcircular to irregular, 8–27 mm diam, with grey to black dots (stroma with conidiophores) and dark grey margins. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in moderately dense fascicles (6–20), arising from a well-developed, intraepidermal and substomatal, brown stromata, 10–55 μ m diam; conidiophores pale brown to brown, 2–6-septate, straight to geniculate-sinuous due to sympodial proliferation, simple, rarely branched, almost uniform in width, often constricted at the proliferating point, (45–)64–75(–100) × 4–5 μ m. Conidiogenous cells intercalary and terminal, pale brown to brown, tapering to flat-tipped apical loci, proliferating sympodially, 20–35 × 4–5 μ m, multi-local; loci distinctly thickened, darkened and somewhat refractive, apical or formed on shoulders caused by geniculation, 2–3.5 μ m diam. Conidia solitary, subcylindrical or somewhat narrowed towards the tip, straight to slightly curved, hyaline, thinwalled, (26–)48–59(–92) × (3.5–)4.5–5.5 μ m, distinctly (2–)3–7(–8)-septate, with subobtusely rounded apices and truncate bases; hila distinctly thickened, darkened, refractive, 1.5–2.5 μ m diam.

Host and Distribution: On leaves of *Solanum nigrum* L., West Azerbaijan province, Khoy (CCTU 1043 = CBS 136038) (CCTU 1050).

Molecular data: CBS 136038 (ITS = KJ886523, TEF = KJ886362, ACT = KJ886040, CAL = KJ885879, HIS = KJ886201); CCTU 1050 (ITS = KJ886524, TEF = KJ886363, ACT = KJ886041, CAL = KJ885880, HIS = KJ886202).

Note: Ten species of *Cercospora* have been reported from *Solanum*, including *C. apii*, *C.* canescens, C. lanugiflori, C. physalidis, C. puyana, C. sciadophila, C. solanacea, C. solani, C. solanigena and C. solani-nigri. Cercospora solani is phylogenetically distinct from C. apii, C. canescens and C. physalidis (Bakhshi et al. 2015). Among the other candidate species, the status of C. lanugiflorii, C. sciadophila and C. solanigena are uncertain, as their type collections are lacking (Crous & Braun 2003); symptoms of C. puyana are different, and C. solanacea has been reduced to synonymy with Pseudocercospora trichophila var. punctata (Braun & Urtiaga 2013). Cercospora solani-nigri is also a Pseudocercospora and heterotypic synonym of P. atromarginalis (type material examined by U. Braun: on Solanum nigrum, India, Poona, 18 Dec. 1957, P.P. Chiddarwar, BPI 441404). The description of C. solani in Chupp (1954) is misleading. It is unclear on which collections Chupp's (1954) description was based. The name C. solani has often been confusingly applied. However, type material of C. solani has been examined by U. Braun (on Solanum nigrum, Portugal, Coimbra, Jan. 1879, F. Moller, Thüm., Mycoth. Univ. 2070, HAL) and was shown to be a true *Cercospora* s. str. characterised by cylindrical to subacicular (somewhat apically attenuated) conidia. The type of C. solani agrees well with the present material from Iran (Bakhshi et al. 2015).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia*, 34(1), pp. 65–86.
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- Crous, P.W. and Braun, U., 2003. *Mycosphaerella* and its *anamorphs: 1*. Names published in *Cercospora* and *Passalora*. Centraalbureau voor Schimmelcultures (CBS).



Cercospora solani: (a) leaf spots; (b, c) fasciculate conidiophores; (d–h) conidia. Scale bars = 10 µm

Cercospora sorghicola M. Bakhshi, Arzanlou, Babai-ahari & Crous, Persoonia 34: 81 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots amphigenous, initially dark purple spots that enlarge over time into linear-oblong lesions with dark purple centre and dark red-purple margins, 5–35 mm long. Mycelium internal. Caespituli amphigenous, brown. Conidiophores aggregated in loose or dense fascicles (5–40), arising from the upper cells of a well-developed, intraepidermal and substomatal, brown stroma, up to 50 μ m diam; conidiophores pale brown to brown, paler towards the apex, simple, unbranched, 1–8-septate, straight or flexuous caused by sympodial proliferation, almost uniform in width, sometimes conical at the apex, (45–)70–80(–100) × 4–5.5 μ m. Conidiogenous cells terminal or intercalary, unbranched, pale brown, smooth, proliferating sympodially, 20–40 × 3.5–5.5 μ m, multi-local; loci thickened, darkened, refractive, protuberant, apical, lateral, 2–4 μ m diam. Conidia solitary, smooth, acicular, cylindro-obclavate to obclavate, straight or curved, successively tapering towards the apex, hyaline, (3–)8–13(–17)-septate, apex subacute to subobtuse, base truncate to obconically truncate, (21–)80–100(–150) × 3–4(–5) μ m; hila distinctly thickened, darkened, refractive, 1.5–2.5 μ m diam.

Host and Distribution: On leaves of *Sorghum halepense* (L.) Pers., Guilan province, Kiashahr (holotype IRAN 16457F, ex-type culture CCTU 1173 = CBS 136448 = IRAN 2672C); on leaves of *Chenopodium* sp., West Azerbaijan province, Khoy (CCTU 1173.2).

Molecular data: CBS 136448 (ITS = KJ886525, TEF = KJ886364, ACT = KJ886042, CAL = KJ885881, HIS = KJ886203); CCTU 1173.2 (ITS = KJ886526, TEF = KJ886365, ACT = KJ886043, CAL = KJ885882, HIS = KJ886204).

Reference:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015.Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia*, 34(1), pp. 65–86.



Cercospora sorghicola: (a) leaf spots; (b, c) fasciculate conidiophores; (d–i) conidia. Scale bars = $10 \ \mu m$

Cercospora violae Sacc., Nuovo Giron. Bot. Ital. 8: 187 (1876)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots circular to irregular, mostly vein-limited, dark brown, with concentric rings (= stroma with conidiophores), 2–8 mm diam. Mycelium internal. Caespituli amphigenous. Stromata lacking to moderately developed, dark brown, intraepidermal and substomatal. Conidiophores in moderately dense fascicles, irregular in width, slightly attenuated at the upper portion, straight or mildly sinuous-geniculate, straight, simple, rarely branched, pale brown to brown, short conically truncate at the apex, wider at the base, 45–70(–90) × 3.5–4.5 μ m, 2–12-septate. Conidiogenous cells integrated, terminal, rarely intercalary, proliferating sympodially, multilocal; loci distinct, thickened, apical or formed on shoulders caused by geniculation, 2–3.5 μ m diam. Conidia solitary, hyaline, subcylindrical to obclavate or acicular, straight to slightly curved, truncate at the base, subobtuse at the apex, 44–95(–132) × 2.5–3.5 μ m, 3–14-septate, smooth.

Host and Distribution: On leaves of *Viola* sp., Mazandaran province, Nowshahr, Sisangan (CCTU 1025 = IRAN 2646C); on leaves of *Viola* sp., Golestan province, Gorgan, Shastkola, 36°46'59.0" N, 54°21'58.0" E (IRAN 3963C, IRAN 17759F) (IRAN 3964C, IRAN 17760F).

Molecular data: CCTU 1025 = IRAN 2646C (ITS = KJ886543, TEF = KJ886382, ACT = KJ886060, CAL = KJ885899, HIS = KJ886221); IRAN 3963C (GAPDH = MT843729); IRAN 3964C (GAPDH = MT843730).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86.
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Cercospora viola: (a, b) leaf spots; (c) fasciculate conidiophores; (d–f) conidia. Scale bars = $10 \mu m$

Cercospora zebrina Pass., Hedwigia 16: 124 (1877)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Cercospora*

Description: Leaf spots distinct, circular to irregular, brown to dark grey, without definite borders. Caespituli amphigenous. Mycelium internal. Stromata well-developed, intraepidermal or substomatal. Conidiophores in moderately dense fascicles (4–18), brown at the base, paler upwards, 1–6-septate, straight to mildly curved, $(30-)50-65(-98) \times 3.5-5 \mu m$. Conidiogenous cells mostly terminal, pale brown, proliferating sympodially, uni-local to multi-local; loci conspicuous, thickened, darkened, refractive, apical, 2–3 μm . Conidia solitary, rarely catenate, cylindrical to obclavate-subcylindrical, straight to mildly curved, hyaline, 3–14-septate, obtuse at the apex, subtruncate or obconically truncate at the base, (30–)50–85(–135) × 3–5 μm .

Host and Distribution: On leaves of *Medicago* sp., Guilan province, Talesh (CCTU 1012 = CBS 136129); on leaves of *Alhagi maurorum* Medik., Zanjan, Tarom (CCTU 1039), Golestan province, Agh-ghala-Incheboroun, Agh-Ghabr, $37^{\circ}00'42.6$ "N, $54^{\circ}23'43.1$ "E (IRAN 3969C, IRAN 17765F); on leaves of *Medicago sativa* L., Zanjan province, Tarom (CCTU 1110 = IRAN 2658C), West Azerbaijan province, Khoy (CCTU 1180), East Azerbaijan province, Marand (CCTU 1225), Golestan province, Gorgan, $36^{\circ}50'26.2$ " N $54^{\circ}27'25.0$ " E (IRAN 3965C, IRAN 17761F), North Khorasan province, Ashkhaneh, $37^{\circ}35'13.2$ " N, $56^{\circ}52'13.7$ " E (IRAN 3966C, IRAN 17762F), Mazandaran province, Galugah-Sefidchah, $36^{\circ}41'50.38$ " N, $53^{\circ}47'58.84$ " E (IRAN 3967C, IRAN 17763F); on leaves of *Trifolium repens* L., West Azerbaijan, Khoy (CCTU 1181); on leaves of *Vicia* sp., West Azerbaijan province, Khoy (CCTU 1185); on leaves of *Oxalis* sp., Golestan province, Gorgan, Ghorogh Forest Park (IRAN 3968C, IRAN 17764F).

Molecular data: CCTU 1012 = CBS 136129 (ITS = KJ886544, TEF = KJ886383, ACT = KJ886061, CAL = KJ885900, HIS = KJ886222); CCTU 1039 (ITS = KJ886545, TEF = KJ886384, ACT = KJ886062, CAL = KJ885901, HIS = KJ886223); CCTU 1110 = IRAN 2658C (ITS = KJ886546, TEF = KJ886385, ACT = KJ886063, CAL = KJ885902, HIS = KJ886224); CCTU 1180 (ITS = KJ886547, TEF = KJ886386, ACT = KJ886064, CAL = KJ885903, HIS = KJ886225); CCTU 1181 (ITS = KJ886548, TEF = KJ886387, ACT = KJ886065, CAL = KJ885904, HIS = KJ886226); CCTU 1185 (ITS = KJ886549, TEF = KJ886388, ACT = KJ886066, CAL = KJ885905, HIS = KJ886227); CCTU 1225 (ITS = KJ886550, TEF = KJ886389, ACT = KJ886067, CAL = KJ885906, HIS = KJ886228); CCTU 1239 = CBS 135977 (ITS = KJ886551, TEF = KJ886390, ACT = KJ886068, CAL = KJ885907, HIS = KJ886229); IRAN 3965C (TEF = MT843602; ACT = MT843628, CAL = MT843654, HIS = MT843681, GAPDH = MT843731); IRAN 3966C (TEF = MT843603; CAL = MT843655, HIS = MT843682, GAPDH = MT843732); IRAN 3967C (ITS = MT804384; TEF = MT843604; ACT = MT843629, CAL = MT843656, HIS = MT843683, GAPDH = MT843733); IRAN 3968C (TEF = MT843605; ACT = MT843630, CAL = MT843657, HIS = MT843684, GAPDH = MT843734); IRAN 3969C (ITS = MT804385, TEF = MT843606, HIS = MT843685, GAPDH = MT843735).

- Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z., Braun, U. and Crous, P.W., 2015. Application of the consolidated species concept to *Cercospora* spp. from Iran. *Persoonia-Molecular Phylogeny and Evolution of Fungi*, 34(1), pp. 65–86.
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Cercospora zebrina: (a, e, i) leaf spots; (b, f, j) fasciculate conidiophores; (c, d, g, h, k) conidia. Scale bars = $10 \ \mu m$

Neocercospora ammicola M. Bakhshi, Arzanlou, Babai-ahari & Crous, Phytotaxa 213: 28 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Neocercospora*

Description: in planta: Foliicolous and caulicolous, phytopathogenic. Leaf spots amphigenous, circular to subcircular, 1-4 mm diam, brown, with raised, dark brown border. Mycelium internal. Stromata substomatal, weakly to moderately developed, brown, 5-18 µm diam. Caespituli amphigenous, punctiform, brown. Conidiophores aggregated in loose to moderately dense fascicles (1-12), arising from the upper cells of substomatal to intraepidermal brown stromata, up to 18 µm wide and 27 µm high, emerging through stomata or erumpent; conidiophores aseptate, reduced to conidiogenous cells. Conidiogenous cells unbranched, pale brown to brown, smooth, subcylindrical to cone-shaped, wider at the base, gradually becoming narrower towards the apex, occasionallygeniculate-sinuous, $(10-)14.5-17(-25) \times 2.5-3.5(-4)$ µm, unilocal and multilocal, sympodial, subdenticulate; loci, conspicuous, thickened, darkened, somewhat refractive, apical or formed on shoulders caused by geniculation, 1–2.5 µm diam. Conidia solitary or catenate, in unbranched chains, hyaline, smooth, guttulate or not, cylindrical, subcylindrical to obclavate-cylindrical, straight to slightly curved, 1-10-septate, $(15-)35-50(-110) \times (2.5-)3-3.5(-4)$ µm, apex obtuse, base obconically truncate or truncate with slight basal taper to hilum, 1-2 µm diam, flattened, moderately thickened, darkened and somewhat refractive. In vitro on MEA: Mycelia consisting of hyaline, branched, septate, smooth hyphae, 2-6 µm diam, guttulate, gradually becoming pale to medium brown and somewhat vertuculose at fertile regions. Conidiophores solitary or in loose fascicles, unbranched, pale brown, becoming darker towards the apex, semi-macronematous to macronematous, up to 85 µm tall, (3-)3.5-4(-5) µm wide, 0-6-septate, septa 10-20 µm apart (but not observed in planta), often reduced to solitary conidiogenous cells. Conidiogenous cells integrated, terminal or lateral or terminal on hyphae when 1-celled, medium brown to brown, $(15-)20-25(-35) \times 3-3.5(-4.5)$ µm, uni- and multilocal, sympodial, subdenticulate; loci moderately conspicuous, slightly thickened and darkened, somewhat refractive, apical or formed on shoulders caused by geniculation, 1-2.5 µm diam. Conidia solitary or catenate, in unbranched chains, hyaline, smooth, guttulate or not, cylindrical to subcylindrical, straight to gently curved, indistinctly 1–9-septate, $(25-)45-60(-95) \times (2-)2.5-3(-4) \mu m$; apex obtuse or subobtuse, base obconically truncate or truncate with slight basal taper to hilum; hila flattened, with marginal thickening along the rim, somewhat refractive, $1-2 \mu m$ diam.

Host and Distribution: On leaves of *Ammi majus* L., West Azerbaijan province, Khoy, Firouragh (holotype IRAN 16461F, ex-type culture CCTU 1186 = CBS 136450) (CCTU 1187).

Molecular data: CCTU 1186 = CBS 136450 (ITS = KR232407, TEF = KR232409, ACT = KR232411, HIS = KR232413); CCTU 1187 (ITS = KR232408, TEF = KR232410, ACT = KR232412, HIS = KR232414).

Reference:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z. and Crous, P.W., 2015. Is morphology in *Cercospora* a reliable reflection of generic affinity. *Phytotaxa*, 213(1), pp. 022–034.



Neocercospora ammicola (in vivo): (a) leaf spots; (b–f) fasciculate conidiophores; (g–m) conidia. Scale bars = $10 \ \mu m$



Neocercospora ammicola (in vitro): (a) colony on MEA; (b–f) conidiophores; (g–l) conidia. Scale bars = $10 \ \mu m$

Passalora fraxinicola (D. Ershad) U. Braun & Crous

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Passalora*

Description: Leaf spots very variable in shape and size, 2 to10 mm long, on upper surface center grayish, border light brown, on lower surface light green but due to fructification appearing black. Fruiting amphigenous, but chiefly hypophyllous, visible as numerous black pustules (Fig. 1). Stroma globose, subglobose to elongate, black, 60-80 μ m long. Fascicles very dense. Conidiophores pale brown, sometimes septate, not branched, mildly geniculate, with spore scars, about 27–30 (–36) μ m long and up to 5 μ m width. Conidia hyaline, cylindro-obclavate, straight sometimes slightly curved, often one up to 3 septate, tip rounded, base nearly obconically truncate, 36.6 (20–50) × 5.5 (4–6) μ m (Fig. 2).

Note: Ershad (2000) described and named the fungus as *Cercospora fraxinicola* D. Ershad on *Fraxinus rotundifolia* Miller, collected from Kelardasht. however, later on, Crous & U. Braun (2003) transferred this species to the genus *Passalora* as *Passalora fraxinicola* (D. Ershad) U. Braun & Crous, due to having conspicuous conidiogenous loci and colorless, also short and broad conidia with few septa. They mentioned that, this species is close to *Passalora fraxini* (DC.: Fr.) Arex, but differs in having shorter conidiophores and colorless, more subcylindrical conidia with obtuse, rounded apices.

Host and Distribution: On leaves of *Fraxinus rotundifolia* Miller., Mazandaran province, Kelardasht (holotype IRAN 10583 F).

- Crous P.W. and Braun, U. 2003 Mycosphaerella and its anamorphs: 1. Names published in *Cercospora* and *Passalora*. Centraalbureau voor Schimmelculture, Utrecht, The Netherlands. 571 pp.
- Ershad, D. 2000. Two new species of mitosporic fungi. Rostaniha 1(1-4): 1-9 (in Persian) & 1-5 (in English).



Passalora fraxinicola: Leaf spots of Passalora fraxinicola on upper (right) and lower (left) surfaces of Fraxinus rotundifolia.



Passalora fraxinicola: (a) conidiophores; (b) conidia. Scale bar = $10 \ \mu m$

Pseudocercospora atromarginalis (G.F. Atk.) Deighton, Mycol. Pap. 140: 139 (1976)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Pseudocercospora*

Description: Leaf spots amphigenous, subcircular to irregular, 2–12 mm diam, olivaceousgreen. Mycelium internal. Caespituli predominantly hypophyllous. Stromata well-developed, substomatal to intraepidermal, semi-immersed, 15–30 µm diam. Conidiophores arranged in moderately dense fascicles, arising from stromata, through stomata or erumpent through the cuticle, medium brown, smooth, 1–6-septate, unbranched, straight to curved, subcylindrical, regular in wide, (15–)45–60 × 4–5 µm. Conidiogenous cells terminal, medium brown, smooth, proliferating sympodially, (8–)10–15(–25) × 3.5–4(–5) µm, loci neither thickened nor darkened. Conidia solitary, pale brown, subcylindrical to obclavate, apex obtuse to subobtuse, base obconically truncate, straight to gently curved, 1–8-septate, (18–)42–55(–85) × 3–4.5 µm; hila neither thickened nor darkened or refractive, 1–2.5 µm diam.

Host and Distribution: On leaves of *Solanum nigrum* L., Ardabil province, Moghan (CCTU 1052) (CCTU 1056 = CBS 136112) (CCTU 1091), Mazandaran province, Ramsar, Kotra (CCTU 1193).

Molecular data: CCTU 1052 (ITS = KM452850, TEF = KM452872, ACT = KM452827, HIS = KM452846, TUB = KM452891, RPB2 = KM452869); CCTU 1056 = CBS 136112 (ITS = KM452851, TEF = KM452873, ACT = KM452828, HIS = KM452847, TUB = KM452892, RPB2 = KM452870); CCTU 1091 (ITS = KM452852, TEF = KM452874, ACT = KM452829, HIS = KM452848, TUB = KM452893, RPB2 = KM452871); CCTU 1193 (ITS = KM452853, TEF = KM452875, ACT = KM452830, HIS = KM452849, TUB = KM452894).

References:

Bakhshi, M., Arzanlou, M., Babai-Ahari, A., Groenewald, J.Z. and Crous, P.W., 2014.Multigene analysis of *Pseudocercospora* spp. from Iran. *Phytotaxa*, 184(5), pp. 245–264.

Crous, P.W., Braun, U., Hunter, G.C., Wingfield, M.J., Verkley, G.J.M., Shin, H.D., Nakashima, C. and Groenewald, J.Z., 2013. Phylogenetic lineages in *Pseudocercospora. Studies in Mycology*, 75, pp. 37–114.



Pseudocercospora atromarginalis: (a) leaf spots; (b, c) fasciculate conidiophores; (d–g) conidia. Scale bars = $10 \ \mu m$

Pseudocercospora mazandaranensis M. Bakhshi, Arzanlou, Babai-ahari & Crous, Phytotaxa 184: 253 (2014)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Pseudocercospora*

Description: Leaf spots amphigenous, irregular to angular, 5–50 mm diam, distinct, greybrown, predominantly occurring at leaf margin or close to leaf tip, but smaller spots are scattered over the whole leaf lamina, border definite, raised, with dark purple-brown to dark brown border. Mycelium internal. Caespituli sporodochial, predominantly hypophyllous, evenly distributed over the leaf spot, punctiform, olivaceous-brown on leaves, floccose. Stromata well-developed, erumpent to superficial, globular, medium brown to brown, 40–110 µm diam. Conidiophores medium brown, becoming paler toward the apex, aggregated in dense sporodochial fascicles, smooth to granular, 0–6-septate, branched, straight to curved, subcylindrical, $(20-)42-52(-75) \times 3-4(-5)$ µm. Conidiogenous cells terminal or lateral, pale brown, smooth, 10–35 × 3–3.5(–5) µm, proliferating sympodially, loci unthickened, nor darkened, 1–2.5 µm diam. Conidia solitary, pale brown to medium brown, guttulate, subcylindrical to obclavate, apex subobtuse to subacute, base obconically truncate to truncate, straight to curved, 1–8-septate, (17–)36–46(–65) × 2–3.5 µm; hila not thickened nor darkened, 1–2.5 µm diam.

Host and Distribution: On leaves of *Nerium oleander* L., Mazandaran province, Tonekabon (holotype IRAN 16462F, ex-type culture CCTU 1102 = CBS 136115), Guilan province, Rasht (CCTU 1146).

Molecular data: CCTU 1102 = CBS 136115 (ITS = KM452854, TEF = KM452876, ACT = KM452831); CCTU 1146 (ITS = KM452855, TEF = KM452877, ACT = KM452832).

Reference:



Pseudocercospora mazandaranensis: (a, b) leaf spots; (c, d) fasciculate conidiophores; (e–i) conidia. Scale bars = 10 μm

Pseudocercospora norchiensis Crous, Fungal Diversity 26: 172 (2007)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Pseudocercospora*

Description: Leaf spots amphigenous, subcircular to circular, 2–7 mm diam, with brown centre and dark purple margins. Mycelium internal. Caespituli epiphyllous. Stromata well-developed, substomatal to intraepidermal, semi-immersed to superficial, 25–60 μ m diam. Conidiophores arranged in moderately dense fascicles, arising from stromata, through stomata or erumpent through the cuticle, brown, smooth, 1–6-septate, unbranched, straight to curved, subcylindrical, regular in wide, (15–)50–70 × 3–4(–5) μ m. Conidiogenous cells terminal, brown, smooth, proliferating sympodially, (8–)10–16(–22) × 3–4(–5) μ m, loci neither thickened nor darkened. Conidia solitary, pale brown, subcylindrical to obclavate, apex subobtuse to subacute, base obconically truncate, straight to gently curved, 1–8-septate, (18–)42–55(–85) × 3–4.5 μ m; hila neither thickened nor darkened or refractive, 1–2.5 μ m diam.

Host and Distribution: On leaves of *Rubus* sp., Guilan province, Talesh, Dulbin (CCTU 1009) (CCTU 1032), Guilan province, Rezvanshahr, Paresar (CCTU 1019).

Molecular data: CCTU 1009 (ITS = KM452856, TEF = KM452878, ACT = KM452833); CCTU 1019 (ITS = KM452857, TEF = KM452879, ACT = KM452834); CCTU 1032 (ITS = KM452858, TEF = KM452880, ACT = KM452835).

Reference:



Pseudocercospora norchiensis: (a) leaf spots; (b, c) fasciculate conidiophores; (d–g) conidia. Scale bars = $10 \ \mu m$

Pseudocercospora punicae (Henn.) Deighton, Mycol. Pap. 140: 151 (1976)

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Synonym: Cercospora punicae Henn., Bot. Jahrb. Syst. 37: 165. 1906

Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Pseudocercospora*

Description: Leaf spots distinct, raised, amphigenous, irregular to subcircular, 1–8 mm diam, dark brown to black, sometimes with diffuse border, spots with colonies at first appearing as small irregular black spots, later coalescing up to 30 mm diam. Mycelium internal. Caespituli punctiform, amphigenous, scattered over the lesion surface, dark olivaceous-brown on leaves. Stromata well-developed, erumpent to semi-superficial, globular, pale to medium brown, 25–100 µm diam. Conidiophores medium brown, aggregated in dense sporodochial fascicles, arising from the upper cells of stromata, smooth, 0–1-septate, $(10–)18–24(-35) \times 2–2.5(-3.5)$ µm, predominantly reduced to conidiogenous cells, straight to curved, subcylindrical to ampulliform (when reduced to conidiogenous cells), unbranched. Conidiogenous cells terminal, or conidiophores reduced to conidiogenous cells, pale brown, smooth, proliferating sympodially or inconspicuously proliferating percurrently, loci inconspicuous neither thickened nor darkened. Conidia solitary, pale brown, guttulate, subcylindrical to obclavate, apex subobtuse to subacute, base truncate, straight to curved, 2–11-septate, (25–)60–75(–125) × 2–3.5 µm; hila not thickened nor darkened, 1–2 µm diam.

Host and Distribution: On leaves and fruits of wild-grown cultivar of *Punica granatum* L., Guilan province, Talesh, Dulbin (CCTU 1125 = CBS 136111), Guilan province, Talesh, Kishunben (CCTU 1169).

Molecular data: CCTU 1125 = CBS 136111 (ITS = KM452859, TEF = KM452881, ACT = KM452836); CCTU 1169 (ITS = KM452860, TEF = KM452882, ACT = KM452837).

Reference:



Pseudocercospora punicae: (a–c) leaf and fruit spots; (d–f) fasciculate conidiophores; (g–i) conidia. Scale bars = $10 \ \mu m$

Pseudocercospora sophoricola M. Bakhshi, Arzanlou, Babai-ahari & Crous, Phytotaxa 184: 256 (2014)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Pseudocercospora*

Description: Leaf spots distinct, amphigenous, circular to subcircular, 1–6 mm diam, pale brown in center, with raised, dark brown to black border. Mycelium internal. Caespituli predominantly hypophyllous, dark brown on leaves. Stromata moderately developed, substomatal to intraepidermal, semi-immersed, globular, 10–30 µm diam. Conidiophores medium brown, arranged in moderately dense fascicles, smooth, unbranched, straight, doliiform or lageniform to short cylindrical, 0–1-septate, $(8-)13-16(-22) \times (3-)4.5-5(-6)$ µm, predominantly reduced to conidiogenous cells, apex subtruncate. Conidiogenous cells medium brown, smooth, proliferating sympodially, tapering to flat-tipped apical loci, loci unthickened to slightly thickened and somewhat darkened, 1–3 µm diam. Conidia solitary, medium to dark brown, guttulate, thick-walled, sometimes constricted at septa, subcylindrical to obclavate, apex obtuse to subobtuse, base obconically truncate, straight to gently curved, conspicuously 1–8septate, $(20-)50-70(-110) \times (2.5-)3.5-4(-5)$ µm; hila unthickened to slightly thickened and somewhat darkened and refractive, 1–2.5 µm diam.

Host and Distribution: On leaves of *Sophora alopecuroides* L., Zanjan province, Tarom, Guilankeshe (holotype IRAN 16463F, ex-type culture CCTU 1037 = CBS 136020) (CCTU 1037.2).

Molecular data: CCTU 1037 = CBS 136020 (ITS = KM452861, TEF = KM452883, ACT = KM452838); CCTU 1037.2 (ITS = KM452862, TEF = KM452884, ACT = KM452839).

Reference:



Pseudocercospora sophoricola: (a) leaf spots; (b–e) fasciculate conidiophores; (f–l) conidia. Scale bars = $10 \ \mu m$

Pseudocercospora vitis (Lév.) Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires, Ser. 3, 20: 438 (1910)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Pseudocercospora*

Description: Leaf spots distinct, amphigenous, circular to subcircular, 2–15 mm diam, with black circle in the center, surrounded by brown circle and black border (appearing as eye-spot). Mycelium internal. Caespituli epiphyllous. Stromata well-developed, substomatal to intraepidermal, semi-immersed to superficial, 35–70 μ m diam. Conidiophores synnematous, arising from stromata, through stomata or erumpent through the cuticle, brown, smooth, unbranched, straight to curved, subcylindrical, regular in wide, (95–)155–195(–245) × 4–5.5 μ m. Conidiogenous cells terminal, brown, smooth, proliferating sympodially, (12–)15–20(–30) × 3.5–5 μ m, loci neither thickened nor darkened. Conidia solitary, brown, obclavate, apex subobtuse, base obconically truncate, straight to gently curved, 2–7-septate, (28–)40–55(–75) × 3–4.5 μ m; hila neither thickened nor darkened or refractive, 1–2.5 μ m diam.

Host and Distribution: On leaves of *Vitis* sp., Guilan province, Sowme'eh Sara, Bahambar (CCTU 1076).

Molecular data: CCTU 1076 (ITS = KM452868, TEF = KM452890, ACT = KM452845).

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Crous, P.W. and Braun, U., 2003. *Mycosphaerella and its anamorphs: 1. Names published in Cercospora and Passalora*. Centraalbureau voor Schimmelcultures (CBS).



Pseudocercospora vitis: (a) leaf spots; (b, c) fasciculate conidiophores; (d–g) conidia. Scale bars = $10 \ \mu m$

Ramularia glennii Videira & Crous, Persoonia 34: 57 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Ramularia*

Description: On SNA, Mycelium consisting of septate, branched, smooth, hyaline, 1–2 µm diam hyphae. Conidiophores reduced to conidiogenous cells. Conidiogenous cells thin-walled, smooth, hyaline, terminal and lateral, $(6.5-)11-15(-24) \times 1-2$ µm, sympodially proliferating with 1–3 apical loci almost flat or protuberant, cylindrical; scars thickened, darkened, refractive, 0.5–1.5 µm diam. Conidia in general hyaline, thin-walled, smooth to finely verruculose. Ramoconidia subcylindrical to clavate or oval, 0–1-septate, $(6-)8-10(-18) \times (2.5-)3-4$ µm. Intercalary conidia aseptate, fusiform or oval, $(5-)6-8(-11) \times 2-3$ µm, in branched chains of up to 8. Terminal conidia, hyaline, smooth to finely verruculose, aseptate, obovoid, $(3-)5-8 \times 1.5-3$ µm; hila thickened, darkened, refractive, 0.5-1 µm diam. On MEA surface folded, radially striated, white, undulate feathery and concave margin, reverse iron-grey, reaching 25 mm after 2 wk at 25 °C. On OA surface flat, smooth, entire margin, white, fluffy aerial mycelium, 5 mm halo around the colony, reaching 20 mm after 2 wk at 25 °C. On SNA surface flat, smooth, ochraceous white, flat aerial mycelium, entire edge, reverse white-grey, reaching 17 mm after 2 wk 25 °C.

Host and Distribution: On leaves of *Acalypha australis* L., Guilan province, Talesh (CCTU 1131 = CBS 135976); on leaves of *Ficus carica* L., Talesh (CCTU 1235); on leaves of *Platanus* sp., East Azerbaijan province, Kaleibar (CCTU 1248).

Molecular data: CBS 135976 (ITS = KY967375, TEF = KY967387, ACT = KY967381, GAPDH = KY967393, RPB2 = KY967396, HIS = KY967398); CCTU 1235 (ITS = KY967376, TEF = KY967388, ACT = KY967382, HIS = KY967399); CCTU 1248 (ITS = KY967377, TEF = KY967389, ACT = KY967383, HIS = KY967400).

Reference:

Bakhshi, M. and Arzanlou, M., 2017. Multigene phylogeny reveals a new species and novel records and hosts in the genus *Ramularia* from Iran. *Mycological progress*, 16(7), pp. 703–712.



Ramularia glennii: (a) culture on MEA; (b) culture on OA; (c) culture on SNA; (d–j) hypha, conidiophores and conidia. Scale bars = $10 \ \mu m$

Ramularia mali Videira & Crous, Persoonia 34: 59 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Ramularia*

Description: On SNA, Mycelium consisting of septate, branched, smooth, hyaline, 1–2 µm diam hyphae. Conidiophores reduced to conidiogenous cells. Conidiogenous cells thin-walled, smooth or slightly verruculose, hyaline, terminal and lateral, $(6-)12-15(-19) \times (1-)1.5(-2)$ µm, sympodially proliferating with 1–3 apical loci, flattened or protuberant cylindrical; loci thickened, darkened, refractive, 0.5–1 µm diam. Conidia in general hyaline, thin-walled, smooth to finely verruculose. Ramoconidia subcylindrical to fusoid, 0(-1)-septate, $(5.5-)7-10(-17) \times 2-3$ µm, with 1–2(-3) apical loci. Intercalary conidia aseptate, fusoid or ovoid, 5– $7(-8) \times 2(-3)$ µm; in branched chains of up to 6. Terminal conidia aseptate, obovoid, (3.5-)4 ($-6) \times (1-)1.5$ (-2.5) µm; hila thickened, darkened, refractive, 0.5-1 µm diam. On MEA surface dirty white with a greenish grey tinge, folded, undulate and concave margin, radially striated with entire margin, reverse iron-grey, reaching 22 mm after 2 wk at 25 °C. On OA surface flat, smooth, entire margin, white, fluffy aerial mycelium, 4 mm halo around the colony, reaching 19 mm after 2 wk at 25 °C.

Host and Distribution: On leaves of *Vitis vinifera* L., East Azerbaijan province, Kaleibar (CCTU 1184 = CBS 136116); on leaves of *Prunus cerasus* L., West Azerbaijan province, Khoy, Firouragh (CCTU 1104).

Molecular data: CCTU 1184 = CBS 136116 (ITS = KY967378, TEF = KY967390, ACT = KY967384, GAPDH = KY967394, HIS = KY967401); CCTU 1104 (ITS = KY967379, TEF = KY967391, ACT = KY967385, GAPDH = KY967395, HIS = KY967402).

Reference:

Bakhshi, M. and Arzanlou, M., 2017. Multigene phylogeny reveals a new species and novel records and hosts in the genus *Ramularia* from Iran. *Mycological progress*, 16(7), pp. 703–712.



Ramularia mali: (a) culture on MEA; (b) culture on OA; (c) culture on SNA; (d–g) hypha, conidiophores and conidia. Scale bars = $10 \ \mu m$

Ramularia taleshina M. Bakhshi, Arzanlou & Crous, Mycological Progress 16: 710 (2017)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Ramularia*

Description: On SNA, Mycelium consisting of septate, branched, smooth, hyaline, 1–2 µm diam hyphae. Conidiophores reduced to conidiogenous cells. Conidiogenous cells thin-walled, smooth or slightly verruculose, hyaline, terminal and lateral, $(6-)13-16(-20) \times (1-)2(-2.5)$ µm, sympodial proliferation with 1–3 apical loci, flattened or protuberant cylindrical; loci thickened, darkened, refractive, 0.5–1 µm diam. Conidia in general hyaline, thin-walled, smooth to finely verruculose. Ramoconidia subcylindrical oval or ellipsoid, 0(-2)-septate, $(8-)12-18(-23) \times 2-$ 3.5 µm, with 1–2(–3) apical loci. Intercalary conidia aseptate, oval or ellipsoid, 5–10(–13) × 2.5–3(–3.5) µm, in branched chains of up to 8. Terminal conidia aseptate, obovoid, $(3-)5(-7) \times (1.5-)2-3$ µm; hila thickened, darkened, refractive, 0.5–1 µm diam. On MEA surface dirty white with a greenish grey tinge, folded, radially striated with entire margin, reverse iron-grey, reaching 22 mm after 2 wk at 25 °C. On OA surface flat, smooth, entire edge, buff, central area sporulating abundantly and outer ring sparse in mycelium, reaching 20 mm after 2 wk at 25 °C. On SNA surface flat, smooth, ochraceous white, flat aerial mycelium, entire edge, reverse white-grey, reaching 15 mm after 2 wk at 25 °C.

Host and Distribution: On leaves of *Alnus subcordata* C.A.Mey., Guilan province, Talesh (holotype IRAN 16880F, ex-type culture CCTU 1097 = CBS 135975).

Molecular data: CBS 135975 (ITS = KY967380, TEF = KY967392, ACT = KY967386, RPB2 = KY967397, HIS = KY967403).

Reference:

Bakhshi, M. and Arzanlou, M., 2017. Multigene phylogeny reveals a new species and novel records and hosts in the genus *Ramularia* from Iran. *Mycological progress*, 16(7), pp. 703–712.



Ramularia taleshina: (a) culture on MEA; (b) culture on OA; (c) culture on SNA; (d–j) hypha, conidiophores and conidia. Scale bars = $10 \ \mu m$

Ramularia uredinicola Khodap. & U. Braun, Mycotaxon 91: 358 (2005)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Mycosphaerellales, Mycosphaerellaceae, Ramularia*

Description: Caespituli confined to uredosori of *Melampsora* sp., punctiform to effuse, at first whitish, with a pale reddish or pink tinge with age. Mycelium superficial and immersed, hyphae septate, sparingly branched, 1.5-3.0 μ m wide, smooth to faintly rough-walled, thin-walled, hyaline. Stromata lacking. Conidiophores in small to moderately large, loose to moderately dense fascicles, arising from hyphae immersed in uredosori, or occasionally solitary, arising from superficial hyphae, erect, straight, subcylindrical to geniculate-sinuous, unbranched or branched, (10-)20-80(-120) × 2-4 μ m, septate, thin-walled, smooth, hyaline, old conidiophores sometimes with a pale reddish tinge. Conidiogenous cells integrated, terminal, 10-25 μ m long, sympodial, cicatrized. Conidiogenous loci conspicuous, 1.0-1.5 μ m wide, somewhat thickened and darkened. Conidia catenate, in simple or branched chains, ellipsoid-ovoid, fusiform, subcylindrical, 4-15(-21) × 2-4(-5) μ m, 0-1-septate, hyaline, old conidia sometimes with a pale reddish or olivaceous tinge, thin-walled, smooth to rough-walled, ends rounded to attenuated, with 1-4 conspicuous hila, 1.0-1.5 μ m wide, somewhat thickened and darkened, conidial secession schizolytic. Colonies on PDA at first whitish, but turning pink with age. Teleomorph unknown.

Host and Distribution: On uredosori of *Melampsora* sp. (Uredinales), on *Salix babylonica* L. (Salicaceae), Guilan province, Sumaehsara; IRAN 12316 F, HAL 1820 (F), GUM 272, CPC: 11852, CBS 141120.

Molecular data: CBS 141120, ex-holotype (LSU = KX287224, ITS = KX287521, *actA* = KX287806, *Tef1a* = KX288084, *gapdh* = KX288365, *rpb2* = KX288684, *his3* = KX288974, *tub2* = KX289228).

- Khodaparast, A. and Braun, U., 2005. *Ramularia uredinicola*-A new species from Iran. *Mycotaxon*, 91, pp. 357–360.
- Videira, S.I.R., Groenewald, J.Z., Braun, U., Shin, H.D. and Crous, P.W., 2016. All that glitters is not *Ramularia*. *Studies in Mycology*, 83, pp. 49–163.


Ramularia uredinicola (a) conidiophores; (b) conidia; (c) section through an infected uredosorus. Scale bar = $10 \ \mu m$



Myrmecridium schulzeri (Sacc.) Arzanlou, W. Gams & Crous, in Arzanlou, Groenewald, Gams, Braun, Shin & furedinicolaCrous, Stud. Mycol. 58: 84 (2007)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Myrmecridiales, Myrmecridiaceae, Myrmecridium

Description: Colonies on OA at 25 °C reaching 20 mm diam in 14 d, orange at the center and white in margin; reverse salmon; on SNA colonies reaching 40 mm diam at 25 °C in 14 d, dark green at the center and white in margin; reverse the same. Conidiophores: unbranched, straight, thick-walled, septate, up to 187.5 μ m long, 2.5– 3.75 μ m wide, with 2–5 additional septa. Conidiogenous cells: cylindrical, variable in length, subhyaline to pale brown, forming a straight rachis with scattered, pimple shaped denticles less than one μ m long, pigmented. Conidia: solitary, subhyaline, thin-walled, obovoid, 5–10 × 2–4 μ m; hilum pigmented.

Host and Distribution: On merged rotten leaves, Guilan province, Anzali lagoon, Anzali (IRAN 3647C).

Molecular data: IRAN 3647C (SSU = MK400437, ITS = MH367060, LSU = MH367078, *tef1* = MK400706).

Reference:

Rezakhani, F., Khodaparast, S.A., Masigol, H., Roja-Jimenez, K., Grossart, H.P. and Bakhshi, M., 2019. A preliminary report of aquatic hyphomycetes isolated from Anzali lagoon (Gilan province, North of Iran). *Rostaniha*, 20(2), pp. 123–143.



Myrmecridium schulzeri: (a) colony on OA after 14 days at 25 °C; (B) colony on SNA after 14 days at 25 °C; (C–D) rachis with scattered and pimple-shaped denticles; (E) conidia. Scale bars = $10 \ \mu m$



Arthrobotrys oligosporus Fresen., Beitr. Mykol. 1: 18 (1850)

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Classification: *Fungi, Dikarya, Ascomycota, Pezizomycotina, Orbiliomycetes, Orbiliomycetidae, Orbiliales, Orbiliaceae, Arthrobotrys*

Description: Colonies on PDA at 25 °C attaining 70–73 mm diam in 14 d, white to cream, aerial mycelium extensive, margins regular, moderate sporulation; reverse cream. Mycelia: $1.25-3.75 \mu m$ wide, hyaline, septate and branched. Conidiophores arising singly from mycelium, unbranched, $150-412 \times 3.75-7.5 \mu m$. Conidiophore tip and nodular areas: swollen, $5-12.5 \mu m$, bearing 5–25 conidia on wart like sterigmata in a tight capitate head. Conidia: $25-30 \times 12.5-15 \mu m$, two-celled, the distal cell usually 1.5-2 times longer than the proximal cells.

Host and Distribution: On merged rotten leaves, Guilan province, Anzali lagoon, Anzali (IRAN 3331C).

Molecular data: IRAN 3331C (SSU = MK400439, ITS = MH367064, LSU = MH367082)

Reference:

Rezakhani, F., Khodaparast, S.A., Masigol, H., Roja-Jimenez, K., Grossart, H.P. and Bakhshi, M., 2019. A preliminary report of aquatic hyphomycetes isolated from Anzali lagoon (Gilan province, North of Iran). *Rostaniha*, 20(2), pp. 123–143.



Arthrobotrys oligosporus: (a) colony on PDA after 14 days at 25 °C; (b) denticles on conidiogenous cell; (c) conidia on conidiophore; (d) conidia. Scale bars = $20 \mu m$



Rhytidhysteron hysterinum (Dufour) Samuels & E. Müll., Sydowia 32(1-6): 286 (1980)

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Synonyms: *Triblidium hysterinum* Dufour [as 'Tryblidium'] 1828; *Eutryblidiella hysterina* (Dufour) Petr. Sydowia 13(1–6): 242 (1959)

Classification: Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Incertae sedis, Patellariales, Patellariaceae, Rhytidhysteron

Description: Ascomata hysteriform, closed at first, later opening to become apothecioid with incurved, margins laterallystriate, gregarious, with KOH extractable pigment, $1.7-3 \times 0.8-1.4$ mm wide, 0.7-1.2 mm high. Asci bitunicate, cylindrical, 8-spored, $108-136.8 \times 12-16.8$ µm. Ascospores ellipsoid with rounded end, smooth, 1-septate, slightly constricted at the septa, thick walled, $19.2-28.8 \times 7.2-12$ µm.

Host and Distribution: On dead twigs and decaying wood of *Buxus sempervirens*, Guilan province, Fuman, Ghalehroodkhan (49°9'54.74981" S, 37°18'16.58509" W) (GUM 1546).

Molecular data: Not available

References:

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- Thambugala, K.M., Hyde, K.D., Eungwanichayapant, P.D., Romero, A.I. and Liu, Z.Y., 2016. Additions to the Genus *Rhytidhysteron* in *Hysteriaceae*. *Cryptogamie Mycologie*, 37, pp. 99–116.



Rhytidhysteron hysterinum: (a) ascoma on wood; (b) ascospore; (c) vertical section through ascoma. Scale bars: $a = 1000 \mu m$; $b = 10 \mu m$; $c = 100 \mu m$



Preussia persica Asgari & Zare, Nova Hedwigia 90: 539 (2010)

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Classification: Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Pleosporomycetidae, Pleosporales, Sporormiaceae, Preussia

Description: Ascomata scattered or aggregated, immersed to semi-immersed, globose to subglobose, dark brown, covered with anastomosing hyphae, which are generally hyaline, at the base dark reddish-brown, indistinctly or distinctly septate, simple or branched, especially at the base, up to $65-100 \,\mu\text{m}$ long and $2-4 \,\mu\text{m}$ wide at the base, gradually tapering to $1-1.5 \,\mu\text{m}$ at the tip, with 1–3 long (rarely short, up to 60 μ m long), bare, straight or slightly curved necks, 100– 140 µm high and 40–55 mm diam, sometimes with a broader tip up to 54–68 µm wide. When the ascomata possess more than one neck, they are apical or placed opposite to each other. Ascoma dimensions vary from $95-105 \,\mu\text{m}$ high and $80-90 \,\mu\text{m}$ diam. When single-necked, to 120–160 um diam in those with 2–3 necks. Peridium translucent, pseudoparenchymatous, 9.5– 12 µm thick, consisting of 3-4 layers of large, greyish brown, angular (Textura angularis), thick-walled and pigmented cells in the outer part, measuring 8.5–13 µm diam, and 2–3 layers of thin-walled, hyaline, isodiametric or rounded cells (T. extura globulosa) in the inner part, measuring 6–8.5 µm diam. Pseudoparaphyses scarce, filiform, septate, unbranched, mostly equalling the asci in length, disappearing at maturity. Asci cylindrical, 8-spored, $75-90 \times 13.5-$ 15.5 µm, with an equal width over the whole length when young and slightly broader below the middle when mature, clearly contracted into a short, 3-5 µm long stipe. Ascospores arranged obliquely, bi- or tri-seriate throughout the asci, 4-celled, $28-31 \times 5-6 \mu m$, transversely septate, deeply constricted at the septa, with readily separable cells, straight or slightly curved, mostly containing a distinct large guttule when mounted in water, hyaline at first, soon turning pale green to olivaceous-brown, yellowish brown and finally dark brown at maturity; germ-slits nearly parallel with a kink near the middle; gelatinous sheath narrow and inconspicuous. Endcells 7.5–8.5 \times 4.5–5 μ m, narrowly rounded; mid-cells 7.5–8.2 \times 4.7–5.7 μ m, nearly equal in size and shape, only slightly broader than the end-cells. Ascospores rarely lacking two or all septa, e.g. halfascospores then measuring $13-15 \times 5-5.5 \mu m$. Colonies moderately fastgrowing, reaching 80 mm diam in 7 d, grey, floccose, reverse greenish grey; mycelium compact with very low aerial growth.

Host and Distribution: Isolated from dead barley leaves, East Azerbaijan province, Sarab (holotype IRAN 12397F, ex-type culture CBS 117680 = IRAN 844C).

Molecular data: IRAN 844C = CBS 117680 (ITS = GQ292750, LSU = GQ292752)

Reference:

Asgari, B. and Zare, R., 2010. Two new species of *Preussia* from Iran. *Nova Hedwigia*, 90(3–4), pp. 533–548.



Preussia persica: (a–d) ascomata; (e) outer surface view of peridium; (f) inner surface view of peridium (focused from outside); (d, g–i) hairs on ascoma surface; (j, k) asci; (l, m) whole ascospores; (n) part-ascospores including mid-cells and end-cells; (o) germ-slits; (p) half-scospores. Scale bars: $a-d = 50 \ \mu m$; $k = 20 \ \mu m$; e-j, $l-p = 10 \ \mu m$

Preussia polymorpha Asgari & Zare, Nova Hedwigia 90: 539 (2010)

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Classification: Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Pleosporomycetidae, Pleosporales, Sporormiaceae, Preussia

Description: Ascomata scattered, semi-immersed to superficial, ovoid to pyriform, $280-350 \times$ 220–240 µm diam (including the neck), smooth, glabrous, dark brown to black with a short and papilliform neck. Peridium dark grey, slightly coriaceous and opaque, pseudoparenchymatous in surface view, $12-16 \mu m$ thick, consisting of relatively thick-walled, nearly isodiametric or rounded cells (textura globulosa), 7.5–10.5 µm diam. Pseudoparaphyses hyaline, filiform, septate, generally longer than the asci, biguttulate, $2.5-3 \mu m$ wide, disappearing at maturity. Asci 8-spored, non-amyloid, of 2 types: (I) subcylindrical, $95-120 \times 18-23 \mu m$, gradually narrowing into a short stout, up to 5.5–11.5 μ m long stipe, (II) clavate, 110–150 \times 30–35 μ m, with a short, up to 9.5–11.5 µm long stipe; cylindrical-clavate asci, is another less common and abnormal type of asci that was observed besides the other two types. Ascospores with a broad gelatinous sheath, bi- or tri-seriate in the upper 2/3 of the subcylindrical asci (tri-seriate above and bi-seriate below), or almost completely filling the clavate asci (tri-seriate above and uni- to bi-seriate below), 4-celled, transversely septate, with broad and deep constrictions at the septa, segments not readily separable, hyaline at first, then turning yellowish-brown and olivaceousbrown, and finally dark-brown to black at maturity, with a parallel to oblique (rarely diagonal) germ-slit extending over the entire length of each segment; ascospores of 2 types: (I) in subcylindrical and clavate asci, cylindrical, $45-50 \times 13-15 \mu m$, end-cells broadly rounded, measuring $11.5-12.5 \times 13-13.5 \mu m$, and mid-cells globose, depressed, slightly broader than the end-cells, measuring $11-11.5 \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $45-50(-58) \times 14-14.5 \mu m$; and (II) in clavate asci, cylindrical, $10.5-12.5 \,\mu\text{m}$, with more irregular part-cells, the end-cells broadly conical, measuring 12-14(-1)15.5) × 9.5–11 µm and mid-cells oblong, measuring $11.5-12(-14.5) \times 11-12.5$ µm. Another type of fusiform-cylindrical ascospores, $35-43 \times 8.5-10 \mu m$, with end-cells conspicuously narrowed (ovoidconical), measuring $9.5-11.5 \times 6-8 \mu m$, and mid-cells oblong, slightly wider than the end-cells, measuring $9-10 \times 8.5-10 \mu m$ was rarely observed in clavate asci. Colonies slow-growing, reaching 20 mm diam in 7 d, woolly, whitish to grey, reverse grey at first, becoming vinaceous with age; mycelium with low aerial growth.

Host and Distribution: Isolated from dead barley leaves from East Azerbaijan province, Osku (holotype IRAN 12398F, ex-type culture CBS 117679 = IRAN 845C).

Molecular data: IRAN 845C = CBS 117679 (ITS = GQ292749, LSU = GQ292751)

Reference:

Asgari, B. and Zare, R., 2010. Two new species of *Preussia* from Iran. *Nova Hedwigia*, 90(3–4), pp. 533–548.



Preussia polymorpha: A–L. teleomorph: (a) ascoma; (b) outer surface view of peridium; (c) (d) subcylindrical asci (type I); (e) clavate asci (type II); (f) cylindrical-clavate ascus; (g–i) ascospores with broadly rounded ends (type I); (j, k) ascospores with ovoid-conical ends; (l) ascospores with more irregular part cells and broadly conical ends (type II). m–q. Anamorph: conidiophores and conidia. Scale bars: $A = 50 \mu m$; $c-f = 20 \mu m$; b, $g-l = 10 \mu m$; $m-q = 5 \mu m$



Chaetomium grande Asgari & Zare, Mycologia 103: 874 (2011)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Chaetomiaceae, Chaetomium*

Description: Ascomata maturing within 13–20 d, olivaceous grey or yellowish green in reflected light, globose, subglobose to ovoid, 200–400 μ m diam, with narrowly rounded base and broad ostiole, 80–130 μ m diam, firmly attached to the substrate with tightly arranged mycelium. Peridium yellowish brown or dark brown, of *textura angularis* or *t. irregularis*. Ascomatal hairs dark brown, occasionally with green or yellow projections in the basal parts, partly long (up to 900 μ m), undulate or hypha-like, simple, with narrowly pointed tip, partly short, irregularly branched, sinuous, with blunt ends, verrucose (ornaments cupulate or globular), 3–5 μ m wide at the base, 2–3 μ m in the middle part. Asci fasciculate, clavate or broadly cylindrical, eight-spored, shortstalked, 55–100(–120) × 25–40 μ m. Ascospores exuded as small, subglobose to irregularly shaped mass, arranged biseriately in the ascus, dark brown or reddish brown, thick-walled, broadly ellipsoidal or spherical, 16–21 × 14.5–18 × 11.5–14 μ m, with two rounded, sometimes slightly protuberant, polar germ pores; immature ascospores containing several small guttules, mature ascospores with a single large guttule. Anamorph undetermined. Colonies 25–(42)–50 mm diam on MEA in 7 d at 25 °C, dirty white; reverse ranging from pale brownish or olivaceous white to dark yellow.

Host and Distribution: On *Triticum aestivum* leaf, West Azerbaijan province, Naghadeh (holotype IRAN 14608F, extype culture IRAN 1064C = CBS 126780). On *T. aestivum* leaf and straw, Naghadeh (IRAN 1063C, IRAN 1658C, IRAN 1659C, IRAN 1664C, IRAN 1210C); on *T. aestivum* straw, West Azerbaijan province, Miandoab (IRAN 1205C, IRAN 1211C = CBS 126665); on *T. aestivum* stem, East Azerbaijan province, Bonab (IRAN 1077C); on *T. aestivum* seed, Hadishahr (IRAN 1666C); on *T. aestivum* straw, Ardabil, Bilesavar (IRAN 1662C, IRAN 1209C, IRAN 1207C, IRAN 1663C, IRAN 1208C = CBS 126781); on *T. aestivum* straw, Ardabil province, Moghan (IRAN 1660C, IRAN 1661C, and IRAN 1206C = CBS 126664); on *T. aestivum* seed, Ardabil province, Parsabad (IRAN 1665C).

Molecular data: IRAN 1064C = CBS 126780 (ITS = HM365253, LSU = HM365253, BenA = HM365273).

Reference:



Chaetomium grande: a–e. ascomata: (a, b) high focus on hairs and ascospore masses; (f–h) ascomatal hairs; (i–k) outer surface of peridium; (l, m) asci (n–p) ascospores. All mounts were prepared in lactic acid except l, m in lactic acid-cotton blue and f, h–k, p in water. All figures illustrate the ex-type culture (IRAN 1064C) except c, i, m, p (IRAN 1206C); d (IRAN 1211C) and h, n (IRAN 1208C). Scale bars: a–d = 200 μ m; e = 100 μ m; l, m = 20 μ m; f–k, n–p = 10 μ m

Chaetomium interruptum Asgari & Zare, Mycologia 103: 874 (2011)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Chaetomiaceae, Chaetomium*

Description: Ascomata maturing within 20–23 d, yellowish green or yellowish brown in reflected light, ovoid, 250–400 µm high, 200–350 µm diam, with narrowly rounded base, and distinct, broad ostiole, 65–150 µm diam, sometimes with hypha-like ostiolar projections. Peridium dark brown, of *textura intricata* or *t. angularis*. Rhizoids poorly developed, dark brown, (400–)600–750 µm long, 2.5–3.5 µm wide. Ascomatal hairs simple, brown, flexuous, undulate or hypha-like, distinctly septate, with numerous, large, deep yellowish orange projections, verrucose (ornaments annulate or globular), sometimes with large vesicular swellings, 350–550(–800) µm long, 4–7.5 µm wide near the base, 3–4.5 µm in the middle part. Asci fasciculate, clavate or slightly fusiform, eight-spored, long-stalked, (40–)50–85 × 15–17(– 18.5) µm. Ascospores exuded as long cirrhi, arranged biseriately in the ascus, dark olivaceous brown, broadly ellipsoidal to nearly spherical, somewhat irregularly shaped, 10–12.3 × 9–11.3 × 7–9 µm, with an apical or slightly subapical, indistinct germ pore; containing several small guttules. Anamorph undetermined. Colonies 15–(24)–34 mm diam on MEA in 7 d at 25 °C, white, floccose; reverse olivaceous or yellowish brown.

Host and Distribution: On *Triticum aestivum* seed, East Azerbaijan province, Hadishahr (holotype IRAN 14607F, ex-type culture IRAN 1278C = CBS 126660); on *Hordeum vulgare* leaf, East Azerbaijan province, Sarab (IRAN 1072C = CBS 126662); on *H. vulgare* leaf, Shindabad (IRAN 1058C and IRAN 1057C); on *T. aestivum* leaf, West Azerbaijan, Salmas (IRAN 1073C = CBS 126661, and IRAN 1657C = CBS 126779).

Molecular data: IRAN 1278C = CBS 126660 (ITS = HM365246, LSU = HM365246, BenA = HM365277), IRAN 1072C = CBS 126662 (ITS = HM365244, LSU = HM365244, BenA = HM365275), IRAN 1073C = CBS 126661 (ITS = HM365245, LSU = HM365245, BenA = HM365276)

Reference:



Chaetomium interruptum: a–da: (a, b) masses of ascospores; (c) high focus on hairs; (e) hyphalike ostiolar projections; (f–i) ascomatal hairs; (j, k) outer surface of peridium; (l, m) asci; (n–p) ascospores. All mounts were prepared in lactic acid except l, m in lactic acid-cotton blue and g–k, p in water. All figures illustrate the ex-type culture (IRAN 1278C) except e, f, g, h, m, o (IRAN 1072C) and l (IRAN 1073C). Scale bars: a–c = 500 μ m, d = 200 μ m; f = 100 μ m; e, l, m = 20 μ m; g–k, n–p = 10 μ m

Chaetomium iranianum Asgari & Zare, Mycologia 103: 877 (2011)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Chaetomiaceae, Chaetomium*

Description: Ascomata maturing within 13 d, pale grey in reflected light, globose to subglobose, 110–145 μ m diam, with broadly rounded base and wide ostiole, 50–85 μ m diam. Peridium pale brown, of *textura intricata* or indistinct *t. angularis*. Ascomatal hairs straight below, spirally and loosely coiled in the upper part, reddish brown, unbranched, distinctly septate, finely verrucose (ornaments lacerate), 300–550 μ m long, 2–3 μ m wide in the middle part. Asci fasciculate, fusiform or clavate, eight-spored, short-stalked, 25–35 × 9.5–12 μ m. Ascospores arranged biseriately in the ascus, pale greyish brown, inequilaterally fusiform or navicular (convex on one side and flat on the other side), often irregular, 10–11 × 5.5–6.5 μ m, with a subapical, occasionally apical germ pore. Anamorph undetermined. Colonies 40 mm diam on MEA in 7 d at 25 °C, floccose, ivory-white, at the margin pale yellow; reverse pale yellowish brown.

Host and Distribution: On *Hordeum vulgare* leaf, East Azerbaijan province, Sarab (holotype IRAN 14609F, ex-type culture IRAN 861C = CBS 126670).

Molecular data: IRAN 861C = CBS 126670 (ITS = HM365257, LSU = HM365257, BenA = HM365297).

Reference:



Chaetomium iranianum: (a, c) ascomata; (b, d–g) ascomatal hairs; (h, i) outer surface of peridium; (j, k) asci (l) ascospores. All mounts were prepared in lactic acid except j, k in lactic acidcotton blue and e–i in water. All figures illustrate the ex-type culture (IRAN 861C). Scale bars: $a = 200 \mu m$; $b-d = 100 \mu m$; $e-l = 10 \mu m$

Chaetomium rectangulare Asgari & Zare, Mycologia 103: 872 (2011)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Chaetomiaceae, Chaetomium*

Description: Ascomata maturing within 13 d, solitary or occasionally aggregated, dark greygreen or black in reflected light, globose to subglobose, 300-450 µm diam, with broadly rounded base and narrow, indistinct ostiole. Peridium dark brown or grey, of textura intricata or t. epidermoidea. Rhizoids well developed, dark olivebrown, 450–750 µm long, 2–4 µm wide. Ascomatal hairs brownish black, paler at the apices, seta-like, straight, regularly and dichotomously branched dis distally (mostly at right angle), sharply pointed at the apices, indistinctly septate, vertucose (ornaments cupulate, annulate or occasionally lacerate), up to 500–800 µm long, 4–7 µm wide in the middle part. Asci fasciculate, clavate or fusiform, eightspored, long-stalked, $50-75(-85) \times 11-14(-15.5)$ µm. Ascospores exuded as subglobose to elongated cirrhi, arranged biseriately in the ascus, dark olivaceousbrown, thick-walled, limoniform or sometimes ellipsoidal, indistinctly apiculate at the ends, flattened, $9-11.5 \times 6.5 8.5 \times 5.5-6.5 \,\mu$ m, with a indistinct, apical germ pore; immature ascospores containing several, small guttules, and mature ones with one or occasionally two large guttules. Phialides mainly produced on ascomatal initials, macronematous, hyaline or pale brown, straight or sinuous, onecelled, occasionally with a septumnear the base, variable length, $5-25(-40) \mu m \log_{2} 2.5-4.5$ μ m wide at the base, gradually tapering to 1–2.5 μ m at the apex. Conidia produced solitarily or in short chains of 2-3 conidia on phialides, hyaline, smooth-walled, ovate or cylindrical, with truncated base and rounded apex, $3-5(-7) \times 2-3 \mu m$. Colonies 44–(46)–48 mm diam on MEA in 7 d at 25 C, white to pale greenish white, floccose, soon appearing dark green to black due to the formation of abundant ascomata; reverse ranging from white to pale brownish white or pale yellowish green.

Host and Distribution: On *Hordeum vulgare* leaf, West Azerbaijan province, Salmas (holotype IRAN 14606F, ex-type culture IRAN 1641C = CBS 126778), on *H. vulgare* stem, East Azerbaijan province, Shabestar (IRAN 855C = CBS 126658); on *Triticum aestivum* seed, East Azerbaijan province, Hadishahr (IRAN 1639C = CBS 126659).

Molecular data: IRAN 1641C = CBS 126778 (ITS = HM365239, LSU = HM365239, BenA = HM365285), IRAN 1639C = CBS 126659 (ITS = HM365240, LSU = HM365240, BenA = HM365286).

Reference:



Chaetomium rectangulare: a–n. teleomorph, o, p. Anamorph. a–c. Ascomata: (a) aggregated ascomata and masses of ascospores; (b) solitary ascoma and mass of ascospores; (d, e) ascomatal hairs; (f) rhizoids; (g) outer surface of peridium; (h–j) asci (k–n) ascospores; (o, p) phialides and conidia. All mounts were prepared in lactic acid except h–j, o, p in lactic acid-cotton blue and e, g, m, n in water. All figures illustrate the ex-type culture (IRAN 1641C) except a, j, m (IRAN 1639C) and f, i, o (IRAN 855C). Scale bars: a–c = 400 µm; d, h–j = 20 µm; e–g, k–p = 10 µm

Chaetomium truncatulum Asgari & Zare, Mycologia 103: 877 (2011)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Chaetomiaceae, Chaetomium*

Description: Ascomata maturing within 20 d, olivaceous grey in reflected light, globose to subglobose, 120–150 μ m diam, with narrow ostiole, 40–54 μ m diam. Peridium pale brown, of *textura intricata* or indistinct *t. angularis*. Ascomatal hairs greenish brown, spirally and tightly coiled over the length, simple, distinctly septate, verrucose or spiny (ornaments cupulate or annulate), 150–250 μ m long, 2–3 μ m wide in the middle part. Asci fasciculate, fusiform, eight-spored, short-stalked, 35–45 × 12–13 μ m. Ascospores arranged biseriately in the ascus, dark olivaceous-brown, fusiform, 11.5–13.5 × 5.7–7 μ m, with an apical or oblique, broad and distinct germ pore surrounded by a thickened wall, appearing truncated at one end. Anamorph undetermined. Colonies 26 mm diam on MEA in 7 d at 25 °C, ivory-white, floccose; reverse pale brown.

Host and Distribution: On *Heterodera schachtii* cysts, West Azerbaijan province, Orumieh (holotype IRAN 14610F, ex-type culture IRAN 918C = CBS 126782).

Molecular data: IRAN 918C = CBS 126782 (ITS = HM365263, LSU = HM365263, BenA = HM365298).

Reference:



Chaetomium truncatulum: (a, b) ascomata; (c, d) ascomatal hairs; (e, f) outer surface of peridium; (g) asci; (h) ascospores. All mounts were prepared in lactic acid except g in lactic acid-cotton blue and d–f in water. All figures illustrate the ex-type culture (IRAN 918C). Scale bars: a, b = 100 μ m; c = 50 μ m; d–h = 10 μ m

Chaetomium undulatulum Asgari & Zare, Mycologia 103: 870 (2011)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Chaetomiaceae, Chaetomium*

Description: Ascomata maturing within 20–22 d, dark green or grey-green in reflected light, globose, subglobose to ovoid, 230–280 µm high, 185–250 µm diam, with narrowly rounded base and wide ostiole, 60–100 µm diam. Peridium pale brown, of *textura intricata* or *t. epidermoidea*. Rhizoids well-developed, dark brown, 300–600 µm long, 2.5–3.5 µm wide. Ascomatal hairs olive-brown, flexuous, wavy or loosely coiled in the upper part, simple, distinctly septate, minutely verrucose (ornaments cupulate or annulate), coarser near the base, 300–600 µm long, 3.5–5.5 µm wide near the base, 2–3 µm in the middle part. Asci clavate or clavate-cylindrical, eight-spored, long-stalked, 60–75 × 13–16 µm. Ascospores exuded as somewhat elongated cirrhi, arranged biseriately in the ascus, dark brown, thick-walled, limoniform, distinctly biapiculate or umbonate, bilaterally flattened, 12–13.5 × 8–10 × 6–7.5 µm, with an apical germ pore; containing several small guttules. Anamorph undetermined. Colonies 42–(55)–68 mm diam on MEA in 7 d at 25 °C, floccose or felt-like, ivory-white; reverse buff or pale olivaceous brown.

Host and Distribution: On *Hordeum vulgare* leaf, East Azerbaijan province, Bonab (holotype IRAN 14605F, ex-type culture IRAN 857C = CBS 126775); on *Triticum aestivum* leaf, West Azerbaijan province, Miandoab (IRAN 1071C = CBS 126776).

Molecular data: IRAN 857C = CBS 126775 (ITS = HM365251, LSU = HM365251, BenA = HM365279), IRAN 1071C = CBS 126776 (ITS = HM365250, LSU = HM365250, BenA = HM365278).

Reference:



Chaetomium undulatulum: a–e. ascomata: (a, b) masses of ascospores; (f, g) ascomatal hairs; (h, i) rhizoids, j, k. outer surface of peridium; (l) asci (m–o) ascospores. Mounts of d, e, g, h, m, n were prepared in lactic acid and those of f, i, j, k, l, o in water. All figures illustrate the extype culture (IRAN 857C) except b, c, d, h, k, m (IRAN 1071C). Scale bars: a, b, d, e = 200 μ m; c = 500 μ m, g l = 20 μ m; f, h–k, m–o = 10 μ m



Coniocessia anandra Asgari & Zare, Mycol. Prog. 10: 205 (2011)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Coniocessiaceae, Coniocessia

Description: Ascomata formed abundantly in 10 d and maturing in 22 d, pyriform to ovoid, solitary, superficial, 150–180 µm high, 100–140 µm diam, translucent at first, semi-translucent at maturity, with one or occasionally two distinct broad ostioles, (16-)30-42 µm high, (40-)50-70 µm diam; hypha-like ostiolar projections, measuring $9-15 \times 2.5-3$ µm. Peridium 7-9 µm thick, pseudoparenchymatous, consisting of several layers of relatively thin-walled, irregularly shaped cells, 7.5–12 um diam; outer layer with *textura intricata*. Paraphyses scarce, filiform, septate, simple, slightly constricted at the septa, as long as the asci, 2.5–3.5 µm wide. Asci cylindrical to rather clavate-cylindrical, 4-spored, with rounded to flattened apex, shortstipitate, $50-70 \times 13-15.5 \,\mu\text{m}$. Ascospores exuded as a black, shiny, globose to elongated mass; in the ascus obliquely uniseriate, hyaline to pale green at first, turning dark olivaceous-grey and finally dull brown or dark greyish brown, thick-walled, occasionally inaequilaterally flattened, variable in shape, ranging from elongateellipsoidal or fusiform, attenuated or rounded at one or both ends to broadly ovate, measuring $18-22 \times 11.5-14 \times 9.5-11 \mu m$; immature ascospores containing a small, indistinct, dull green guttule when mounted in water; germ-slit straight, extending over the whole length of the ascospore. Anamorph undetermined. Colonies on MEA reaching 22 mm diam in 14 d at 24 °C, pale olivaceous-brown, with scanty aerial mycelium, appearing zonate due to the production of ascomata, slightly sulcate; reverse buff.

Host and Distribution: Isolated from wheat seeds, West Azerbaijan province, Miandoab (holotype IRAN 14375F, ex-type culture CBS 125766 = IRAN 1468C)

Molecular data: IRAN 1468C = CBS 125766 (ITS = GU553338, LSU = GU553349).

Reference:

Asgari, B. and Zare, R., 2011. A contribution to the taxonomy of the genus *Coniocessia* (Xylariales). *Mycological Progress*, 10(2):189–206.



Coniocessia anandra: (a) masses of ascospores; (b, c) ascomata; 2 ostioles in c); (d) outer surface of peridium; (e) paraphyses; (f, g) asci; (h–l) ascospores in (h, i) germ-slits visible. Mounts of (b, c, i, k, l) were prepared in lactic acid, those of (d–h, j) in water. All figures illustrate the ex-type culture (IRAN 1468C). Scale bars: a 100 μ m; b, c = 50 μ m; d–l = 10 μ m

Coniocessia cruciformis Asgari & Zare, Mycol. Progr. 10: 200 (2011)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Coniocessiaceae, Coniocessia

Description: Ascomata formed abundantly within 10 d and maturing within 20-22 d, subglobose to pyriform, translucent at first, then becoming dark brown to semi-translucent, 140–180 µm high, 115–170 µm diam, with distinct ostiole, 15–35 µm high, 30–55 µm diam; hypha-like ostiolar projections measuring $(7.5-)12-15(-17) \times 2-3.5 \mu m$. Peridium 7–9.5 μm thick, pseudoparenchymatous, consisting of several layers of thinwalled, irregularly-shaped cells, 6.5–15(–17.5) µm diam, outer layer with textura intricata. Paraphyses numerous, filiform, septate, simple to branched, slightly constricted at the septa, as long as the asci, $3-5 \mu m$ wide. Asci cylindrical, 4-spored, short-stipitate, $55-70(-85) \times 12-15 \mu m$, rounded or flattened at the apex. Ascospores exuded as a black, shiny, mostly elongated mass; in the ascus obliquely uniseriate, hyaline to pale green at first, soon turning olivaceous-green and finally dark brown, relatively thickwalled, bilaterally flattened, elongate-ellipsoidal to broadly fusiform, with slightly apiculate ends and strongly thickened longitudinal rim, appearing rather cruciform in side view, measuring $16.5-21 \times 10.5-13 \times 9-11.5 \ \mu\text{m}$, with visibly irregular incrustations on the surface; immature ascospores containing a distinct, large, greenish brown guttule when mounted in water; germ-slit straight, extending over the whole length of the ascospores. Conidiophores abundant, micronematous to semi-macronematous, simple, hyaline, unbranched to rather irregularly branched, geniculate, smooth-walled to slightly vertuculose, (100–)140– $300(-350) \times 2-3.5$ µm. Conidiogenous cells integrated or rather often discrete, formed terminally or all along the conidiophore, proliferating, polyblastic, with hardly visible denticles, $(5-)11-25 \times 2-4 \mu m$, sometimes with slightly swollen tip, up to 4.5-6.5 μm wide. Conidia remaining attached to the conidiogenous locus for a long time, abundant, hyaline, subglobose to pyriform, smooth-walled to finely vertuculose, $6-8 \times 5-7 \mu m$, with rounded apex, and attenuated and truncated base, with a small basal projection. Colonies on MEA reaching 22-(26)-28 mm diam in 14 d at 24 °C, ivory-white; aerial mycelium at first scanty, soon becoming floccose to funiculose due to the copious formation of conidia, later appearing zonate with the production of ascomata, slightly sulcate; reverse ranging from hyaline to pale buff.

Host and Distribution: Isolated from wheat straw, Ardabil province, Bilesavar (holotype IRAN 14374F, ex-type culture CBS 125769 = IRAN 1475C).

Molecular data: IRAN 1475C = CBS 125769 (ITS = GU553336, LSU = GU553347).

Reference:

Asgari, B. and Zare, R., 2011. A contribution to the taxonomy of the genus *Coniocessia* (Xylariales). *Mycological Progress*, 10(2): 189–206.



Coniocessia cruciformis: a–o. teleomorph, p–y. Anamorph. (a, b) masses of ascospores; (c, d) ascomata; (e) hypha-like ostiolar projections; (f) outer surface of peridium; (g) inner surfaces of peridium; (h, i) asci; (j–n) ascospores and germ-slits; (o) paraphyses; (p) abundant conidiophores around ascomata; (q–w) conidiophores and conidiogenous cells; (x, y) conidia. Mounts of (c, d, j, l, m) were prepared in lactic acid, those of (e–i, k, o, r–t, v–y) in water. All figures illustrate the ex-type culture (IRAN 1475C) except (a, d, k, s, y) (IRAN 1472C) and (j, q, r, u) (IRAN 1474C). Scale bars: a, b, p = 100 μ m; c, d, q, u = 50 μ m; e–o, r–t, v–y = 10 μ m

Coniocessia minima Asgari & Zare, Mycol. Progr. 10: 202 (2011)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Coniocessiaceae, Coniocessia

Description: Ascomata formed abundantly within 10 d and maturing in 2 wk, globose to subglobose, solitary, superficial, 110–135 µm diam, dark greyish brown, opaque, with indistinct ostioles, 7–12 μ m high, 27–40 μ m diam; hypha-like ostiolar projections, measuring 9–11 \times 2.5– 3.5 µm. Peridium 6–8.5 µm thick, consisting of several layers of thick-walled, very irregularly shaped cells, 4.5–8 µm diam, outer layer with *textura intricata*. Paraphyses numerous, filiform, septate, simple to rarely branched, as long as the asci, 2.5–3.5 µm wide. Asci cylindrical to clavate-cylindrical, 4-spored, with rounded to flattened apex, short-stipitate, $(48-)53-60 \times 13-$ 15.5(-17.5) µm. Ascospores exuded as a black, shiny, mostly globose mass; in the ascus obliquely uniseriate, hyaline to pale green at first, then turning dark olivaceous-grey and finally dull brown or dark greyish brown, thick-walled, mostly inaequilaterally flattened, elongateellipsoidal or fusiform with attenuated or rounded ends, measuring $17.5-21.5 \times 11-13 \times 9-11$ um; immature ascospores containing a large, distinct, dark green guttule when mounted in water; germ-slit straight, slightly protuberant, extending over the whole length of the ascospores. Conidiophores abundant, macronematous to semi-macronematous, septate, hyaline, smooth-walled to vertucose, branched, $(40-)75-145(-170) \times 1.5-3 \mu m$. Conidiogenous cells terminal, discrete, polyblastic, denticulate, proliferating, sometimes branched at right angles, $(11.5-)15-20(-30) \times 2.5-4 \mu m$, mostly with broad, swollen tip (bulbose to club-shaped), up to 6–8.5 µm wide. Conidia easily detached, abundant, globose to subglobose, hyaline, smooth-walled, 5–6.5 µm diam, with rounded apex and slightly attenuated base, with indistinct basal projection. Colonies on MEA reaching 16 mm diam in 14 d at 24 °C, dirty white, with scanty aerial mycelium, becoming distinctly floccose and funiculose in older colonies with the formation of conidia, slightly sulcate; reverse sulcate, pale brown.

Host and Distribution: Isolated from wheat seeds, Ardabil province, Parsabad (holotype IRAN 14376F, ex-type culture CBS 125765 = IRAN 1470C).

Molecular data: IRAN 1470C = CBS 125765 (ITS = GU553334, LSU = GU553345).

Reference:

Asgari, B. and Zare, R., 2011. A contribution to the taxonomy of the genus *Coniocessia* (Xylariales). *Mycological Progress*, 10(2): 189–206.



Coniocessia minima: a–l. teleomorph, m–o. Anamorph. (a) masses of ascospores; (b) ascomata; (c) hypha-like ostiolar projections; (d, e) outer surface of peridium; (f) paraphyses; (g, h) asci; (i–l) ascospores in (j) germ-slits visible; (m, n) conidiophores and conidiogenous cells; (o) conidia. Mounts of (b, i, j) were prepared in lactic acid, those of (c–h, k, l, n, o) in water. All figures illustrate the ex-type culture (IRAN 1470C). Scale bars: $a = 100 \mu m$; $b, m = 50 \mu m$; $c-l, n, o = 10 \mu m$

Coniocessia nodulisporioides (D. Hawksw.) Dania García, Stchigel, D. Hawksw. & Guarro, Mycol Res 110: 1285 (2006)

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Basionym: Coniochaeta nodulisporioides D. Hawksw., Norw J Bot 25: 15 (1978)

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Coniocessiaceae, Coniocessia

Description: Ascomata formed within 1 wk and maturing in 20–22 d, globose, subglobose to slightly pyriform, solitary, superficial, 100–150 µm diam, translucent at first, later becoming semi-translucent, with more or less distinct ostiole, 9–18 µm high, 30–45 µm wide; hypha-like ostiolar projections, measuring $7-12 \times 2-3$ µm. Peridium 8.5-13 µm thick, pseudoparenchymatous, consisting of several layers of slightly thick-walled, irregularly shaped cells, 6–13 µm diam, outer layer with *textura intricata*. Paraphyses numerous, filiform, septate, hyaline, simple or rarely branched, as long as the asci, 3-4.5 µm wide. Asci cylindrical to subcylindrical, 4-spored, short-stipitate, with rounded ends, $50-70 \times 14-17 \mu m$. Ascospores exuded as a black, shiny, globose to subglobose mass; arranged uniseriately in the ascus, hyaline to pale green at first, soon turning olivaceousbrown and finally dark greyish brown, thick-walled, bilaterally flattened, broadly ellipsoidal with slightly apiculate or umbonate ends and a slightly thickened longitudinal rim, appearing slightly hexagonal in side view, measuring $15-19 \times 12-15 \times 10-12$ µm, with slightly visible irregular incrustations on the surface; immature ascospores containing a distinct, large, greenish brown guttule when mounted in water; germ-slit straight, protuberant, extending over the whole length of the ascospores. Conidiophores scarce or abundant, semi-macronematous, septate, hvaline, simple or sometimes irregularly branched, smooth-walled to verticulose, variable in length, up to $(60-)100-200 \,\mu m$ long and 2-3.5 µm wide. Conidiogenous cells terminally integrated, sometimes discrete, polyblastic, denticulate, mostly proliferating densely at the apex, $(7-)12-25 \times 2-4 \mu m$. Conidia mostly remaining attached to the conidiogenous locus for a long time (giving a grape-like appearance), subglobose to pyriform, hyaline, smooth-walled or slightly vertuculose, $5-7 \times 4-$ 6 μm, with rounded apex, attenuated and truncated base, mostly with a distinct basal projecton. Colonies on MEA reaching 12–(17)–18 mm diam in 14 d at 24 °C, white or brownish white, with scanty aerial mycelium, sometimes becoming floccose to funiculose with the formation of conidia; reverse ranging from buff or pale apricot to dark reddish-brown; sometimes reddish brown pigments diffusing into the agar.

Host and Distribution: Isolated from soil, Jordan (holotype IMI 204247, ex-type culture CBS 281.77 = IRAN 1616C); isolated from seed of *Hordeum vulgare*, Ahar (IRAN 1471C = CBS 126675); isolated from straw of *Triticum aestivum*, Salmas (IRAN 1473C = CBS 125776) isolated from Seed of *Hordeum vulgare*, Ahar (IRAN 1466C = CBS 125778); isolated from

seed of *Triticum aestivum*, Miandoab (IRAN 1469C = CBS 125777); isolated from seed of *Hordeum vulgare*, Ahar (IRAN 1467C = CBS 125779).

Molecular data: IRAN 1616C = CBS 281.77 (ITS = GU553333, LSU = AJ875224), IRAN 1471C = CBS 126675 (ITS = GU553341), IRAN 1473C = CBS 125776 (ITS = GU553342), IRAN 1466C = CBS 125778 (ITS = GU553343, LSU = GU553351), IRAN 1469C = CBS 125777 (ITS = GU553340), IRAN 1467C = CBS 125779 (ITS = GU553339, LSU = GU553350)

Reference:

Asgari, B. and Zare, R., 2011. A contribution to the taxonomy of the genus *Coniocessia* (Xylariales). *Mycological Progress*, 10(2): 189–206.


Coniocessia nodulisporioides: a–n. teleomorph, o–s. Anamorph. (a) masses of ascospores; (b) ascomata; (c, d) hypha-like ostiolar projections; (e) outer surface of peridium, f. inner surface of peridium; (g) paraphyses; (h) immature ascus; (i, j) mature asci; (k–n) ascospores, in (n) germ-slits visible; (o–r) conidiophores and conidiogenous cells; (s) conidia. Mounts of (b–d, k, l) were prepared in lactic acid, those of (e, f, g–j, m, n, q–s) in water. (p, r, s) (ex-type culture, CBS 281.77), (a, c, l, m) (IRAN 1466C), (b, d, j, k, n) (IRAN 1471C), (o, q) (IRAN 1467C), e, f, h, i (IRAN 1469C), g (IRAN 1473C). Scale bars: a = 100 μ m; b = 50 μ m; o, p = 20 μ m; c–n, q–s = 10 μ m

Coniolariella ershadii (Zare, Asgari & W. Gams) Zare, Asgari & W. Gams, Mycologia 102: 1383 (2010)

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Basionym: Coniochaeta ershadii Zare, Asgari & W. Gams, Nova Hedwigia 84:177 (2007)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Coniolariella*

Description: Ascoma initials arising as interwoven hyphae, soon becoming contorted. Perithecia produced abundantly in the second week, maturing in 4–6 wk, solitary or aggregated, superficial, black, globose to subglobose, 200–500 µm diam, with a nearly globose venter and a very short neck; covered with dark stiff setae that are thick-walled and blunt-ended, with smooth or rough surface, simple or distinctly branched, mostly swollen near the base, measuring 44–46 \times 4.2–4.6 µm. Peridium irregularly pseudoparenchymatous, dark brown, with cells 6–12 μm. Paraphyses numerous, filiform, septate, simple, hyaline, 8–9.5 μm wide at the base, tapering to 2.5–4 μ m near the apex, with a pointed tip, mostly longer than the asci. Asci cylindrical, 8-spored, with non-amyloid undifferentiated apex, with a short stout stipe, measuring $110-150 \times 10.5-12 \mu m$. Ascospores obliquely uniseriate, hyaline at first but soon turning pale green to greenish brown and finally dark brown or black, smooth, without a sheath, ellipsoid-fusoid, mostly with rotational symmetry, measuring $16-18 \times 9.5-10.5 \mu m$, with a distinctive protrusion at one or both ends reaching up to $1.7-2.5 \,\mu\text{m}$, containing a large guttule when mounted in water; germ slits straight, extending over the whole length of the ascospores; ascospores exuded as a large globose mass at the mouth of the ostiole. Conidiogenous cells, produced predominantly on hyphal coils and also on aerial hyphae, simple, hyaline, variable in length, measuring $4-24 \times 2-2.3$ µm, monoblastic or polyblastic, usually producing 2-3conidiogenous denticles bearing single blastoconidia; phialides absent; Conidia rarely formed on aerial hyphae, remaining attached to the conidiogenous locus for a long time, smooth, subhyaline, oblong, regularly cylindrical, sometimes slightly constricted in the middle, with rounded apex and distinctly attenuated base (0.5–1.2 μ m long), with truncated basal scar, measuring $8-11 \times 2-3 \mu m$. Colonies reaching 90 mm diam in 9 d on Leonian agar, at first white, then becoming dark brown, reverse uncoloured; mycelium with low aerial growth, composed of hyaline, smooth-walled, septate, often anastomosing, 2.3–2.7 µm wide hyphae; numerous octahedral crystals present in the culture; chlamydospores absent.

Host and Distribution: Isolated from dead twigs of *Pistacia vera*, Tehran province, Varamin (holotype IRAN 1841F, ex-type culture IRAN 972 C = CBS 119785).

Molecular data: IRAN 972 C = CBS 119785 (ITS = GU553328, LSU = GU553331).

- Zare, R., Asgari, B. and Gams, W., 2010. The species of *Coniolariella* (Xylariales). *Mycologia*, 102, pp. 1383–1388.
- Asgari, B., Zare, R. and Gams, W., 2007. *Coniochaeta ershadii*, a new species from Iran, and a key to well-documented *Coniochaeta* species. *Nova Hedwigia*, 84, pp. 175–187.



Coniolariella ershadii and its nodulisporium-like anamorph: a–j. teleomorph: (a) ascomata viewed from above exuding ascospore masses; (b, c) peridium of irregular structure; (d, e) setae (f–h) asci; (i–j) ascospores. k–u. Anamorph: (k–q) conidiogenous cells; (r, s) crystals (t, u) conidia

Coniolariella gamsii (Asgari & Zare) Dania García, Stchigel & Guarro, Mycol. Res. 110: 1285 (2006)

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Basionym: Coniochaeta gamsii Asgari & Zare, Nova Hedwigia 82:228 (2006)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Coniolariella*

Description: Ascoma initials arising as interwoven hyphae, soon becoming contorted. Perithecia produced abundantly in the second week, maturing in 3–4 wk, solitary or aggregated, superficial, black, globose to subglobose, 500–800 µm diam, with a nearly globose venter and a broad short neck (40–90 µm long); perithecia covered with a loosely appressed layer of flexuous, hyaline hyphae, but no dark stiff setae. Peridium blackish, opaque, pseudoparenchymatous, consisting of several cell layers, the outermost layer comprises large, swollen, pseudoparenchymatous, darkly pigmented cells, while the innermost layer contains small, flattened hyaline cells forming a typical pseudoparenchyma. The intermediate layers consist of smaller, less pigmented and more compressed cells. Paraphyses numerous, filiform, septate, simple, hyaline, broad at the base, tapering towards the apex, with slightly inflated or pointed tip, mostly longer than the asci. Asci cylindrical, 8-spored, non-amyloid in Melzer's reagent, with a short stout stipe, $110-130 \times 12-14$ µm. Ascospores 8, obliquely uniseriate, measuring $16-19 \times 6-11 \mu m$, hyaline at first but soon turning pale green, greyish green to greenish brown and finally dark brown or black, smooth, without sheaths, ellipsoid-fusoid with a protrusion at both ends, sometimes more distinct on one end; containing a distinct large guttule; germ slit straight, extending from one end to the other; ascospores exuded as a large globose mass at the mouth of the ostiole. Colonies fast-growing, reaching 90 mm diam in 9 d, first white, then becoming dark brown, reverse uncoloured; pigmentation usually restricted to the central part of the colony, later extending towards the margins; mycelium compact with low aerial growth, composed of hyaline, smooth-walled, septate, often anastomosing, $2.5-4 \mu m$ wide hyphae; chlamydospores absent.

Host and Distribution: Isolated from barley leaves, East Azerbaijan province, Bonab (holotype IRAN 12363F, ex-type culture CBS 114379 = IRAN 842C), Unknown host, East Azerbaijan province, Bonab (CBS 117677).

Molecular data: IRAN 842C = CBS 114379 (ITS = GU553325, LSU = GU553329), IRAN 907C = CBS 117677 (ITS = GU553326)

- Asgari, B. and Zare, R., 2006. Two new *Coniochaeta* species from Iran. *Nova Hedwigia*, 82, pp. 227–236.
- Zare, R., Asgari, B. and Gams, W., 2010. The species of *Coniolariella* (Xylariales). *Mycologia*, 102, pp. 1383–1388.



Coniolariella gamsii and its Nodulisporium-like anamorph: a–j. Teleomorph: (a) ascoma and ostiole, view from top; (b) ascoma, longitudinal section; (c) outermost layers of ascoma; (d) innermost layers of ascoma; (e, f) asci; (g) paraphyses; (h) ascospore mass at the ostiole; (i) germ slit; (j) ascospores. k–r. Anamorph: (k–n) conidiophores and conidiogenous loci; (o–r) conidia. Scale bars: a, $h = 100 \mu m$; $b = 50 \mu m$; e–g 20 μm ; c, d, i–r = 10 μm

Cryptosphaeria pullmanensis Glawe, Mycologia 76(1): 166 (1984)

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Classification: *Fungi*, *Ascomycota*, *Pezizomycotina*, *Sordariomycetes*, *Xylariomycetidae*, *Xylariales*, *Diatrypaceae*, *Cryptosphaeria*

Description: Stromata poorly developed, with perithecia scattered or gregarious and embedded in bark, circular to ovoid, with sulcate ostioles, $300-700 \ \mu\text{m}$ diam. Asci eight-spored, clavate to spindle-shaped, long-stipitate, $150-220 \times 10-13 \ \mu\text{m}$ (p. sp. 55–110). Ascospores brown, oblong to allantoid, $(10-)12-16(-18) \times 3.5-4.7 \ \mu\text{m}$. On host tissue, conidiomata immersed in bark, scattered, circular to irregular, $0.3-3 \ \text{mm}$ diam, flat to subconical, multichambered, emptying into common ostiole, yellow inside, surrounded by a black line, with orange stratum of spores. Conidiophores cylindrical, simple or branched, $15-50(30.6) \times 1-1.7 \ \mu\text{m}$ long. Conidia allantoid, with a flattened base and hyaline, $5.5-8(-8.7) \times 1.4-2 \ \mu\text{m}$ (mean = $7.1 \times 1.6 \ \mu\text{m}$). Colonies on PDA were circular to irregular, white to grey, cottony, reverse of colonies yellow at the margin and olivaceous black in the centre after 2 wk in the dark at 24 °C, covering 60 mm of Petri plate after 8 d.

Host and Distribution: On *Populus nigra* L., Zanjan province (IRAN 2512C, IRAN 16718F, IRAN 2426C, IRAN 2514C), Esfahan province (IRAN 2511C).

Molecular data: IRAN 2512C (ITS = KX828172, TUB = KY242617), IRAN 2426C (ITS = KU162943, TUB = KY242618), IRAN 2511C (ITS = KU726248, TUB = KY242615), IRAN 2514C (ITS = KU726249, TUB = KY242616).

- Mehrabi, M., Hemmati, R. and Trouillas, F.P., 2017. First report of *Cryptosphaeria* pullmanensis as causal agent of Cryptosphaeria canker of *Populus nigra* in Iran. Forest Pathology, 47(3), p. e12339.
- Trouillas, F.P., Hand, F.P., Inderbitzin, P. and Gubler, W.D., 2015. The genus *Cryptosphaeria* in the western United States: taxonomy, multilocus phylogeny and a new species, *C. multicontinentalis*. *Mycologia*, 107, pp. 1304–1313.



Cryptosphaeria pullmanensis from *Populus nigra*: (a) symptom of canker on bark with anamorph; (b) transverse section through the perithecia; (c) transverse section through the conidiomata; (d) asci with ascospores; (e) conidia; (f–h) symptoms developed in the pathogenicity test on *P. nigra* 5 months after inoculation of *C. pullmanensis* isolates IRAN 2513C (i) colony morphology on PDA. Scale bars: b, $c = 500 \mu m$; $d = 20 \mu m$; $e = 5 \mu m$

Cryptovalsa ampelina (Nitschke) Fuckel, Jahrbücher des Nassauischen Vereins für Naturkunde 23-24: 212 (1870)

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Basionym: Valsa ampelina Nitschke, Pyrenomycetes Germanici 1, p. 156. (1867)

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Diatrypaceae, Cryptovalsa

Description: Stromata immersed in bark, poorly developed, dotted at the surface with visible black zone on the bark surface, circular to ovoid, 0.3-1.5(0.5) mm diam, containing 1–6 perithecia arranged at different depth in the bark, 280–630 µm diam, delimited by distinct black zone, discs dark brown to grey, 0.1–0.3 mm diam, ostioles at the same level as the discs or slightly above, dark brown, 28–70 µm diam, perithecia dark brown, circinately arranged, globoid to subgloboid, surrounded by yellow to grey entostroma. Paraphyses absent. Asci elongate, subcylindrical to clavate, long-stipitate, (60–)80–120(–140) 6 × 6–9(–10) µm, polyspored. Ascospores allantoid, rounded at the apex, subhyaline to yellowish brown, aseptate, (6–)8–10(–12) × 1.8–3 µm. Colonies white on PDA, cottony, with diffuse margins, covering 85 mm of Petri plate after 7 d at 24 °C, reverse later (> 20 d) turning dark, beginning from the center of the colony.

Host and Distribution: On dead branches of *Juglansregia* L., Kermanshah province, Paveh (IRAN 16599F, IRAN 2281C).

Molecular data: IRAN 2281C (ITS = KJ767718, TUB= KY352426).

- Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2015. A new species and a new record of Diatrypaceae from Iran. *Mycosphere*, 6, pp. 60–68.
- Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2016. *Diatrypella macrospora* sp. nov. and new records of diatrypaceous fungi from Iran. *Phytotaxa*, 252, pp. 43–55.
- Trouillas, F.P., Pitt, W.M., Sosnowski, M.R., Huang, R., Peduto, F., Loschiavo, A., Savocchia, S., Scott, E.S. and Gubler, W.D., 2011. Taxonomy and DNA phylogeny of Diatrypaceae associated with *Vitis vinifera* and other woody plants in Australia. *Fungal Diversity*, 49, pp. 203–223.
- Trouillas, F.P., Úrbez-Torres, J.R. and Gubler, W.D., 2010. Diversity of diatrypaceous fungi associated with grapevine canker diseases in California. *Mycologia*, 102, pp. 319–336.



Cryptovalsa ampelina from *Juglans regia*: (a) habit of ascostromata on bark with visible black zone on the bark surface; (b) transverse section through the ascoma shows globose perithecia surrounded in entostroma and ascoma delimited by black zone; (c) ascus with ascocpores; (d) allantoid ascospores; (e) colony morphology on PDA. Scale bars: a = 1 mm; b = 500 µm; c, d = 10 µm

Cryptovalsa rabenhorstii (Nitschke) Sacc., Syll. fung. 1: 190 (1882)

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Synonym: Valsa ampelina Nitschke, Pyrenomycetes Germanici 1. 156 (1867)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Diatrypaceae, Cryptovalsa*

Description: Saprobic on decaying wood. Teleomorph: Stromata in the bark of dead branches (2 cm diam), effuse, covered by the epidermis which is not discolored. Perithecia buried in the inner bark, black and shin inside, either scattered in groups of 5–25 perithecia or rarely in larger groups, circinately or linear arranged, 400–600 μ m diam, delimited by a black zone in the host tissues, ostioles mostly sheltered around a white to yellowish ectostroma, ostioles poorly emerging. Asci clavate, long and slender pedicellate, polysporous, 115–175(–200) × 13–20 μ m. Ascospores hyaline when immature turning yellowish to light-brown at maturity, sub-allaintoid to cylindrical, smooth, aseptate (12–)13–15(–16) × (2.5–)3–4(–5) μ m. Anamorph: immersed in bark, pycnidia interspersed amongst stromata, rare, 0.5–2 mm diam, subconical, delimited by a black zone in the host tissues, hymenium labyrinthiform, light yellow, surface white to grey, powdery, with yellow stratum of spores. Conidia filiform and arcuate, 17–22(–25) × 0.8–1 μ m.

Host and Distribution: On dead branches of *Citrus* sp., Mazandaran province, Sari (IRAN 16683F, IRAN 2346C).

Molecular data: IRAN 2346C (ITS = KR605649, TUB= KY352428).

- Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2016. *Diatrypella macrospora* sp. nov. and new records of diatrypaceous fungi from Iran. *Phytotaxa*, 252, pp. 43–55.
- Trouillas, F.P., Pitt, W.M., Sosnowski, M.R., Huang, R., Peduto, F., Loschiavo, A., Savocchia, S., Scott, E.S. and Gubler, W.D., 2011. Taxonomy and DNA phylogeny of Diatrypaceae associated with *Vitis vinifera* and other woody plants in Australia. *Fungal Diversity*, 49, pp. 203–223.
- Trouillas, F.P., Úrbez-Torres, J.R. and Gubler, W.D., 2010. Diversity of diatrypaceous fungi associated with grapevine canker diseases in California. *Mycologia*, 102, pp. 319–336.



Cryptovalsa rabenhorstii from *Citrus* sp.: (a) habit of ascostromata on bark; (b) longitudinal section through the stroma shows ostioles and perithecia; (c, d) Anamorph; (e) ascus with ascocpores; (f) ascospores; (g) conidia; (h) colony morphology on PDA. Scale bars: a = 1 mm; $b-d = 500 \text{ }\mu\text{m}$; $e-g = 20 \text{ }\mu\text{m}$

Daldinia caldariorum Henn., Verhandlungen des Botanischen Vereins der Provinz Brandenburg 40: 158 (1898)

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Synonyms: Daldinia gollani Henn., Hedwigia 40: 339 (1901); Daldinia cognata Har. & Pat., J. Bot., Paris 17: 15 (1903); Daldinia corrugata Pat. & Har., Bull. Soc. mycol. Fr. 22: 120 (1906); Hypoxylon hibisci Henn., Hedwigia 47: 259 (1908); Daldinia hibiscus (Henn.) Lloyd, Mycol. Writ. 6(Letter 61): 901 (1919); Daldinia platensis Speg., Anal. Mus. nac. B. Aires, Ser. 3 12: 345 (1909); Daldinia aparaphysata Saccas, J. Agric. Trop. Bot. Appl. 1: 190 (1954)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Daldinia*

Description: Stroma depressed-spherical, short stipitate, 0.8×1.4 cm; surface smooth, sepia in age; with KOH-extractable pigments livid purple or vinaceous purple; tissue beneath perithecial layer composed of concentric zones, darker zones dark brown, 0.12-0.38 mm thick, lighter zones whitish or pale brown, 0.12-0.64 mm thick. Perithecia obovoid, cylindrical, $0.5-0.7 \times 0.3-0.45$ mm, with inconspicuous ostioles. Asci with amyloid, discoid apical apparatus, $0.5-1 \times 1.5-2 \mu m$ long, stipe up to 135 μm , and the spore-bearing portion measuring 49–65 $\times 6.5-9 \mu m$. Ascospore smooth, pale to dark brown, ellipsoidal, with broadly rounded ends, 7–9 $\times 3-4 \mu m$, with straight germ slit spore-length; perispore indehiscent in 10% KOH.

Host and Distribution: On branches of *Morus alba* L., Guilan province, Siahkal, Ziaratgah forest (GUM 1113).

Molecular data: Not available.

References:

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Daldinia caldariorum: (a) stroma on host *in vivo*; (b) stroma in longitudinal section internal concentric zones, locules and perithecial layer; (c) perithecial layer; (d) stromatal surface with stromatal pigments in 10% KOH; (e) asci with apical ring bluing in Melzer's iodin regent; (f) ascospores in 10% KOH; (g) ascospores in water with germ slit. Scale bars: B = 0.6 mm, C 1 mm, $E = 20 \mu \text{m}$, F, $G = 10 \mu \text{m}$

Daldinia childiae J.D. Rogers & Y.M. Ju, Mycotaxon 72: 512 (1999)

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Synonym: Daldinia concentrica sensu auct. NZ; fide NZfungi (2008)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Daldinia*

Description: Stromata spherical, depressed-spherical to turbinate, sessile or shortly stipitate, $0.5-2 \times 0.5-2.5$ cm; surface smooth, livid red, dark brick, sepia, brown vinaceous or greyish sepia in age; with orange brown or reddish brown granules immediately below surface and KOH-extractable pigments amber or cinnamon; tissue beneath perithecial layer composed of concentric zones, darker zones dark brown to black, 0.12–0.51 mm thick, lighter zones brown to cream, 0.15-1 mm thick. Perithecia obovoid to lanceolate, $0.71-1.4 \times 0.23-0.64$ mm, with inconspicuous or slightly papillate ostioles. Asci with amyloid, discoid apical apparatus, 0.5- 1.5×2.5 -3.5 µm, long stipe up to 174 µm and, the spore-bearing portion measuring 60–104 $\mu m \times 8-13 \mu m$. Ascospores brown to dark brown, ellipsoid-inequilateral, with narrowly rounded ends, $11-16(-17) \times 5-7(-8)$ µm, with straight germ slit spore-length; perispore dehiscent in 10% KOH. Conidiophores laterally or terminally, hyaline, vertuculose to verrucose, branched, branches short to medium, di- or trichotomously branched, 3 µm wide. Conidiogenous cells integrated, hyaline, with up to 4 loci, not crowded at the apex, $11-23 \times$ 2.5-4 µm. Conidia hyaline, smooth, subglobose to ellipsoid or fusiform, with more or less flattened base, $6-9(-10) \times 3-5 \mu m$. Colonies on OA reaching 90 mm diam in 4 wk, first white, felty and zonate, then becomingHoney with concentric zones. Hyphae superficial, smooth to finely vertuculose, up to 2.5 µm wide.

Hosts and Distributions: On fallen wood of Carpinus betulus L., Guilan province, Masal forest (GUM 1114); on fallen wood of Alnus subcordata C.A. Mey., Guilan province, Shaft, Emamzadeh Ebrahim forest (GUM 1115); on dead branches of Parrotia persica C.A. Mey., Guilan province, Siahkal, Deilaman forest (GUM 1116); on dead branches of unknown tree, Guilan province, Roudsar, Rahimabad (Sefidab) forest (GUM 1117); on dead parts of branches of Pterocarya fraxinifolia (Poir.) Spach, Guilan province, Kelachai, Siahkalroud forest (GUM 1118); on fallen wood of unknown, Guilan province, Chaboksar, Sarvelat forest (GUM 1119); on dead branches of Prunussp., Guilan province, Amlash, Bolourdokan forest (GUM 1120); on dead branches of unknown tree, Guilan province, Lahijan, Kohbijar forest (GUM 1121); on fallen wood of Citrus sinensis (L.) Osbeck, Guilan, Langaroud, Parashkoh forest (GUM 1122); on fallen wood of *Quercus* sp., Langaroud, Liseroud forest (GUM 1123); on trunk and branches of Buxus sempervirens L., Guilan province, Siahkal, Lonak forest (GUM 1124); on fallen wood of Gleditschia caspica Desf., Guilan province, Kelachai, Vajargah forest (GUM 1125); on dead branches of unknown tree, Guilan province, Siahkal, Deilaman forest (GUM 1126); on trunk of Morus albaL., Langaroud, Komle forest (GUM 1127); on dead branches of unknown, Guilan province, Langaroud, Khorma forest (GUM 1128); on different kinds of forest trees, Guilan province, Gisom Kolab forests (IRAN 947F); on Acer sp., Guilan province, Asalem(IRAN 955F); on wood, Guilan province, Khalkhal, Asalam (IRAN 11215F); on wood, East Azarbaijan, Arasbaran Forest (IRAN 11933F); on Wood, Mazandaran, Nowshahr, Kheirudkenar (IRAN 5746F); on wood, Golestan, Gorgan, Baran-Kuh forest (IRAN 13383F); on wood, Esfahan, Najafabad (IRAN 10582F); on Fagusorientalis Lipsky, Mazandaran, Kheirudkenar (IRAN 15742F); on wood, Mazandaran, Amol, Zardman (IRAN 14699F); on DiospyroskakiL., Guilan province, Siahkal forest (IRAN 8115F); on Fagus sp., Guilan province, Lahijan, Siahkal (IRAN 9286F); on Fagus sp., Mazandaran, Sangdeh, Dehmian Forest (IRAN 949F); Guilan province, Asalem forest (IRAN 950F); fallen stumps of *Quercus* sp., Mazandaran, Ramsar, Dalikhani forests (IRAN 946F); decorticated trunk, Mazandaran, Ramsar, Cibon forests Khoshkedaran (IRAN 948F); on rotten trunk, Golestan, Gorgan, Shamooshak Forest (IRAN 954F); on fallen wood, Guilan province, Rasht, Emamzadeh-Hashem, Baragol Forest (IRAN 9285F); on rotten trunk of Fagus sp., Mazandaran, Tonekabon, Porehsar (IRAN 6775F); dried wood, Golestan, Gorgan, Khanbebin, Shirabad forests (IRAN 951F); dried wood, Golestan, Gorgan, Zengo forests (IRAN 952F); on Diospyros kaki, Mazandaran, Amol, Mahmoudabad (IRAN 953F); on Wood, Mazandaran, Firuzkola (IRAN 14348F); on wood Mazandaran, Amol to Babol, Baliran (IRAN 14349F); dn wood, Mazandaran, Noor, Chamestan (IRAN 14955F); wn wood, Mazandaran, Sangdeh, Flourd (IRAN 14956F); wn wood Mazandaran, Tonekabon, Liresar (IRAN 14700F).

Molecular data: Not available.

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Daldinia childiae: (a) stromata on hast *in vivo*; (b) stromatal habit; (c) stroma in longitudinal section showing internal concentric zones and perithecial layer; (d) stromatal surface, with stromatal pigments in 10% KOH; (e) ascus with apical ring bluing in Melzer's iodin regent; (f) ascospores in 10% KOH, showing dehiscing perispore; (g) ascospores in water with germ slit. Scale bars: b = 10 mm; b = 1 mm; $e = 20 \text{ }\mu\text{m}$; f, $g = 10 \text{ }\mu\text{m}$

Daldinia gelatinoides Lar. N. Vassiljeva, Nizshie Rasteniya, Griby i Mokhoobraznye Dalnego Vostoka Rossii, Griby. Tom 4. Pirenomitsety i Lokuloaskomitsety (Sankt-Peterburg): 177 (1998)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Daldinia*

Description: Stroma turbinate, stipitate, stout stipe, $1-2.4 \times 0.8-2.7$ cm; surface smooth, sepia in age; with KOH-extractable pigments vinaceous purple; tissue beneath perithecial layer is not composed of alternating zones but consists of a hollow cavity, with remnants of zonate tissue at base of stroma. Perithecia obovoid to lanceolate, $0.7-1.15 \times 0.38-0.64$ mm, with inconspicuous ostioles. Asci with amyloid, discoid apical apparatus, $0.5-1.5 \times 2-3.5 \mu$ m, long stipe up to 117 μ m, and the spore-bearing portion measuring 62.4–78 μ m × 10.4–13 μ m. Ascospores dark brown to black, ellipsoid-inequilateral, with broadly to narrowly rounded ends, $(11-)12-13(-14) \times (5.5-)6-7 \mu$ m, with straight germ slit spore-length; perispore indehiscent in 10% KOH.

Host and Distribution: On branches of *Morus alba*, Guilan province, Siahkal, Ziaratgah forest (GUM 1129).

Molecular data: Not available.

Note: This species is similar to *D. vernicosa* in having the same spore morphology and indehiscent perispore. However, it is distinguished from the latter species by an *Entonaema*-like habit of its stromata that are highly gelatinous, almost entirely hollow inside and filled with liquid when fresh (Stadler *et al.* 2014).

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Daldinia gelatinoides: (a) stromata on host *in vivo*; (b) stroma in longitudinal section showing hollow interior, perithecial layer and remnants of internal concentric zones at base; (c) perithecial layer; (d) stromatal surface, with stromatal pigments in 10% KOH; (e) asci with apical ring bluing in Melzer's iodin regent ;(f) ascospores in 10% KOH with germ slit; (g) ascospores in water. Scale bars: b = 1 cm, c = 0.5 mm; $e = 20 \mu$ m; f, $g = 10 \mu$ m

Daldinia pyrenaica M. Stadler & Wollw., Mycotaxon 80: 180 (2001)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Daldinia

Description: Stromata hemispherical to depressed-spherical, sessile, $0.7-1.1 \times 1.2-1.5$ cm, surface smooth, dark brick in age; with KOH-extractable pigments amber, cinnamon or honey; tissue beneath perithecial layer composed of alternating concentric zones, darker zones dark brown to black, 0.12-0.51 mm thick, lighter zones light brown, 0.25-0.76 mm thick. Perithecia lanceolate to obovoid $0.76-1.3 \times 0.25-0.58$ mm, with inconspicuous or slightly papillate ostioles. Asci with amyloid, discoid apical apparatus, $0.75-1.5 \times 2.5-4$ µm, long stipe up to 182 µm, and the spore-bearing portion measuring 83–91 µm × with 9–13 µm wide. Ascospores brown, ellipsoid-inequilateral with narrowly rounded ends, $12-17 \times 6-8(-9)$ µm, with straight germ slit spore-length, perispore dehiscent in 10% KOH.

Hosts and Distributions: On dead branches of *Pterocarya fraxinifolia*, Guilan province, Siahkal, Lonak forest (GUM 1131); on dead branches of *Buxus sempervirens*, Guilan province, Langaroud, Khorma forest (GUM 1132).

Molecular data: Not available.

Note: This species resembles to *Daldinia Childiae* by having darker and lighter concentric zones, released pigments in KOH 10%, dehiscent perispore, the shape of ascospores. However, stroma in *D. childiae*are distinctly stipitate and ascospores are slightly smaller than those of *D. pyrenaica* (Stadler *et al.* 2014). *Daldinia pyrenaica* is a new record to the Iranian mycobiota.

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Daldinia pyrenaica: (a) stromatal habit; (b) stroma in longitudinal section showing internal concentric zones and perithecial layer; (c) perithecial layer; (d) stromatal surface, with stromatal pigments in 10% KOH; (e) asci with apical ring bluing in Melzer's iodin regent; (f) ascospores in 10% KOH, showing dehiscing perispore; (g) ascospores in water with germ slit. Scale bars: a = 5 mm; b = 0.5 cm; c = 1 mm; e = 20 µm; f, g = 10 µm

Daldinia vernicosa Ces. & De Not., Comment. Soc. Crittog. Ital. 1: 198 (1863)

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Synonyms: Sphaeria vernicosa Schwein., J. Acad. nat. Sci. Philad. 5: 9 (1825); Daldinia vernicosa Ces. & De Not., Comm. Soc. crittog. Ital. 1 (fasc. 4): 198 (1863) f. vernicosa; Hypoxylon vernicosum (Ces. & De Not.) Berk. & M.A. Curtis, in Berkeley, J. Linn. Soc., Bot. 10(No. 46): 384 (1868); Hemisphaeria vernicosa (Ces. & De Not.) Kuntze, Revis. gen. pl. (Leipzig) 3(2): 482 (1898)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Daldinia*

Description: Stromata turbinate or peltate, usually stipitate, $1.3-1.8 \times 1.3-3.5$ cm; surface smooth or wrinkled, sepia or fuscous black in age; with KOH-extractable pigments dark livid; tissue beneath perithecial layer composed of concentric zones, darker zones dark brown to black, 0.17-0.38 mm thick, lighter zones white, gelatinous, disintegrating and becoming loculate when dry, 0.33-1.2 mm thick. Perithecia obovoid to lanceolate, $0.76-1 \times 0.28-0.71$ mm, with inconspicuous or slightly papillate ostioles. Asci with amyloid, discoid apical apparatus, $0.5-1.5 \times 2.5-3.5 \mu$ m, long stipe up to 208 μ m, and the spore-bearing portion measuring $65-93 \times 9-13 \mu$ m wide. Ascospores dark brown to black, ellipsoid–inequilateral, with broadly to narrowly rounded ends, $11-14(-15) \times 6-8 \mu$ m, with straight germ slit sporelength; perispore indehiscent in 10% KOH.

Host and Distribution: On trunk and branches of *Ficus* sp., Guilan province, Siahkal, Ziaratgah forest (GUM 1133); oOn trunk and branches of *Parrotia persica*, Siahkal, Ziaratgah forest (GUM 1134); on trunk and branches of *Ulmus* sp., Guilan province, Langaroud, Komle forest (GUM 1135).

Molecular data: Not available.

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Daldinia vernicosa: (a–b) stromata on host in vivo; (c) perithecial layer; (d) stroma in longitudinal section showing loculate interior, internal concentric zones and perithecial layer; (e) stromatal surface, with stromatal pigments in 10% KOH; (f) asci with apical ring bluing in Melzer's iodin regent; (g) ascospores in 10% KOH and germ slits; (h) ascospores in water with germ slits. Scale bars: c = 0.5 mm; d = 1 mm; $e = 20 \mu$ m; $g,h = 10 \mu$ m

Diatrype disciformis (Hoffm.) Fr., Summa veg. Scand., Section Post. (Stockholm): 385 (1849)

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Basionym: Sphaeria disciformis Hoffm., Veg. Crypt. 1: 15 (1787)

Classification: *Fungi*, *Ascomycota*, *Pezizomycotina*, *Sordariomycetes*, *Xylariomycetidae*, *Xylariales*, *Diatrypaceae*, *Diatrype*

Description: Saprobic on decaying wood with bark. Teleomorph: Stromata erumpent from bark of dead branches (8 mm diam), disc-shaped, 1.5–2 mm diam, flat or slightly convex, dark at the surface, whitish inside, base sunk to the wood and circumscribed by a black line. Ostioles dark, at the same level as the discs surface, sulcate. Perithecia 10–23 (or more) in a stroma, dark, globoid to subgloboid, 300–600 µm diam. Paraphyses elongate, filiform. Asci elongate, clavate, $45-70(-90) \times 3.5-5(-6)$ µm, octospori, ascospore allantoids, hyaline, aseptate, $5-7 \times 1-1.7$ µm. Anamorph undetermined.

Host and Distribution: On dead branches of *Alnus* sp., Guilan province, Rasht (IRAN 16680F, IRAN 2347C).

Molecular data: IRAN 2347C (ITS = KR605644, TUB = KY352434).

References:

Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2016. *Diatrypella macrospora* sp. nov. and new records of diatrypaceous fungi from Iran. *Phytotaxa*, 252, pp. 43–55.

Trouillas, F.P., Pitt, W.M., Sosnowski, M.R., Huang, R., Peduto, F., Loschiavo, A., Savocchia, S., Scott, E.S. and Gubler, W.D., 2011. Taxonomy and DNA phylogeny of Diatrypaceae associated with *Vitis vinifera* and other woody plants in Australia. *Fungal Diversity*, 49, pp. 203–223.

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Diatrype disciformis from *Alnus* sp.: (a) habit of ascostromata on bark; (b) transverse section through the ascoma shows globoseperithecia surrounded in white entostroma; (c) ascus with ascocpores; (d) ascospores; (e) colony morphology on PDA. Scale bars: a = 2 mm; b = 1 mm; c, d = 10 µm

Diatrypella iranensis Mehrabi & Hemmati, Mycosphere 6 (1): 64 (2015)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Diatrypaceae, Diatrypella*

Description: Stromata immersed in the bark of dead branches (3 mm diam), erumpent, circular to ovoid, surface black, finely rugose due to the ostioles of the perithecia, 2-5(2.9) mm diam, delimited by a black zone in the host tissues, with groups of 4–57 perithecia, arranged on a unique layer in the bark, circular to ovoid, 280–650 µm diam, ostioles dark brown, at the same level of the stroma surface or slightly above, 28–100 µm diam, perithecia dark brown, circinately arranged, crowded, globoid to subgloboid, surrounded by whitish yellow entostroma. Paraphyses elongate, filiform, septate. Asci elongate, subcylindrical to clavate, long-stipitate, (55–)70–110(–130) × 6–9(–10) µm, polyspored; Ascospores allantoids, subhyaline, yellowish in mass, aseptate, (5–)6–7(–8) × 1–1.3(–1.5) µm. Colonies white on PDA, cottony, reverse of colonies pale yellow, covering 85 mm of Petri plate after 8 d at 24 °C.

Host and Distribution: On dead branches of *Quercus brantii* Lindl., Kohkiluyeh & Buyer Ahmad province, Sisakht (holotype IRAN 16600 Fex-type culture, IRAN 2280C).

Molecular data: IRAN 2344C (ITS = KM245033, TUB = KY352429).

Note: *Diatrypella iranensis* resembles in many aspects earlier description of *D. quercina* and *D. pulvinata*. However, the spores of *D. quercina* are longer than those of the new species. In addition, *D. quercina* differs from the new species by marked curvature of the ascospores and wider asci. The new species also differs from *D. pulvinata* on the basis of stromatal morphology and ascus size.

- Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2015. A new species and a new record of Diatrypaceae from Iran. *Mycosphere*, 6, pp. 60–68.
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- Trouillas, F.P., Úrbez-Torres, J.R. and Gubler, W.D., 2010. Diversity of diatrypaceous fungi associated with grapevine canker diseases in California. *Mycologia*, 102, pp. 319–336.



Diatrypella iranensis from *Quercus brantii*: (a) habit of ascostromata on bark; (b) longitudinal section through the stroma shows ostioles and perithecia surrounded in whitish yellow entostroma and ascoma delimited by black zone; (c) ascus with ascocpores; (d) allantoid ascospores; (e) colony morphology on PDA. Scale bars: a = 5 mm; b = 500 µm; c, d = 10 µm

Diatrypella macrospora Mehrabi, R. Hemmati, L.N. Vasilyeva & F.P. Trouillas, Phytotaxa 252 (1): 47 (2016)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Diatrypaceae, Diatrypella*

Description: Saprobic on oak branch. Teleomorph: Stromata immersed in the bark of dead branches (2 cm diam), 1.5–2.5 mm diam, discrete, erumpent, circular, surface black, delimited by a black zone in the host tissues, with groups of 3–10 perithecia, white to yellow to light brown entostroma, Perithecia 400–700 µm diam, usually not compressed, hyaline to black (with age), circinately arranged, monostichous, shining inside, globoid. Necks of the perithecia about 200–500 µm above the periderm, converge together, black. Ostioles black, opening separately. Paraphyses elongate, filiform, septate. Asci elongate, sporiferous parts 110–150(– 160) × 10–15 µm, basal part filiform, up to 80 mm long, narrow when young and more or less cylindrical when mature, with obtuse apex, poly spore. Ascospores (10–)12–20(–23) × 1.7–3 (–3.7) µm (av. = 15.8 × 2.3 µm, n = 39), allantoid, subhyaline, yellowish in mass, thinwalled, smooth, aseptate, usually with two oil droplets. Anamorph undetermined.

Host and Distribution: On dead branches of *Quercus brantii* Lindl. (Fagaceae) Kohkiluyeh & Buyer Ahmad province, Sisakht (holotype IRAN 16679F, ex-type culture IRAN 2344C).

Molecular data: IRAN 2344C (ITS = KR605648, TUB = KY352430).

Note: Differs from other *Diatrypella* species by the size of ascospores.

References:

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Trouillas, F.P., Úrbez-Torres, J.R. and Gubler, W.D., 2010. Diversity of diatrypaceous fungi associated with grapevine canker diseases in California. *Mycologia*, 102, pp. 319–336.



Diatrypella macrospora from *Quercus brantii*: (a) habit of ascostromata on bark (inset: closeup of perithecia necks in lateral view); (b) longitudinal section through the stroma shows ostioles and perithecia; (c, d) anamorph; (e) ascus with ascocpores; (f) ascospores; (g) conidia; (h) colony morphology on PDA. Scale bars: a = 1 mm, b-d = 500 µm, e-g = 20 µm

Eutypella citrincola Speg., Anales del Museo Nacional de Buenos Aires 6: 245 (1898)

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Classification *Fungi*, *Ascomycota*, *Pezizomycotina*, *Sordariomycetes*, *Xylariomycetidae*, *Xylariales*, *Diatrypaceae*, *Eutypella*

Description: Saprobic on dead branch. Teleomorph: Stromata immersed in the bark of dead branches (1 cm diam), in pustules scattered; 6–25 perithecial arranged in a stromata, rarely single, delineated with black line, 0.5–1.5 mm diam, stromatal aggregations widely effused over branches; perithecia surrounded by white, powdery entostroma, sometimes compressed with others, black, circinately arranged, 300–500 µm diam, ostioles raising and piercing the periderm, rarly with elongated clusters of perithecial necks, about 100–300 µm long, 3–6 sulcate. Paraphyses elongate, filiform. Asci octospori, clavate, $50-80(-90) \times 6-8$ µm. Ascospores allantoid, sometimes semicircular, with an oil droplet at each end, subhyaline, yellow in mass, aseptate, 7–11(–12) × 1.7–2.3 µm. Anamorph: Conidia observed on the surface of Petri plate in light yellow mass, filiform, (11–)13–20(–23) × 1–1.2 µm.

Host and Distribution: On dead branches of probably *Salix* sp., Guilan province, Masal (IRAN 16682F, IRAN 2349C)

Molecular data: IRAN 2349C (ITS = KR605647, TUB = KY352439).

- Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2016. *Diatrypella macrospora* sp. nov. and new records of diatrypaceous fungi from Iran. *Phytotaxa*, 252, pp. 43–55.
- Trouillas, F.P., Pitt, W.M., Sosnowski, M.R., Huang, R., Peduto, F., Loschiavo, A., Savocchia, S., Scott, E.S. and Gubler, W.D., 2011. Taxonomy and DNA phylogeny of Diatrypaceae associated with *Vitis vinifera* and other woody plants in Australia. *Fungal Diversity*, 49, pp. 203–223.
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Eutypella citrincola from possible *Salix* sp.: (a) habit of ascostromata on bark (inset: close-up of sulcateostioles); (b) longitudinal section through the ascoma shows globose perithecia surrounded in white entostroma; (c) ascus with ascocpores; (d) ascospores; (e) conidia; (f) Colony morphology on PDA. Scale bars: a = 1 mm; b = 500 µm; c-e = 10 µm

Hypoxylon eurasiaticum Pourmoghaddam, Krisai-Greilhuber & Khodap. Journal of Fungi: 7(2): 131 (2021)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Hypoxylaceae, Hypoxylon*

Description: Stromata superficial, hemispherical, pulvinate to effused-pulvinate, up to 12 cm long \times 0.2–2 cm wide, with inconspicuous to slightly conspicuous perithecial mounds, surface vinaceaous (57, according to Rayner colour chart) or dark vinaceaous (82), brown vinaceous (84); dullorange to orange-brown granules beneath the surface and dark dull granules between the perithecia, with amber (47) to honey (64), isabelline (65), olivaceous (48) or hazel (88) KOH-extractable pigments. Perithecia obovoid to spherical, 0.15–0.4 mm high 0 \times 0.1 mm–0.3 mm wide. Ostioles umbilicate, inconspicuous. Asci with amyloid, discoidapical apparatus, 0.5–1.5 μ m high \times 2.5–3.5 μ m wide, stipe up to 60 μ m, and sporebearing portion $70-90 \times 7-10 \mu m$. Ascospores smooth, unicellular, brown to dark brown, ellipsoid, inequilateral with narrowly rounded ends, $9-12.5 \times 4-6 \mu m$, with more sigmoid to less straight germ slit spore-length on convex side; perispore dehiscent in 10% KOH, conspicuous coil-like ornamentation in SEM; epispore smooth. Colonies on OA covering 9 cm of Petri plate in 2 wk, at first white, becoming straw (46) from outwards, cottony; finally, attaining umber (9) or ochraceous (44). Conidiogenous structure branching virgariella-like as defined by Ju & Rogers (1996). Conidiophores hyaline, smooth to finely roughened. Conidiogenous cells hyaline, smooth to finely roughened, $15-23 \times 2-3 \mu m$. Conidia hyaline, smooth to ellipsoid, $4-6 \times 2-$ 4 μm.

Host and Distribution: On fallen branch of *Quercus castaneifolia*, Shaft (GUM 1597; exholotype MUCL 57720); on fallen branch of *Quercus castaneifolia*, Langaroud (GUM 1598; culture MUCL 57721); on fallen branch of *Quercus castaneifolia*, Siahkal (GUM 1600; culture MUCL 57722); on fallen branch of *Quercus castaneifolia*, Masouleh forest (GUM 988; culture MUCL 57723).

Molecular data: GUM 1597 = MUCL 57720 (ITS = MW367851, RPB2 = MW373852, TUB2 = MW373861); GUM 1598 = MUCL 57721 (ITS = MW367852, RPB2 = MW373853, TUB2 = MW373862); GUM 1600 = MUCL 57722 (ITS = MW367853, RPB2 = MW373854, TUB2 = MW373863); GUM 988 = MUCL 57723 (ITS = MW367854, RPB2 = MW373855, TUB2 = MW373864).

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Hypoxylon eurasiaticum (holotype GUM 1597): (a) stromatal habit; (b,c) close-up view of stromatal surface, with stromatal pigments in 10% KOH; (d) ascospore under SEM; (e) stroma in section showing perithecia and ostioles; (f) immature ascus in water; (g) mature ascus in water; (h) ascus in Melzer's reagent; (i) ascospores in 10% KOH with dehiscent perispore; (j) ascospore in water, with sigmoid germ-slit. Scale bars: a,b = 5 mm; c = 0.5 mm; d = 2 μ m; e = 0.5 mm; f–h = 20 μ m; i,j = 10 μ m



Culture and anamorphic structures of *Hypoxylon eurasiaticum* (GUM 1597) on OA. (a,b) surface of colony after 1 and 8 weeks of incubation (left to right, respectively); (c–f) general view of anamorph structure with virgariella-like branching patterns, conidiogenous cells, immature and mature conidia. Scale bars = $20 \mu m$

Hypoxylon guilanense Pourmoghaddam & C. Lambert. Mycokeys: 66: 112 (2020)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Hypoxylaceae, Hypoxylon*

Description: Stromata superficial, hemispherical to pulvinate, up to 2 cm long \times 0.1–0.7 cm wide, with conspicuous perithecial mounds, surface sienna (8), umber (9) to buff (45); scarlet (5) to orange (7) granules beneath the surface and between the perithecia, with orange (7) KOH-extractable pigments. Perithecia spherical to obovoid, 0.33–0.66 high \times 0.3–0.55 mm wide. Ostioles umbilicate, inconspicuous. Asci not seen. Ascospores smooth, unicellular, brown to dark brown, ellipsoid, inequilateral with narrowly rounded ends, 12–15 \times 5–6 µm, with straight germ slit spore-length on convex side; perispore dehiscent in 10% KOH, conspicuous coil-like ornamentation in SEM; epispore smooth. Colonies on OA covering 9 cm of Petri plate in 4 wk, at first white, becoming buff (45), cottony, slightly zonate with diffuse margins; finally, becoming honey (64). Anamorph not produced in culture.

Host and Distribution: On fallen branch of *Quercus castaneifolia*, Guilan province, Saravan forest (GUM 989; ex-holotype MUCL 57726).

Molecular data: GUM 989 = MUCL 57726 (ITS = MT214997, LSU = MT214992, RPB2 = MT212235, TUB2 = MT212239).

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- Stadler, M., Fournier, J., Granmo, A., Beltrán-Tejera, E., 2008. The "red Hypoxylons" of the temperate and subtropical Northern Hemisphere. *North American Fungi*, *3*, 1–73.
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Hypoxylon guilanense (Holotype GUM 989): (a) stromatal habit; (b) close-up view of stromatal surface, with stromatal pigments in 10% KOH; (c,h,i) ascospores in water, with germ-slits; (d,e) ascospores in 10% KOH with dehiscent perispore; (f,g) ascospore under SEM; (j,k) culture on 9 cm OA plates after 1 and 3 wk of incubation (left to right). Scale bars a = 2.5 mm; b = 1 mm; $c-e = 10 \mu$ m; f, $g = 2 \mu$ m; h,i = 10 μ m

Hypoxylon pseudofuscum Pourmoghaddam, Krisai-Greilhuber & Khodap. Journal of Fungi: 7(2): 131 (2021)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Hypoxylaceae, Hypoxylon*

Description: Stromata superficial, pulvinate to effused-pulvinate, up to 6 cm long \times 1–3 cm wide, with inconspicuous to slightly conspicuous perithecial mounds, surface rust (39), brick (59), vinaceaous (57) or dark vinaceaous (82), brown vinaceous (84); dull orange to orange-brown granules beneath the surface and dark dull granules between the perithecia, with amber (47), isabelline (65), olivaceous (48) or hazel (88) KOH-extractable pigments. Perithecia spherical to obovoid, 0.19–0.36 high \times 0.12–0.28 mm wide. Ostioles umbilicate, inconspicuous. Asci with amyloid, discoid apical apparatus, 0.5–1.5 µm high \times 2–3.5 µm wide, stipe up to 55 µm, and spore-bearing portion 65–85 \times 6–10 µm. Ascospores smooth, unicellular, brown to dark brown, ellipsoid, inequilateral with narrowly rounded ends, 11–16 \times 4.5–7.3 µm, with sigmoid to less frequently straight germ slit spore-length on convex side; perispore dehiscent in 10% KOH; epispore smooth. Colonies on OA covering 9 cm of Petri plate in 2 wk, at first white, cottony, becoming pale luteous (46) from outwards with concentric zones; finally, attaining amber (47). Anamorph not observed.

Host and Distribution: On fallen branch of *Alnus* sp., Guilan province forest, Gisoom forest (GUM 987).

- Rayner, R.W., 1970. A Mycological Colour Chart. Commonwealth Mycological Institute, Kew and British Mycological Society.
- Ju, Y.M., Rogers, J.D., 1996. A Revision of the Genus Hypoxylon; Mycologia Memoir number 20; APS Press: St. Paul, MN, USA, p. 365.
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Hypoxylon pseudofuscum (Holotype): (a,b) stromatal habit; (c) close-up view of stromatal surface; (d,e) stroma in section showing perithecia and ostioles; (f) mature and immature ascus in water; (g) mature and immature asci tips in Melzer's reagent; (h) ascospores in 10% KOH with dehiscent perispore; (i) ascospores in water, with sigmoid germ-slit. Scale bars a = 1 cm; b = 2.5 mm; c-e = 1 mm; f = 20 µm; g-i = 10 µm

Hypoxylon rubiginosum (Pers.) Fr., Summa Veg. Scand. II, p. 384 (1849)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Hypoxylaceae, Hypoxylon*

Description: Stromata superficial, effused-pulvinate, up to 8 cm long \times 0.3–0.2 cm wide; with inconspicuous to conspicuous perithecial mounds, surface red (2) to brick (59); scarlet (5) to orange (7) granules beneath the surface and between the perithecia, with orange (7) to scarlet (5) KOH-extractable pigments. Perithecia spherical to obovoid, 0.2–0.5 high \times 0.15–0.45 mm wide. Ostioles umbilicate, inconspicuous. Asci 8-spored, cylindrical, with amyloid, discoid apical apparatus, 0.5–1 µm high \times 1.5–2.5 µm wide, stipe up to 180 µm long and spore-bearing portion 40–80 \times 6.5–10 µm. Ascospores smooth, unicellular, brown to dark brown, ellipsoid, inequilateral with narrowly rounded ends, 9–12 (–13) \times 4–6 µm, with straight germ slit sporelength on convex side; perispore dehiscent in 10% KOH; epispore smooth.

Host and Distribution: On fallen branch of *Quercus castaneifolia*, Guilan province, Siahkal (GUM 1586; MUCL 57727); on fallen trunk of *Pterocarya fraxinifolia*, Shaft, (GUM 1583); on fallen branch of *Quercus castaneifolia*, Langaroud (GUM 1584); on fallen branch of *Populus* sp., Gisoum forest (GUM 1585).

Molecular data: GUM 1586 = MUCL 57727 (ITS = MT214998, LSU = MT214993, RPB2 = MT212236, TUB2 = MT212240).

- Ju, Y.M., Rogers, J.D., 1996. A Revision of the Genus Hypoxylon; Mycologia Memoir 20; APS Press: St. Paul, MN, USA, p. 365.
- Pourmoghaddam, M.J., Lambert, C., Surup, F., Khodaparast, S.A., Krisai-Greilhuber, I., Voglmayr, H., Stadler, M., 2020 Discovery of a new species of the *Hypoxylon rubiginosum* complex from Iran and antagonistic activities of *Hypoxylon* spp. against the Ash Dieback pathogen, *Hymenoscyphus fraxineus*, in dual culture. *MycoKeys*, 66, 105–133.
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- Stadler, M., Fournier, J., Granmo, A., Beltrán-Tejera, E., 2008. The "red Hypoxylons" of the temperate and subtropical Northern Hemisphere. *North American Fungi*, 3, 1–73.



Hypoxylon rubiginosum (GUM 1586): (a,b) stromatal habit; (c) close-up view of stromatal surface; (d) close-up view of stromatal surface, with stromatal pigments in 10% KOH; (e) ascospores in 10% KOH with dehiscent perispore; (f) mature and immature asci in water; (g) immature ascus in water; (h) mature ascus in water; (i) ascus in Melzer's reagent; (j) ascospores in water; (k) ascus tip in Melzer's reagent. Scale bars: a = 2 cm; b = 1 cm; c = 4 mm; d = 2 mm; e = 10 µm; f-I = 20 µm; j, k = 10 µm

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Kretzschmaria*

Description: Stromata superficial, pulvinate to effused-pulvinate, densely aggregated, up to 7.5 cm long $\times 2-5.2$ cm wide $\times 2.8-4.5$ mm thick, with broad attachment to substrate and narrow connective, sloped margins; surface black to blackish brown, with inconspicuous perithecial mounds, often with reticulate cracks, carbonaceous immediately beneath surface; tissue between and beneath perithecia brown to dark brown. Perithecia spherical to obovoid, 1–1.8 mm wide $\times 1-2$ mm high, ostioles papillate. Asci with amyloid, urn-shaped apical apparatus, 4–6 µm high $\times 2.5-4$ µm wide, stipe up to 250 µm long, spore-bearing part 100–150 $\times 10-14$ µm. Ascospores smooth, unicellular, brown to dark brown, fusoid-inequilateral, 25–34 $\times 5.5-8(-9)$ µm, with straight germ-slit much less than spore-length on flattened side; perispore indehiscent in 10% KOH. Anamorph undetermined. On 2% OA reaching 90 mm diam in 5 wk, first whitish, felty and zonate, then becoming grey from centre outwards with concentric zones.

Host and Distribution: On dead trunk of *Fagus orientalis*, Guilan province, Siahkal, Deilaman forest, 36°53'11.27" N, 49°54'31.67" E, 1432 m elev. (GUM1547 consisting of a dried specimen ex-type culture IRAN 6030C).

Molecular data: GUM1547 (ITS = MH084755, ACT = MH056202)

Notes: *Kretzschmaria deusta* belongs to the ustulinoid taxa and can be distinguished from other ustulinoid *Kretzschmaria* species by smaller ascospores, except for *K. zonata* (Rogers & Ju 1998). They (Rogers & Ju, 1998) also believed that, *K. deusta* is a fungus of the Northern temperate regions. Up to now, there are indeed no reliable reports of this species from tropical (1998), except for slight differences in ascospore size $(25-34 \times 5.5-8 (-9) \text{ vs. } 27-35 \times 7-9 \text{ } \mu\text{m})$.

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- Hladki, A.I. and Romero, A.I., 2001. The genus *Kretzschmaria* from Tucuman, Argentina. *Mycotaxon*, 79, pp. 481–496.
- Hsieh, H.M., Ju, Y.M. and Rogers, J.D., 2005. Molecular phylogeny of *Hypoxylon* and closely related genera. *Mycologia*, 97(4), pp. 844–865.
- Hsieh, H.M., Lin, C.R., Fang, M.J., Rogers, J.D., Fournier, J., Lechat, C. and Ju, Y.M., 2010.
 Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution*, 54(3), pp. 957–969.
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Rogers, J.D. and Ju, Y., 1998. The genus Kretzschmaria. Mycotaxon, 68, pp. 345–393.

Rogers, J.D. and Ju, Y.M., 2004. *Kretzschmaria varians* sp. nov., *Xylaria coremiifera* sp. nov. and *Xylaria umbonata* sp. nov. from Costa Rica. *Mycological Progress*, 3(1), pp. 37–40.



Kretzschmaria deusta: (a) close-up view of stromatal surface; (b) close-up view of ostiolar discs; (c) stroma in vertical section showing perithecia; (d) asci; (e) asci, showing apical apparatus in Melzer's reagent; (f) apical apparatus in Melzer's reagent; (g) ascospores in water, showing germ slits; (h) culture on OA. Scale bars: a = 1 mm; b = 0.4 mm; c = 0.4 mm; $d-e = 20 \mu\text{m}$; $f-g = 10 \mu\text{m}$

Kretzschmaria hedjaroudei Pourmoghaddam & Khodap, Mycosphere 9(6): 1202 (2018)

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Classification: *Fungi*, *Ascomycota*, *Pezizomycotina*, *Sordariomycetes*, *Xylariomycetidae*, *Xylariales*, *Xylariaceae*, *Kretzschmaria*

Description: Stromata superficial, pulvinate, discrete, sessile, up to 2 cm long $\times 1-1.4$ cm wide $\times 2.28-2.54$ mm thick, attachment to substrate with strong connective, steep margins; surface black to dark brown, with inconspicuous perithecial mounds and cracks, carbonaceous immediately beneath surface; tissue between and beneath perithecia black to dark brown. Perithecia obovoid to cylindrical, 0.75-1.15 mm wide $\times 1.15-1.8$ mm high, ostioles coarsely papillate. Asci with amyloid, urn-shaped apical apparatus, $6-8 \mu$ m high $\times 3-5 \mu$ m wide, stipe up to 200 µm long, spore-bearing part 90–140 $\times 12-14 \mu$ m. Ascospores smooth, unicellular, brown to dark brown, fusoid to ellipsoid, inequilateral, with narrowly or broadly rounded ends, $24-30 \times 5-7 \mu$ m, with straight germ slit much less than spore-length on flattened side; perispore indehiscent in 10% KOH. Anamorph undetermined. On 2% OA reaching 90 mm diam in 4 wk, first whitish, felty and zonate, then becoming grey from center outwards with concentric zones.

Host and Distribution: On wood or bark of a dead branch, Mazandaran province, Tonekabon, Dohezar forest, $36^{\circ}47'21.02"$ N, $50^{\circ}52'34.07"$ E, 1 m elev. (type GUM1549, ex-type culture IRAN $3061C = STMA \ 18005$).

Molecular data: GUM1549 (ITS = MH084757, ACT = MH056204).

Notes: *Kretzschmaria hedjaroudei* is closely related to *K. deusta*; however, it can be easily distinguished by its stromatal shape, smaller diam and steep margins of stromata, coarsely papillate ostioles, smaller ascospores $(24-30 \times 5-7 \text{ vs. } 27-35 \times 7-9 \text{ } \mu\text{m})$ and larger apical apparatus $(6-8 \times 3-5 \text{ vs. } 4-6 \times 3-4 \text{ } \mu\text{m})$ (Rogers & Ju, 1998). It is also similar to *K. parvistroma* according to the shape of stromata, which according to Mugambi *et al.* (2009) differs by much larger ascospores $(34-)37-38(-39) \times (10-)12-13 \text{ } \mu\text{m}$.

Reference:

Pourmoghaddam, M.J., Khodaparast, S.A., Krisai-Greilhuber, I., Voglmayr, H. and Stadler, M., 2018. Two new species and one new record of *Kretzschmaria* (Ascomycota, Xylariales) from Iran. *Mycosphere*, 9(6), pp. 1197–1208.



Kretzschmaria hedjaroudei (holotype): (a) stromata habit; (b) close-up view of stromata surface; (c) close-up view of ostiolar discs; (d) stroma in vertical section showing perithecia; (e) asci; (f) asci, showing apical apparatus in Melzer's reagent; (g) apical apparatus in Melzer's reagent; (h–i) ascospores in water, showing germ slits; (j) culture on OA. Scale bars: a = 1 mm, b = 0.4 mm, c = 0.2 mm, d = 0.5 mm, $e-f = 20 \mu \text{m}$, $g-i = 10 \mu \text{m}$

Kretzschmaria iranica Pourmoghaddam & Khodap, Mycosphere 9(6): 1202 (2018)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Kretzschmaria*

Description: Strromata superficial, pulvinate to effused-pulvinate, densely aggregated, up to 8.5 cm long $\times 2-4$ cm wide $\times 1.8-3.45$ mm thick, with broad attachment to substrate and narrow connective, margins steep; surface brown to dark brown, with inconspicuous perithecial mounds, often with reticulate cracks, carbonaceous immediately beneath surface; tissue between and beneath perithecia brown to dark brown. Perithecia obovoid to lanceolate, 0.6–0.9 mm wide $\times 0.75-1.15$ mm high, ostioles finely papillate. Asci with amyloid, urn-shaped apical apparatus, 7–10 µm high $\times 4.5-7$ µm wide, stipe up to 150 µm long, spore-bearing part 80–130 $\times 10-15$ µm. Ascospores smooth, unicellular, dark to blackish brown, fusoid to ellipsoid, inequilateral, with narrowly or broadly rounded ends, 29–40 $\times 8-12(-13)$ µm, with straight germ-slit slightly less than spore-length on flattened side; perispore indehiscent in 10% KOH.

Host and Distribution: On fallen wood of *Alnus subcordata*, Guilan province, Fouman, Ghalerodkhan forest, 37°04′05.02" N, 49°14′40.08" E, 480 m elev. (holotype GUM1551); on dead trunk of *Quercus* sp., Guilan province, Fouman, Ghalerodkhan forest, 37°04′10.26" N, 49°14′40.18" E, 551 m elev. (GUM1552). on dead trunk of *Pterocarya fraxinifolia*, Mazandaran province, Tonekabon, Dohezar forest, 36°47′21.02" N, 50° 52′34.07" E, 1 m elev. (GUM1550)

Molecular data: GUM1551 (ITS = MH084759, ACT = MH056206), GUM1552 (ITS = MH084760, ACT = MH056207), GUM1550 (ITS = MH084758, ACT = MH056205).

Notes: *Kretzschmaria iranica* has morphological similarities to *K. pavimentosa*, but differs by a larger apical apparatus (7–10 × 4.5–7 vs. 6–9 × 4.5–6 μ m), smaller ascospores (29–40 × 8–12(–13) vs. 35–54(–56) × 7.5–11 μ m) and in the length of germ-slit, which is similar to *K. deusta*.

Reference:

Pourmoghaddam, M.J., Khodaparast, S.A., Krisai-Greilhuber, I., Voglmayr, H. and Stadler, M., 2018. Two new species and one new record of *Kretzschmaria* (Ascomycota, Xylariales) from Iran. *Mycosphere*, 9(6), pp. 1197–1208.



Kretzschmaria iranica (holotype): (a) stromatal habit; (b) close-up view of stromata surface; (c) close-up view of ostiolar discs; (d) stroma in vertical section showing perithecia; (e) asci, showing apical apparatus in Melzer's reagent; (f) apical apparatus in Melzer's reagent; (g) ascospores in water, showing germ slits; (h) ascospores in 10% KOH, showing indehiscent perispore. Scale bars: b = 2 mm; c = 0.3 mm; d = 0.4 mm; e = 20 µm; f-h = 10 µm

Kretzschmaria zonata (Lév.) P. Martin, J. S. African Bot. 42: 75 (1976)

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Classification: *Fungi*, *Ascomycota*, *Pezizomycotina*, *Sordariomycetes*, *Xylariomycetidae*, *Xylariales*, *Xylariaceae*, *Kretzschmaria*

Description: Stromata superficial, pulvinate to effused-pulvinate, densely aggregated, up to 8.5 cm long $\times 2-3.5$ cm wide $\times 1.8-2.54$ mm thick, with broad attachment to substrate and narrow connective, sloped margins; surface brown to dark brown, with inconspicuous perithecial mounds, often with reticulate cracks, carbonaceous immediately beneath surface; tissue between and beneath perithecia brown to dark brown. Perithecia with very variable shapes, 0.6–0.75 mm diam $\times 0.5$ –0.9 mm high, ostioles papillate. Asci with amyloid, urnshaped apical apparatus, 7–9 µm high $\times 5-7$ µm wide, stipe up to 150 µm long, spore-bearing part 80–130 $\times 11-13$ µm. Ascospore smooth, unicellular, dark to blackish brown, fusoid to ellipsoid, inequilateral, 30–35(–40) $\times 8-11$ µm, with straight germ-slit slightly shorter than spore-length on flattened side; perispore indehiscent in 10% KOH.

Host and Distribution: On fallen wood of *Parrotia persica*, Guilan province, Talesh, Gisom forest, 37°37′30.95" N, 48°58′15.11" E, 471 m (GUM1548, consisting of a dried specimen).

Molecular data: GUM1548 (ITS = MH084756, ACT = MH056203).

Notes: *Kretzschmaria zonata* is similar to *K. deusta* in having the same stromatal morphology and an indehiscent perispore in 10% KOH. However, it differs by darker and wider ascospores with a slightly longer germ slit (Rogers & Ju 1998). The characters of the Iranian specimen are in accordance with *K. zonata* as defined by Rogers & Ju (1998), except that the ascospores were slightly longer $[30-35(40-) \times 8-11 \text{ vs. } 21-34 \times 8.5-12 \text{ µm}].$

Reference:

Pourmoghaddam, M.J., Khodaparast, S.A., Krisai-Greilhuber, I., Voglmayr, H. and Stadler, M., 2018. Two new species and one new record of *Kretzschmaria* (Ascomycota, Xylariales) from Iran. *Mycosphere*, 9(6), pp. 1197–1208.



Kretzschmaria zonata: (a) close-up view of stromatal surface; (b) close-up view of ostiolar discs; (c) stroma in vertical section showing perithecia; (d) apical apparatus in Melzer's reagent; (e) asci; (f–g) ascospores in water, showing germ slits. Scale bars: a = 2 mm; b = 0.2 mm; c = 0.4 mm; d, f, g = 10 µm; e = 20 µm

Lopadostoma dryophilum (G.H. Otth) Jaklitsch, J. Fourn. & Voglmayr, Persoonia 32: 61 (2014)

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Basionym: *Phaeosperma dryophilum* G.H. Otth, Mitt. Naturf.Ges. Bern Nr. 654–683: 42. (1868)

Synonyms: Sphaeria (Diatrype) dryophila Curr., Trans. Linn. Soc. London 22: 269 (1859) [non Sphaeria dryophila Schwein., Trans. Amer. Philos. Soc., Ser. 2, 4, 2: 226 (1832)]; Anthostoma dryophilum (Curr.) Sacc., Syll. Fung. 1: 308. (1882). Further synonyms are given by Jaklitsch *et al.* (2014).

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Lopadostomataceae, Lopadostoma*

Description: Stromata immersed in the bark of dead branches (1.5 cm diam), pustulate, erumpent, 2–3.5 mm diam, often with slightly projecting black ostioles, delimited by a black zone in the host tissues, the latter 100–200 μ m thick, with groups of 8–20 perithecia. Ostioles dark, opening separately in the disc. Perithecia dark, circinately arranged, globoid to subgloboid, monostichous, 300–800 μ m diam, surrounded by brownish entostroma. Asci narrow cylindric, containing (6–)8 uniseriate ascospores, (74–)90–110 × 7–8 μ m, with stalks up to 30 μ m long. Ascospores (–9)10–15(–16.5) × 3.4–4.7 μ m, narrowly ellipsoid or narrowly fusiform, aseptate, dark brown to nearly black, with straight, circumferential germ slit and 2 large and sometimes several small guttules.

Host and Distribution: On dead branch of *Quercus* sp., East Azerbaijan province, Aghoyeh (IRAN 16685F).

Molecular data: IRAN 16685F (ITS = KR999998).

- Mehrabi, M and Hemmati, R., 2015. Two new records of *Lopadostoma* for mycobiota of Iran.*Mycologia Iranica*, 2(1), pp. 59–64.
- Jaklitsch, W.M., Fournier, J., Rogers, J.D. and Voglmayr, H., 2014. Phylogenetic and taxonomic revision of *Lopadostoma*. *Persoonia*, 32, pp. 52–82.



Lopadostoma dryophilum: (a) habit of ascostromata on bark; (b) ectostromatic discs; (c) transverse section through the ascoma; (d) longitudinal section through the stroma; (e–f) asci; (g) ascospores; (h) ascospore with straight spore-length germ slit. Scale bars: a = 3 mm; b-d = 1 mm; e-h = 10 µm

Lopadostoma fagi Jaklitsch, J. Fourn. & Voglmayr, Persoonia 32: 63 (2014)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Lopadostomataceae, Lopadostoma*

Description: Stromata densely immersed in the bark of dead branches (1.5 cm diam), pustulate, covered by the epidermis which is not discolored, 1–1.5 mm diam, slightly erumpent with tiny, black, rounded or slightly elliptical ectostomatic disc, with groups of 3–7 perithecia. Ostioles dark, converging toward the disc; tissue between the ostioles blackish, opening separately in the disc. Perithecia dark, circinately arranged, globoid to subgloboid, monostichous, 300–800 μ m diam, tissue surrounding perithecia yellowish brown. Asci cylindric, containing 8 uniseriate ascospores, 60–70 × 5–6 μ m, with stalks up to 34 μ m long. Ascospores 7–10.5(–11.3) × 3–4 μ m, oblong or narrowly ellipsoid, aseptate, brown to nearly black, smooth, with straight, circumferential germ slit and 2 large guttules.

Host and Distribution: On dead branch of *Faqus* sp., Ardabil province, Khalkhal (IRAN 16686F).

Molecular data: IRAN 16686F (ITS = KR999997)

- Mehrabi, M and Hemmati, R., 2015. Two new records of *Lopadostoma* for mycobiota of Iran.*Mycologia Iranica*, 2(1), pp. 59–64.
- Jaklitsch, W.M., Fournier, J., Rogers, J.D. and Voglmayr, H., 2014. Phylogenetic and taxonomic revision of *Lopadostoma*. *Persoonia*, 32, pp. 52–82.



Lopadostoma fagi: (a) habit of ascostromata on bark; (b) ectostromatic discs; (c) transverse section through the ascoma; (d) longitudinal section through the stroma; (e–f) asci; (g) ascospores; (h) ascospore showing germ slit. Scale bars: a = 3 mm; b-d = 1 mm; e-h = 10 µm

Peroneutypa scoparia (Schwein.) Carmarán & A.I. Romero, in Carmarán, Romero & Giussani, Fungal Diversity Res. Ser. 23: 84 (2006)

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Synonyms: *Sphaeria scoparia* Schwein., Schr. naturf. Ges. Leipzig 1: 37 (1822). Further synonyms are given in Mycologica Helvetica 2: 285–648 (1987).

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Diatrypaceae, Peroneutypa*

Description: Saprobic on decaying wood. Teleomorph: Stromata in the bark or wood of dead branches (1.5 cm diam), numerous, densely aggregated, erumpent from bark, 0.5–2 mm diam, surrounded by a thin, black stratum, with a black line on horizontal section. Perithecia 5–25 in a stroma, globose, about 300–600 μ m diam, black inside, with elongated clusters of perithecial beaks, about 0.2–1 mm long. Paraphyses elongate, filiform. Asci clavate, crowded, 20–33(–40) × 3.5–4(–4.7) μ m. Ascospores allantoid, minute, strongly curved, hyaline, 3–4.5 × 1 μ m, with a oil droplet in each end. Anamorph: Conidia observed on the surface of Petri plate, infrequent, filiform, (9–)10–14(–16) × 1–1.5 μ m.

Host and Distribution: On dead branches of *Gledischia* sp., Guilan province, Rezvanshahr (IRAN 16684F, IRAN 2345C).

Molecular data: IRAN 2345C (ITS = KR605646, TUB = KY352452).

References:

Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2016. *Diatrypella macrospora* sp. nov. and new records of diatrypaceous fungi from Iran. *Phytotaxa*, 252, pp. 43–55.

Trouillas, F.P., Pitt, W.M., Sosnowski, M.R., Huang, R., Peduto, F., Loschiavo, A., Savocchia, S., Scott, E.S. and Gubler, W.D., 2011. Taxonomy and DNA phylogeny of Diatrypaceae associated with *Vitis vinifera* and other woody plants in Australia. *Fungal Diversity*, 49, pp. 203–223.

Trouillas, F.P., Úrbez-Torres, J.R. and Gubler, W.D., 2010. Diversity of diatrypaceous fungi associated with grapevine canker diseases in California. *Mycologia*, 102, pp. 319–336.



Peroneutypa scoparia from *Gledischia* sp.: (a) habit of ascostromata on bark; (b) longitudinal section through the stroma shows ostiolar necks and perithecia; (c) ascus with ascocpores; (d) ascosporese; (e) conidia; (f) colony morphology on PDA. Scale bars: a = 1 mm; b = 500 µm; c-e = 10 µm

Quaternaria quaternata (Pers.) J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2 (4): 451 (1897)

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Synonyms: Sphaeria quaternata Pers. in Observ. mycol. (Lipsiae) 1: 64 (1796); Eutypella quaternata (Pers.) Rappaz in Mycol. helv. 2(3): 502 (1987)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Diatrypaceae, Quaternaria*

Description: Saprobic on decaying wood. Teleomorph: Stromata densely immersed in the bark of dead branches (1.5 cm diam), dotted at the surface with tiny black ectostroma; 2–6 perithecial arranged in a stromata in the bark, circular, 1–2 mm diam, stromatal aggregations widely effused over branches; perithecia black, circinately arranged, 300–600 μ m diam. Paraphyses elongate, filiform. Asci octospori, almost cylindrical or slightly clavate, (70–)90–130(–155) × 6–7.5 μ m. Ascospores uni or biseriate, allantoid, dilute brown (8–)9–13(–14) × 2–3 μ m. Anamorph undetermined.

Host and Distribution: On dead branches of *Fagus* sp., Guilan province, Rasht (IRAN 16681F, IRAN 2348C).

Molecular data: IRAN 2348C (ITS = KR605645, TUB = KY352464).

- Mehrabi, M., Hemmati, R., Vasilyeva, L.N. and Trouillas, F.P., 2016. *Diatrypella macrospora* sp. nov. and new records of diatrypaceous fungi from Iran. *Phytotaxa*, 252, pp. 43–55.
- Trouillas, F.P., Pitt, W.M., Sosnowski, M.R., Huang, R., Peduto, F., Loschiavo, A., Savocchia, S., Scott, E.S. and Gubler, W.D., 2011. Taxonomy and DNA phylogeny of Diatrypaceae associated with Vitis vinifera and other woody plants in Australia. *Fungal Diversity*, 49, pp. 203–223
- Trouillas, F.P., Úrbez-Torres, J.R. and Gubler, W.D., 2010. Diversity of diatrypaceous fungi associated with grapevine canker diseases in California. *Mycologia*, 102, pp. 319–336



Quaternaria quaternata from *Fagus* sp.: (a) habit of ascostromata on bark; (b) longitudinal section through the stroma shows ostioles and perithecia; (c) ascus with ascocpores; (d) ascosporese; (e) colony morphology on PDA. Scale bars: a = 1 mm; b = 500 µm; c, d = 10 µm

Rosellinia corticium (Schwein.: Fr) Sacc., Syll. F. 1: 253 (1882)

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Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Rosellinia*

Description: Stromata superficial, semiglobose, sessile, solitary, 880–1800 μ m high × 760–1750 μ m wide, dark brown, embedded in a well developed persistent subiculum. Ostioles finely papillate. Ectostroma 25–55 μ m thick, black. Entostroma not seen. Perithecia 760–1500 μ m high × 890–1500 μ m wide, usually separate from the stromatal wall. Asci with amyloid, urn-shaped apical apparatus, 8–15 μ m high × 4–6 μ m upper width × 5–8 μ m lower width, spore-bearing part 140–190 × 10–16 μ m. Ascospores smooth, unicellular, brown to dark brown, ellipsoid-inequilateral, with narrowly or broadly rounded ends, 24–35 × 8–12 μ m, with straight or diagonal or sigmoid germslit as long as spore, one or sometimes both end with semiglobose cellular appendage, whole spore surrounded by a slimy sheath, up to 3 μ m at the ends. Colonies on OA covering 9 cm of Petri plate in 7 d, at first white, becoming light green from outwards, aerial mycelium abundant, cottony, slightly zonate; finally, attaining dark green to dark brown after 60 d. Anamorph geniculosporium (Petrini, 2013). Conidiophores variables in length, hyaline to light brown. Conidiogenous cells up to 43 × 3–4 μ m, with intercalary conidiogenous regions, hyaline to light brown. Conidia hyaline, ellipsoid to elongated ellipsoid with truncate base, 4.5–8 × 3–5 μ m.

Host and Distribution: On fallen branch of *Gleditschia caspica*, Bolur Dokan forest (GUM 1642; culture MUCL 57712); on fallen branch of *Populus alba*, Sarvelat forest, (GUM 1643; culture MUCL 57713); on fallen branch of *Pterocarya fraxinifolia*, Astara (GUM 1644; culture MUCL 57714); on fallen branch of *Quercus castaneifolia*, Chalus, (GUM 1645; culture MUCL 57715); on fallen branch of *Gleditschia caspica*, Masuleh (GUM 1636; culture IRAN 3731C); on fallen branch of *Parrotia persica*, Dohezar forest (GUM 1645; culture IRAN 3732C).

Molecular data: GUM 1642 = MUCL 57712 (ITS = OL635178, LSU = OL635169, RPB2 = OL657204, TUB2 = OL657213); GUM 1643 = MUCL 57713 (ITS = OL635179, LSU = OL635170, RPB2 = OL657205, TUB2 = OL657214); GUM 1644 = MUCL 57714 (ITS = OL635180, LSU = OL635171, RPB2 = OL657206, TUB2 = OL657215); GUM 1646 = MUCL 57715 (ITS = OL635181, LSU = OL635172, RPB2 = OL657207, TUB2 = OL657216); GUM 1636 = IRAN 3731C (ITS = OL635182, LSU = OL635173, RPB2 = OL657208, TUB2 = OL657217); GUM 1645 = IRAN 3732C (ITS = OL635183, LSU = OL635174, RPB2 = OL657209, TUB2 = OL657218).

- Petrini, L.E., 2013. *Rosellinia*-A World Monograph. Bibliotheca Mycologica, Vol. 205. J. Cramer: Stuttgart, DE.
- Pourmoghaddam, M.J. 2020. Taxonomy and multigene phylogeny of *Rosellinia*, *Daldinia* and *Hypoxylon* sensu lato in Guilan and Mazandaran provinces. Ph.D. Thesis. University of Rasht, Iran.
- Pourmoghaddam, M.J., Ekiz, G., Lambert, C., Surup, F., Primahana, G., Wittstein, K., Khodaparast, S.A., Voglmayr, H., Krisai-Greilhuber, I., Stradal, T.E.B., and Stadler, M., 2022. Studies on the secondary metabolism of strains of *Rosellinia* and *Dematophora* from Iran (Xylariaceae). *Mycological Progress*, 21 (8):1-14.
- Wittstein, K., Cordsmeier, A., Lambert, C., Wendt, L., Sir, E.B., Weber, J., Wurzler, N., Petrini, L.E., Stadler, M., 2020. Identification of *Rosellinia* species as producers of cyclodepsipeptide PF1022A and resurrection of the genus *Dematophora* as inferred from polythetic taxonomy. *Studies in Mycology*, 96, 1–16.



Rosellinia corticium. (a,b) stromatal habit; (c,d) close-up view of stromatal surface; (e) closeup view of stroma surface showing ostiole; (f) stroma in horizontal section showing perithecia and ectostroma; (g) immature ascus in Melzer's reagent; (h) mature ascus in water; (i) mature ascus in Melzer's reagent; (j) ascus apical plug in water; (k) ascus apical plug in Melzer's reagent; (l) immature and mature ascospors surrounded by slimy sheath; (m,q) ascospore surrounded by slimy sheath with cellular appendage at one end; (n) ascospore showing sigmoid germ slit; (o) ascospore with cellular appendage at both end; (p) ascospores showing spiral and straight germ slit. Scale bars: c = 1.5 mm; d = 1 mm; e = 0.5 µm; f = 1 mm; g-i = 20 µm; j-q= 10 µm

Xylaria arbuscula Sacc., Michelia 1(2): 249 (1878)

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Synonyms: Xylaria biceps Speg.in An. Soc. Cient. Argentina 12, 110 (1881); Xylaria biceps Speg. var. botryose Rehm in Hedwigia 28, 300 (1889); Xylaria mellisii Cooke in Grevillea 11, 85 (1883); Xylaria botrys Pat. in Journal de Botanique 4, 63 (1890); Xylaria pattersonii Massee in Kew Bull., 2 (1910); Hypoxylon mellisii Berk. (1875); Hypoxylon mellissii Berk., St. Helena: 379 (1875); Xylosphaera mellisii (Berk.) Dennis (1958)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria*

Description: Stromata solitary to gregarious, unbranched or branched near apex, (3.4-)4.2-54 mm high × 1.3–2.5(–3.5) mm broad, with very short to long stipe, fertile portion cylindrical with acute sterile apices; stromatal surface black to brownish black with light brown to black peeling outer layer; perithecia completely immersed, 300–550 µm diam; ostioles slightly papillate to inconspicuous. Asci 8-spored, 125–180 µm long × (5.5–)6.3–7(–10) µm broad, the spore-bearing part 70–90 µm long, with apical ring bluing in Melzer's iodine reagent (amyloid), inverted hat shape, $(3-)3.5-4 \times 2-3(-3.5)$ µm. Ascospores 12–16(–17) × 5–6 µm, inequilateral, young spores occasionally apiculate at one end, brown, with straight $\frac{1}{2}-\frac{3}{4}$ sporelength germ-slit.

Host and Distribution: On unknown decaying wood, Guilan province, Shaft (GUM 1033),Guilan province, Rasht (GUM 1034); on decaying wood of *Alnus* sp., Guilan province, Lahijan (GUM 1035); on rotten trunk of *Quercus* sp., Guilan province, Shaft (GUM 1159).

Molecular data: GUM 1159 (ITS = MF682323).

Note: *Xylaria arbuscula* is a complex species and it may evolve more than one taxon. It has been recorded on large variety of hosts. *Xylaria arbuscula* differs from *X. multiplex* mainly in ascospore and germ slit lengths and not having caespitosestromata. Molecular study may elucidate description of this species.

- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of Xylaria species in Iran. *Rostaniha*, 15(2), pp. 153–166.
- Hsieh, H.M., Lin, C.R., Fang, M.J., Rogers, J.D., Fournier, J., Lechat, C. and Ju, Y.M., 2010.
 Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution*, 54(3), pp. 957–969.
- Rogers, J.D. and Ju, Y.M., 2012. The Xylariaceae of the Hawaiian Islands. North American Fungi, 7, pp. 1–35.
- San Martin Gonzalez, F. and Rogers, J.D., 1989. A preliminary account of *Xylaria* of Mexico. *Mycotaxon*, 34(2), pp. 283–373.



Xylaria arbuscula: (a, b) stromata on wood; (c, d) stromatal surface, with distinctive peeling outer layer; (e) ascospores; (f) asci with apical ring bluing in Melzer's reagent. Scale bars = $10 \mu m$

Xylaria cubensis (Mont.) Fr., Nova Acta Regiae Societatis Scientiarum Upsaliensis 1: 126 (1851)

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Synonyms: *Hypoxylon cubense* Mont., Annales des Sciences Naturelles Botanique 13: 345 (1840); *Xylosphaera cubensis* (Mont.) Dennis, Kew Bulletin 13(1): 103 (1958); *Xylosphaera papyrifera* subsp. *cubensis* (Mont.) Dennis, Bulletin du JardinBotanique de l'État à Bruxelles 31: 122 (1961); *Xylaria papyrifera* subsp. *cubensis* (Mont.) D. Hawksw., Transactions of the British Mycological Society 61(1): 200 (1973)

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria

Description: Stromata solitary, cylindric-clavate, usually unbranched, 15–50(–65) mm high × (3.7–)4–11(–12.5) mm broad, with short or long stipe from a pannose base, fertile portion copper-colored to blackish brown, becoming hollow at maturity, with rounded fertile apices, stromatal surface smooth except for ostioles or tiny cracks; perithecia completely immersed, 500 µm diam; ostioles more or less finely papillate. Asci 8-spored, stipitate, 88–133 µm long × 7 µm broad, the spore-bearing part 60 µm long, with apical ring bluing in Melzer's iodine reagent, cylindrical, 3×2 µm. Ascospores brown, ellipsoid-inequilateral, smooth, (7–)8–9.5(–11) × 4–5(–6) µm, mostly without germ-slit or rarely with straight nearly spore-length germ-slit. Anamorph: Synnemata produced separately from the teleomorph on wood. Synnemata flabellate, pinkish colored, with dense layer of sparsely branched conidiophores. Conidia produced sympodially on conidiogenous cells, pinkish in mass, one-celled, 4.5–6 × 2–2.5 µm, hyaline, obovate to ellipsoidal with flattened base at one end.

Host and Distribution: On unknown decaying wood, Guilan province, Rasht (GUM 1037); Mazandaran province, Kelardasht (GUM 1041); Guilan province, Astara (GUM 1046); Guilan province, Roodsar (GUM 1050); Lahijan (GUM 1051); on decaying wood of *Quercus* sp., Guilan province, Rasht (GUM 1036); on decaying wood of *Diospyrus lotus*, Kelardasht (GUM 1038, 1039, 1040); on decaying wood of *Parrotia persica*, Rasht (GUM 1047, 1048); on decaying wood of *Gleditschia caspica*, Mazandaran province, Chaloos (GUM 1049).

Molecular data: GUM 1039 (ITS = MF682324); GUM 1041 (ITS = MF682325); GUM 1075 (ITS = MF682326); GUM 1051 (ITS = MF682327).

Note: *Xylaria cubensis* is mainly chracterized by its smooth, copper-colored stromata with rounded fertile apices and small ascospres mostly without germ-slit. Based on color and size of stromata and ascospore, this species has been divided into two types, A and B. *Xylaria cubensis* differs from *X. pannosa* Lloyd, the closest species, by having hollow stromatal flesh at or prior to maturity.

References:

Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of Xylaria species in Iran. *Rostaniha*, 15(2), pp. 153–166.

Hsieh, H.M., Lin, C.R., Fang, M.J., Rogers, J.D., Fournier, J., Lechat, C. and Ju, Y.M., 2010. Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution*, 54(3), pp. 957–969.

Rogers, J.D. and Ju, Y.M., 2012. The Xylariaceae of the Hawaiian Islands. North American Fungi, 7, pp. 1–35.

San Martin Gonzalez, F. and Rogers, J.D., 1989. A preliminary account of *Xylaria* of Mexico. *Mycotaxon*, 34(2), pp. 283–373.



Xylaria cubensis: (a–d) stromata; (e, f) smooth surface of mature and young stromata, respectively; (g) fertile tip of stromata; (h) ascospores; (i) ascus apical ring bluing in Melzer's reagent; (j) anamorph and teleomorph on wood; (k, l) conidia and conidiophores, respectively. Scale bars = $10 \ \mu m$

Xylaria filiformis (Alb. &Schwein.) Fr., Summa vegetabilium Scandinaviae 2: 382 (1849)

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Synonyms: Sphaeria filiformis Alb. & Schwein., Conspectus Fungorum in Lusatiaesuperioris: 2, t. 3:5 (1805); *Hypoxylon filiforme* (Alb. &Schwein.) Rabenh., Deutschlands Kryptogamen flora 1: 223 (1844); *Xylosphaer afiliformis* (Alb. &Schwein.) Dennis, Kew Bulletin 13(1): 103 (1958);

Podosordaria filiformis (Alb. &Schwein.) P.M.D. Martin, South African Journal of Botany 42(1): 79 (1976)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria*

Description: Stromata solitary, filiform, mostly unbranched but occasionally two stromata arising from a common base, 58–72 mm long × 1(–2) mm diam; perithecia intercalary, solitary, with distinct perithecial contours, (400–)560–670 μ m diam; ostioles papillate; stromatal surface roughened with peritecial counters, dark brown to black. Asci cylindrical, 8-spored, 130–155 μ m long × 5.5–6.2 μ m broad, the spore-bearing part 80–102 μ m long, with apical ring bluing in Melzer's iodine reagent, inverted hat shaped, 2.8–3 × 1.8–2 μ m. Ascospores uniseriate with overlapping ends, (12.5–)13–16(–21) × (4.5–)5(–5.5) μ m, inequilateral, flat on one side and round on the other, light brown, with straight spore-length germ-slit.

Host and Distribution: On herbaceous stem of undetermined plant, Guilan province, Fouman (GUM 1052).

Molecular data: GUM 1052 (ITS = KP218907).

Note: *Xylaria filiformis* mostly occurs on decaying leaves of dicotyledonous trees and less often on other herbaceous debris.

References:

Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.

Rogers, J.D. and Samuels, G.J., 1986. Ascomycetes of New Zealand 8. *Xylaria*. *New Zealand Journal of Botany*, 24(4), pp. 615–650.



Xylaria filiformis: (a) stromata; (b) naked perithecia; (c) stipe of stromata; (d) ascospores; (e) ascus apical ring bluing in Melzer's reagent; (f, g) front and reverse sides of colony on OA after 16 days at 20 ± 0.5 °C in 12/12 h D/L regime; respectively. Scale bars = $10 \ \mu m$

Xylaria flabelliformis (Schwein.) Berk. & M.A. Curtis, Journal of the Linnean Society. Botany 10: 381 (1869) [MB#143461]

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Synonym: Xylaria fusca Lloyd., Xylaria pannosa Lloyd.

Classification: Fungi, Dikarya, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria

Description: Stromata solitary, usually unbranched, rarely branched from fertile part, clavate, occasionally cylindrical to ellipsoid, with rounded fertile apices, (10-)15-55 mm high × (3.5-)4-9(-11.5) mm diam., with short to long stipe arising from pannose base, copper-colored to blackish brown, internally white, not becoming hollow; stromatal surface smooth except for tiny cracks and ostioles; perithecia completely immersed, 400–600 µm diam; ostioles papillate to hemispherical; asci 120–175 µm long × 5.5–7 µm broad, the spore-bearing part 50–70(–95) µm long, with apical ring bluing in Melzer's iodine reagent, rectangular, $(1.5-)2-2.5 \times 2$ µm broad; ascospores brown, ellipsoid-inequilateral, $(7.5-)8-9(-10) \times 4-5(-5.5)$ µm, mostly without germ-slit or very rarely with straight nearly spore-length germ-slit. Anamorphic state of this species is similar to those described herein for *X. cubensis*.

Host and Distribution: on undetermined decaying wood, Guilan, Astara (GUM 1062, 1063, GUM 1064, 1065, 1066); Guilan, Lahijan (GUM 1068, 1080, 1081); Guilan, Rasht (GUM 1072, 1079); Golestan, Kordkoy (GUM 1076); Guilan, Roodsar (GUM 1078); on decaying wood of *Castanea sativa*, Guilan, Shaft (GUM1061); on decaying wood of *Acer velutinum*, Guilan, Lahijan (GUM 1067); on decaying wood of *Alnussp.*, Guilan, Rasht (GUM 1069); on decaying wood of *Mespilus germanica*, Guilan, Rasht (GUM 1070, 1071); on wood of *Parrotia persica*, Guilan, Rasht (GUM 1073, 1074, 1075); on wood of *Gleditschia caspica*, Guilan, Fouman (GUM 1077).

Molecular data: GUM 1061 (ITS = MF682328); GUM 1063 (ITS = MF682329); GUM 1081 (ITS = MF682331).

Note: This species previously reported from Iran as *X. pannosa* (Hashemi *et al.*, 2014). However, according to Ju *et al.* (2016) *Xylaria pannosa* is synonym of *X. flabelliformis. Xylaria flabelliformis* is morphologically close to *X. cubensis*. However, this species distinguished from the *X. cubensis*, by having solid stromatal flesh at or prior to maturity (Rogers & Ju, 2012). Moreover, *X. flabelliformis* has longer (7.8–10.2 × 3.4–4.7 µm), inequilateral, with broadly rounded ends and a short, inconspicuous germ slit (Fournier *et al.*, 2019). The BLAST search of ITS sequences showed that *X. flabelliformis* (MZ854248.1) is the closest taxon to Iranian isolates. Morphological characteristics of Iranian isolates are very close to *X. flabelliformis* described by Fournier *et al.*, (2019).

References

Fournier, J., Lechat, C. and Courtecuisse, R., 2019. The genus *Xylaria* sensu lato (Xylariaceae) in Guadeloupe and Martinique (French West Indies) II. Taxa with robust upright stromata. *Ascomycetes.org* 11(3) Doi: 10.25664/art-0263

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- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp.153-166.
- Lloyd, C.G. 1918. Mycological Writings 5: Xylaria Notes No. 1. 1-16.
- Rogers, J.D. and Ju, Y.M., 2012. The Xylariaceae of the Hawaiian Islands. North American Fungi, 7, pp.1-35.



Xylaria flabelliformis: (a–e) stromata on wood; (f, g) close-up of stromatal surface; (h) ascospores; (i) ascus apical rings bluing in Melzer's reagent; (j) anamorphic and teleomorphic states on wood; (k, l) conidia and conidiophores, respectively. Scale bars = $10 \ \mu m$

Xylaria hypoxylon (L.) Grev., Flora Edinensis: 355 (1824)

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Synonyms: Sphaeria hypoxylon (L.) Pers., Observ. Mycol. 1: 20 (1796); Xylosphaera hypoxylon (L.) Dumort., Comment. bot.: 91 (1822); Clavaria hypoxylon L., Species Plantarum: 1182 (1753); Sphaeria hypoxylon (L.) Sowerby, Coloured Figures of English Fungi 1: t. 55 (1797); Xylosphaera hypoxylon (L.) Dumort., Commentationes botanicae: 91 (1822)

Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria

Description: Stromata solitary, ubconical, often branched and flattened toward the apex, 35 mm high \times 6 mm diam, at first white, becoming dull black, internally white; perithecia immersed; ostiolespapillate. Asci 8-spored, stipitate, 150–182 µm long \times 5.5–6.5 µm broad, the spore-bearing part 75–80 µm long, with apical ring bluing in Melzer's iodine reagent, rectangular to urn shape, $(2.5-)3(-3.5) \times (2-)2.5$ µm. Ascospores brown, ellipsoid-inequilateral, $(9.5-)10-12.5(-13) \times 4.5-5(-5.5)$ µm, with straight nearly spore-length germ-slit.

Host and Distribution: On undetermined decaying wood, Guilan province, Lahijan (GUM 1053).

Molecular data: GUM 1053 (ITS = MF682345).

- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.
- Hsieh, H.M., Lin, C.R., Fang, M.J., Rogers, J.D., Fournier, J., Lechat, C. and Ju, Y.M., 2010.
 Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution*, 54(3), pp. 957–969.
- Persoh, D., Melcher, M., Graf, K., Fournier, J., Stadler, M. and Rambold, G., 2009. Molecular and morphological evidence for the delimitation of *Xylaria hypoxylon. Mycologia*, 101(2), pp. 256–268.
- Stadler, M., Hawksworth, D.L. and Fournier, J., 2014. The application of the name *Xylaria hypoxylon*, based on *Clavaria hypoxylon* of Linnaeus. *IMA Fungus*, 5(1), pp. 57–66.



Xylaria hypoxylon: (a,b) mature and young stromata on wood, respectively; (c) ascospores; (d) ascus apical ring bluing in Melzer's reagent. Scale bars = $10 \ \mu m$

Xylaria longipes Nitschke, Pyrenomycetes Germanici 1: 14 (1867)

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Synonym: Xylosphaera longipes (Nitschke) Dennis, Kew Bulletin 13(1): 104 (1958)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria*

Description: Stromata cylindrical to clavate with fertile apex mostly unbranched but occasionally up to two stromata arising from a common base, dull blackish brown with light brown polygonal scales, (13.5-)21-55 mm high × (2-)3.5-7(-10) mm broad; stromatal surface roughened by polygonal scales; perithecia completely immersed, 460–660 µm diam; ostioles slightly papillate to indistinct. Asci stipitate, 148–193 µm long × 6–10 µm broad, the sporebearing part 52–80(–92) µm long, with apical ring bluing in Melzer's iodine reagent, rectangular to inverted hat shape, $(2-)2.5-3 \times (2-)2.5-3$ µm. Ascospores brown, ellipsoid-inequilateral, $(11.5-)12-14.5(-16) \times (4.5-)5-6(-7)$ µm, with spiraling germ-slit.

Host and Distribution: On undetermined fallen wood, Guilan province, Rasht (GUM 1054, GUM 1055), Golestan province, Gorgan (GUM 1057, 1058); on fallen wood of *Parrotia persica*, Mazandaran province, Noor (GUM 1056).

Molecular data: GUM 1057 (ITS = MF682344).

Note: *Xylaria longipes* has been mostly reported in association with *Acer* spp. in northeastern USA and Europe. Having ascospores with spiraling germ-slit make the species to be unique among *Xylaria* species reported from Iran until now.

Reference:

Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.

San Martin Gonzalez, F. and Rogers, J.D., 1989. A preliminary account of *Xylaria* of Mexico. *Mycotaxon*, 34(2), pp. 283–373.



Xylaria longipes: (a–d) stromata on wood; (e) close-up of stromatal surface with distinctive brown and polygonal plaques; (f) ascospores; (g) ascus apical ring bluing in Melzer's reagent. Scale bars = $10 \ \mu m$

Xylaria longissima Hashemi, Khodaparast, Zare & Elahinia, Mycologia Iranica 2(1): 2 (2015)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria

Description: Stromata caespitose, 55–71 mm long, fertile portion $6-8 \times 1-1.5$ mm diam, with very long (30–45 mm long) setiform and branched sterile apices; stipe pubescent, $17-20 \times 1$ mm diam; stromatal surface roughened from evidently to slightly perithecial elevations, with light brown peeling outer layer splitting in longitudinal bands; ostioles slightly papillate. Asci cylindrical, 8-spored, $165-180 \times 6-7 \mu m$, the spore bearing part 90–100 μm , with apical ring bluing in Melzer's iodine reagent, rectangular, $(3-)3.5-4(-4.5) \times 2.5 \mu m$. Ascospores $(15-)16-18(-20) \times 5-6 \mu m$, inequilateral to navicular, with straight spore-length germ-slit.

Culture characteristics: Colony growth on OA was 32 ± 6.9 , 53.2 ± 10.1 and 76.8 ± 9.1 mm after 10, 16 and 25 d at 20 ± 0.5 °C and 12/12 h light/dark regime, respectively. Colony at first was white with gray center, and then turned to vinaceous buff with dark concentric rings which produced dark, branched and setiform stromata with white tip.

Host and Distribution: On the wood of unknown dicotyledonous plant, Guilan province, Rasht (holotype IRAN 16581F, ex-type culture IRAN 2268C = GUM 1170); Guilan province, Shaft (IRAN 16582F, IRAN 2269C).

Molecular data: IRAN 16581F = IRAN 2268C (ITS = KP218905); IRAN 16582F = IRAN 2269C (ITS = KP218906); GUM 1170 (ITS = MF682343).

Note: *Xylaria longissima* is characterized by very long setiform sterile apices, more or less conspicuous perithecia, light brown peeling outer layer and $16-18 \times 5-6 \mu m$ ascospores with straight spore-length germ-slit. Morphologically, *X. longissima* is somewhat close to *X. filiformis, X. theissenii* var. *macrospora, X. juruensis* and *X. arbuscula*. Based on a BLAST search using ITS sequences, the closest taxa to *X. longissima* were *X. bambusicola* and *X. grammica* with 95% homology. Differences of *X. longissima* from above mentioned species have been discussed in Hashemi *et al.* (2015).

Reference:

Hashemi, S.A., Zare, R., Khodaparast, S.A. and Elahinia, S.A., 2015. A new *Xylaria* species from Iran. *MycologiaIranica*, 2(1), pp. 1–10.



Xylaria longissima (holotype): (a) stromata on wood in natural conditions; (b) stromata with very long, setiform and branched sterile apices; (c) close-up of surface of stromata with brown peeling outer layer; (d) pubescent stipe; (e) ascospores and rectangular ascus apical ring bluing in Melzer's reagent; (f) close-up of ascospores with straight spore-length to nearly spore-length germ-slit; (g) colony on OA after 21 d at 20 ± 0.5 °C in 12/12 h D/L regime; (h) close-up of stromata produced on OA. Scale bars = $10 \ \mu m$
Xylaria multiplex (Kunze ex Fr.) Fr., Nova Acta Regiae Societatis Scientiarum Upsaliensis 1: 127 (1851)

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Synonyms: *Xylaria caespitulosa* Ces.Mycetum in itinereborneensi p. 15, 1879; *Xylosphaera multiplex* (Kunze ex Fr.) Dennis, Kew Bulletin 13(1): 105 (1958)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria*

Description: Stromata solitary or branched, 1-2(-5) fertile parts on each stipe, cylindrical with acute sterile apices, (9-)16-25(-29) mm high × (1.3-)1.5-3 mm broad, caespitose, stipe 6–10 mm long, fertile portion dull blackish brown; perithecia completely immersed, 300–500 µm diam; ostioles papillate. Asci 8-spored, 125–150 µm long × 6–7 µm broad, the spore-bearing part 70–77 µm long; with apical ring bluing in Melzer's iodine reagent, quadrate to inverted hat shape, $2 \times 1.5-2$ µm. Ascospores $10-13(-14) \times (4-)5(-6)$ µm, inequilateral with rounded apices, light brown with straight spore length germ-slit.

Host and Distribution: On undetermined decaying wood, Guilan province, Rasht (GUM 1059); on fallen wood of *Quercus* sp. (GUM 1060); on fallen wood of *Parrotia persica* (GUM 1167); on rotten root of *Parrotia persica* (GUM 1168).

Molecular data: GUM 1167 (ITS = MF682346); GUM 1168 (ITS = MF682347).

Note: *Xylaria multiplex* is mainly differentiated from *X. arbuscula* by shorter ascospores with germ-slit extending over the whole length.

- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.
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 Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution*, 54(3), pp. 957–969.
- San Martin Gonzalez, F. and Rogers, J.D., 1989. A preliminary account of *Xylaria* of Mexico. *Mycotaxon*, 34(2), pp. 283–373.



Xylaria multiplex: (a) stromata on wood; (b) longitudinal section of stromata; (c) stromatal surface with distinctive papillate ostioles; (d) ascospores and asci with apical ring bluing in Melzer's reagent. Scale bar = $10 \ \mu m$

Xylaria polymorpha (Pers.) Grev., Flora Edinensis: 355 (1824)

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Synonyms: Sphaeria polymorpha Pers., Commentatio de Fungis Clavae formibus: 17 (1797); Hypoxylon polymorphum (Pers.) Gray, A natural arrangement of British plants 1: 512 (1821); Xylosphaera polymorpha (Pers.) Dumort., Commentationes botanicae: 92 (1822); Hypoxylon polymorphum var. polymorphum (Pers.) Mont.: 13 (1840)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria*

Description: Stromata unbranched to branched, extremely variable in shape and size, cylindrical, cylindric-clavate, irregular to rarely ellipsoid, with rounded fertile apices, stipe short, rarely long, (6.5-)13-92(-113) mm high × (2.5-)3-18.4(-24) mm broad; stromatal surface roughened with wrinkles, blackish brown to fuscous black; ostioles more or less papillate to hemispheric; perithecia completely immersed, 500–900 µm diam. Asci 8-spored, 180–230(–250) µm long × 65–8(–10) µm broad, the spore-bearing parts (80–)90–135(–140) µm, with ascus apical rings bluing in Melzer's iodine reagent, urn-shaped to rectangular to inverted hat shape, $(4-)4.5-7(-8) \times (3.5-)4-5$ µm. Ascospores brown, ellipsoid-inequilateral to navicular, with rounded to acute ends, $(17.5-)18-24(-26) \times (5.5-)6-8(-9)$ µm, with straight to slightly oblique germ-slits about ½ spore-length.

Host and Distribution: On undetermined decaying wood, Guilan province, Fouman (GUM1083, 1084, 1087, 1090, 1091, 1107); Rasht (GUM1086, 1098); Guilan province, Roodsar (GUM 1100, 1101, 1102, 1104); on wood of *Fraxinus*sp., Guilan province, Fouman (GUM1082, 1085); on wood of *Alnus* sp., Mazandaran, Noor (GUM1088, 1097); Guilan province, Shaft (GUM1093, 1094, 1095); on wood of *Pterocarya fraxinifolia*, Guilan province, Shaft (GUM1089); Guilan province, Roodsar (GUM1099); on wood of *Quercus* sp.,Guilan province, Shaft (GUM1092, 1096); Guilan province, Rasht (GUM 1112); on wood of *Diospyrus lotus*, Guilan province, Roodsar (GUM1103); on wood of *Parrotia persica*, Guilan province, Rasht (GUM 1105, 1110, 1111); on wood of *Platanus* sp., Guilan province, Fouman (GUM1106); on wood of *Zelkova* sp., Guilan province, Lahijan (GUM1108, 1109).

Molecular data: GUM 1171 (ITS = MF682332); GUM 1172 (ITS = MF682333); GUM 1088 (ITS = MF682334); GUM 1173 (ITS = MF682335); GUM 1089 (ITS = MF682336); GUM 1174 (ITS = MF682337); GUM 1093 (ITS = MF682338); GUM 1099 (ITS = MF682339); GUM 1103 (ITS = MF682340); GUM 1105 (ITS = MF682341); GUM 1106 (ITS = MF682342).

Note: *Xylaria polymorpha*, mainly characterized by extremely variable stromata in shape and size (polymorph stromata). It is the most frequently reported species from temperate regions of the world and is considered as a complex species.

- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.
- Hsieh, H.M., Lin, C.R., Fang, M.J., Rogers, J.D., Fournier, J., Lechat, C. and Ju, Y.M., 2010. Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily

Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution*, 54(3), pp. 957–969.

Rogers, J.D. and Callan, B.E., 1986. *Xylaria polymorpha* and its allies in continental United States. *Mycologia*, 78(3), pp. 391–400.



Xylaria polymorpha: (a) stromata; (b) close-up of rough stromatal surface; (c) ascospores; (d) ascus apical ring bluing in Melzer's reagent. Scale bars = $10 \ \mu m$

Xylaria cf. striata Pat. (1887)

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Classification: Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria

Description: Stromata gregarious on soil, several arising from common base, 44–120 mm long, fertile portion cylindrical, 9–18(–22) × (2–)2.5–3(–4) mm diam, with acute sterile apices; stipe root-like, 70–100 mm long, stromatal surface more or less roughened from whitish to pale peeling outer layer and minute wrinkles; perithecia almost immersed, 0.38–0.56 mm diam; ostioles papillate to slightly papillate. Asci degenerated and not seen; apical ring bluing in Melzer's iodine reagent, rectangular, 3–3.5(–4) × 2(–3) µm. Ascospores (13–)15–19(–22.5) × 5–7(–9) µm, fusiform to ellipsoid, often apiculate at one end when produced on stromata under natural conditions but not apiculate when produced on stromata under laboratory conditions, with straight about 1/3 of spore-length. Anamorph undetermined. Colony growth on fresh OA 12±3.2 mm after 10 d at 20±0.5 °C in 12 h dark/12 h fluorescent light regime. Colonies covering 9 cm of Petri plate in 6–7 wk, at first white then becoming blackish brown at center, margins regular, zonate, with blackish brown furrows with dark and unbranched mature stromata with buff tip. Reverse side with dark furrows and zones.

Host and Distribution: On soil, Guilan province, Lahijan (GUM 1150).

Molecular data: GUM 1150 (ITS = KP218908).

Note: Although, the deeply buried stipe in the soil suggests that the stromata comes from the immersed plant material, no plant material were found at least in 20 cm depth of the soil at sampling site. Ascospores of *X. striata* have always been described as lacking apiculate ends, while spores of the Iranian specimen are often apiculate at one or rarely two ends when produced on stromata under natural conditions. They are, however, not apiculated when produced on stromata in culture. Phylogenetic analysis of ITS sequences showed that *X.cf. striata* was close to *X. striata* (GU300089) with high bootstrap support value.

- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.
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Xylaria cf. *striata*: (a) gregarious stromata on soil; (b) stromata with long rooting base; (c) close-up of stromatal surface with whitish to buff color peeling outer layer; (d) stromata produced on OA with drops of ascospores logged from mature perithecia; (e) mostly papillateascospores produced on stromata from natural conditions; (f) not apiculatedascospores produced on stromata in OA; (g) rectangular apical ring bluing in Melzer's iodine reagent; (h, i) front and reverse sides of colony on OA after 44 days at 20 ± 0.5 °C in 12/12 h D/L regime, respectively. Scale bars = $10 \mu m$

Xylaria xylarioides (Speg.) Hladki& A.I. Romero, Fungal Diversity 42: 86 (2010)

A. Hashemi

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Synonyms: *Hypoxylon xylarioides* Speg., Anales de la SociedadCientífica Argentina 9 (4): 179 (1880); *Kretzschmaria xylarioides* (Speg.) Sacc., Sylloge Fungorum 2: XXIX (1883)

Classification: *Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Xylariomycetidae, Xylariales, Xylariaceae, Xylaria*

Description: Stromata solitary or in small groups, $2-8.3 \times (0.7-)1.1-1.5(-1.8)$ mm, fertile region cylindrical, subglobose to conical, $1.4-2.9(-3.2) \times (0.7-)1.1-1.5(-1.8)$ mm, with acute sterile apices, stromatal surface, dark, roughened with perithecial contours, with brown peeling outer layer. Stipe short $(0.1-)0.4-1.7(-5.4) \ 0 \times 0.2-0.7$ mm. Perithecia 0.56-0.67 mm diam. Ostioles inconspicuous to minutely papillate. Asci 8-spored, $173-183(-203) \times 7.5$ µm, the spore-bearing part 117-127 µm, with apical ring bluing in Melzer's iodine reagent, rectangular, $(5-)6 \times (2.5-)2.8-3$ µm. Ascospores $(16.5-)18-21(-21.5) \times 6.5-8(-9.5)$ µm, brown, ellipsoid inequilateral, with straight nearly spore-length germ-slit.

Host and Distribution: On wood of unknown dicotyledonous plant, Guilan province, Astara (GUM 1151).

Molecular data: GUM 1151 (ITS = KP218909).

Note: *Xylaria xylarioides* has been recently segregated from *X. apiculata. Xylaria xylarioides* differs from *X. apiculate* mainly in stromatal surface, ascospore size and shape. *Xylaria apiculate* has smooth stromatal surface with completely immersed perithecia, larger ascospores, $(16.0-)20-24.5(-30) \times (5.0-)6.7-8.0(-9.0) \mu m$ with occasionally an inconspicuous cellular appendage on one end while *X. xylarioides* has roughened stromatal surface with conspicuous perithecial outlines, $17-21 \times 6.5-9 \mu m$ and not appendiculate ascospores.

- Hashemi, S.A., Khodaparast, S.A., Zare, R. and Elahinia, S.A., 2014. Contribution to the identification of *Xylaria* species in Iran. *Rostaniha*, 15(2), pp. 153–166.
- Hladki, A.I. and Romero, A.I., 2010. A preliminary account of *Xylaria* in the Tucuman Province, Argentina, with a key to the known species from the Northern Provinces. *Fungal Diversity*, 42(1), pp. 79–96.



Xylaria xylarioides: (a) stromata on wood; (b, c) close-up of stromatal surface with perithecial counters and with short to very short stipe; (d) ascospores; (e) ascus apical ring bluing in Melzer's iodine reagent. Scale bars = $10 \mu m$

Taxon	Order	Phyllum/Class	Page
Aspergillus aurantiobrunneus	Eurotiales	Ascomycota: Eurotiomycetes	66
A. calidoustus	Eurotiales	Ascomycota: Eurotiomycetes	68
A. flavipes	Eurotiales	Ascomycota: Eurotiomycetes	70
A. iizukae	Eurotiales	Ascomycota: Eurotiomycetes	72
A. insuetus	Eurotiales	Ascomvcota: Eurotiomvcetes	74
A. iranicus	Eurotiales	Ascomycota: Eurotiomycetes	76
A. kassunensis	Eurotiales	Ascomycota: Eurotiomycetes	79
A. osmophilus	Eurotiales	Ascomycota: Eurotiomycetes	81
A. proliferans	Eurotiales	Ascomycota: Eurotiomycetes	84
A. quadrilineatus	Eurotiales	Ascomycota: Eurotiomycetes	87
A. urmiensis	Eurotiales	Ascomycota: Eurotiomycetes	89
Arthrobotrys oligosporus	Orbiliales	Ascomycota: Orbiliomycetes	177
Barriopsis iraniana	Botryosphaeriales	Ascomycota: Dothideomycetes	9
Cladosporium cladosporioides	Cladosporiales	Ascomycota: Dothideomycetes	36
C. halotolerans	Cladosporiales	Ascomycota: Dothideomycetes	38
C. herbarum	Cladosporiales	Ascomycota: Dothideomycetes	40
C. macrocarpum	Cladosporiales	Ascomycota: Dothideomycetes	42
C. oxysporum	Cladosporiales	Ascomycota: Dothideomycetes	44
C. perangustum	Cladosporiales	Ascomycota: Dothideomycetes	46
C. pseudocladosporioides	Cladosporiales	Ascomycota: Dothideomycetes	48
C. sphaerospermum	Cladosporiales	Ascomycota: Dothideomycetes	50
C. tenuissimum	Cladosporiales	Ascomycota: Dothideomycetes	52
Caudospora iranica	Diaporthales	Ascomycota: Sordariomycetes	58
Ca. taleola	Diaporthales	Ascomycota: Sordariomycetes	61
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Ce. beticola	Mycosphaerellales	Ascomycota: Dothideomycetes	124
Ce. chenopodii	Mycosphaerellales	Ascomycota: Dothideomycetes	126
Ce. convolvulicola	Mycosphaerellales	Ascomycota: Dothideomycetes	128
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Ce. cylindracea	Mycosphaerellales	Ascomycota: Dothideomycetes	132
Ce. iranica	Mycosphaerellales	Ascomycota: Dothideomycetes	134
Ce. pseudochenopodii	Mycosphaerellales	Ascomycota: Dothideomycetes	136
Ce. rumicis	Mycosphaerellales	Ascomycota: Dothideomycetes	138
Ce. solani	Mycosphaerellales	Ascomycota: Dothideomycetes	140
Ce. sorghicola	Mycosphaerellales	Ascomycota: Dothideomycetes	142
Ce. violae	Mycosphaerellales	Ascomycota: Dothideomycetes	144
Ce. zebrina	Mycosphaerellales	Ascomycota: Dothideomycetes	146
Chaetomium grande	Sordariales	Ascomycota: Sordariomycetes	187
Ch. interruptum	Sordariales	Ascomycota: Sordariomycetes	189
Ch. iranianum	Sordariales	Ascomycota: Sordariomycetes	191
Ch. rectangulare	Sordariales	Ascomycota: Sordariomycetes	193
Ch. truncatulum	Sordariales	Ascomycota: Sordariomycetes	195
Ch. undulatulum	Sordariales	Ascomycota: Sordariomycetes	197
Coniocessia anandra	Xylariales	Ascomycota: Sordariomycetes	200
Co. cruciformis	Xylariales	Ascomycota: Sordariomycetes	202
Co. minima	Xylariales	Ascomycota: Sordariomycetes	204
Co. nodulisporioides	Xylariales	Ascomycota: Sordariomycetes	206
Conidiocarpus guilanensis	Capnodiales	Ascomycota: Dothideomycetes	26
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Cr. rabenhorstii	Xylariales	Ascomycota: Sordariomycetes	217
Cryptosphaeria pullmanensis	Xylariales	Ascomycota: Sordariomycetes	213
Daldinia caldariorum	Xylariales	Ascomycota: Sordariomycetes	219
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Da. gelatinoides	Xylariales	Ascomycota: Sordariomycetes	224
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Di. macrospora	Xylariales	Ascomycota: Sordariomycetes	234
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Pyricularia grisea	Magnaporthales	Ascomycota: Sordariomycetes	115
Py. oryzae	Magnaporthales	Ascomycota: Sordariomycetes	117
Quaternaria quaternata	Xylariales	Ascomycota: Sordariomycetes	261
Ramularia glennii	Mycosphaerellales	Ascomycota: Dothideomycetes	165
R. mali	Mycosphaerellales	Ascomycota: Dothideomycetes	167
R. taleshina	Mycosphaerellales	Ascomycota: Dothideomycetes	169
R. uredinicola	Mycosphaerellales	Ascomycota: Dothideomycetes	171
Rhytidhysteron hysterinum	Patellariales	Ascomycota: Dothideomycetes	179
Rosellinia corticium	Xylariales	Ascomycota: Sordariomycetes	263
Sarocladium subulatum	Hypocreales	Ascomycota: Sordariomycetes	95
Scorias spongiosa	Capnodiales	Ascomycota: Dothideomycetes	28
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Thyronectria austroamericana	Hypocreales	Ascomycota: Sordariomycetes	97
Volutella citrinella	Hypocreales	Ascomycota: Sordariomycetes	99
Xylaria arbuscula	Xylariales	Ascomycota: Sordariomycetes	266
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X. filiformis	Xylariales	Ascomycota: Sordariomycetes	270
X. flabelliformis	Xylariales	Ascomycota: Sordariomycetes	272
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X. longipes	Xylariales	Ascomycota: Sordariomycetes	276
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X. cf. striata	Xylariales	Ascomycota: Sordariomycetes	284
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kbar	-1957 ,Khodaparast, Seyed Akbar
عنوان و نام یدیدآور :	:
	Color atlas of Iranian fungi[Book]/ seved Akbar Khodaparast, Bita
	Asgari, Mounes Bakhshi: scientific literary editor Saeed hirzadian.
مشخصات نشر : رشت:	: رشت: دانشگاه گیلان، ۲۰۲۱ = ۲۰۲۲م.
مشخصات ظاهری : ج.: مص	:ج.: مصور(رنگی)؛ ۲۲ × ۲۹ سم.
92-4 _: شابک	978-600-153-292-4 _.
وضعيت فہرست نويسی : فيپا	: فيپا
يادداشت : زبان: ا	: زبان: انگلیسی.
يادداشت : عنوان	: عنوان به فارسی: اطلس رنگی قارچهای ایران.
آوانويسي عنوان : كالر	: كالر
موضوع : قارچھا	:قارچها –– ایران–– اطلسها
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شناسه افزوده : دانشگا	:دانشگاه گیلان
رده بندی کنگره ۱۴۰۱ ا	الفه خf/ QKs.۹
رده بندی دیویی داد ۱۹۵۵	۵۷۹/۵۰۹۵۵ :
شمارہ کتابشناسی ملی 🛛 : ۹۷۴۳	AA99YFT :

مرکز نشر دانشگاه گیلان

اطلس رنگی قارچهای ایران	:	نام کتاب
دکتر سیّداکبر خداپرست، دکتر بیتا عسگری، دکتر مونس بخشی	:	گردآورندگان
دکتر سعید شیرزادیان	:	ویراستارعلمی و
		ادبی
اول، ۱٤۰۱	:	نوبت چــاپ
مرکز نشردانشگاه گیـلان	:	ناشــر
۱۰۰۰ جلد	:	شــمارگان

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* هر گونه چاپ و تکثیر صرفاً در اختیار مرکز نشر دانشگاه گیلان است.*



اطلس رنگی قارچهای ایران ج۱

تدوین به (شیوه گردآوری): دکتر سیّد اکبر خداپرست استاد دانشکده علوم کشاورزی دانشگاه گیلان دکتر بیتا عسگری خسروشاهی استادیار پژوهش موسسه تحقیقات گیاهپزشکی کشور دکتر مونس بخشی کزج استادیار پژوهش موسسه تحقیقات گیاهپزشکی کشور

> مرکز نشر دانشگاه گیلان ۱۴۰۱