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**TWO NEW *ZWACKHIOMYCES*
(*XANTHOPYRENIACEAE*, *ASCOMYCOTA*)
SPECIES OF LICHENICOLOUS FUNGI FROM
ESFAHAN PROVINCE, IRAN**

Key words: lichenicolous fungi, Zwackhiomyces,
Xanthopyreniaceae, Iran

Introduction

There are hitherto only data on twenty one lichen species of the genera *Acarospora* A. Massal., *Aspicilia* A. Massal., *Caloplaca* Th. Fr., *Candelariella* Müll. Arg., *Collema* Web., *Glypholecia* Nyl., *Lecidea* Ach. & A. Massal., *Lobothallia* (Clauzade & Cl. Roux) Hafellner, *Physcia* (Schreb.) Michaux, *Polysporina* Vezda, *Rhizoplaca* Zopf, *Rusavskia* S.Y. Kondr. & Kärnefelt, *Sarcogyne* Flot., *Toninia* A. Massal., and *Verrucaria* Wigg. em. Th. Fr., found in the Esfahan Province of Iran [5, 6].

During our special study of recent collection of lichens and lichenicolous fungi from Mooteh Wildlife Refuge and Karkas Hunting-Prohibited Region of the Esfahan Province of Iran, a number of new taxa as well as some rather common but not mentioned in the Iran Checklist taxa were found.

Mooteh Wildlife Refuge (hereafter Mooteh), which is located about 200 km south of Tehran, about 85 km north of Esfahan City, between Meymeh and Delijan settlements, along the Teheran-Esfahan highway 5, with the total area ca. 205302 ha, was created in 1990, while it was a protected area since 1964. Mooteh is characterized by very dry climate (yearly rainfall ca. 275 mm and average temperature 12°C), and situated in the range 1500—2900 m alt.

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Karkas Hunting-Prohibited Region (hereafter Karkas) is located about 250 km south of Tehran and about 80 km north of Esfahan City, to the east of suburbs of Natanz settlement, along the Teheran-Yezd highway 7. Karkas, with its total area ca. 92 100 ha, has the protected area status since 1980. It is characterized by a wider range of altitudes (1389—3880 m alt.) and rainfall (between 153 and 328 mm per year) and lower average temperature (2.1 °C).

The objective of this article is to provide diagnoses of two new for science taxa of lichenicolous fungi of the genus *Zwackhiomyces*, *Z. esfahanensis* and *Z. zareii* (Xanthopyreniaceae, Pyrenulales, Ascomycota), associated with *Protoparmeliopsis garovaglii* (Körb.) S.Y. Kondr. and *Rhizoplaca melanophthalma* (DC.) Leuckert, consequently, as well as to report localities of new species for Iran and Isfahan Province.

Materials

An extensive collection of lichens (more than 500 field packets) in Mooteh and Karkas of the Esfahan Province of Iran was done by B. Zarei-Darki and S.J. Khajeddin in cooperation with some colleagues of Natural Resources Faculty of Esfahan University of Technology during 2010. Further specimens from the *KW-L* collection (i.e. some recent collections from Kazakhstan, Uzbekistan and Tajikistan) of other members of the genera treated in this paper were included in the comparative study.

Results

Preliminary results of identification of the material collected show the high species diversity of both lichen-forming and lichenicolous fungi in the mentioned areas. Consequently, a number of lichen taxa, i.e. *Arthonia epiphyscia* Nyl., *A. hawksworthii* Halici, *Caloplaca intrudens* H. Magn., *C. scrobiculata* H. Magn., *Opegrapha romsae* S.Y. Kondr. & Kudratov, *Protoparmeliopsis* cf. *laatokkaensis* (Rasanen) Moberg & R. Sant., *Xanthoparmelia loxodes* (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch, and *Zwackhiomyces coepulonus* (Norman) Grube & R. Sant., are for the first time recorded for Iran.

The lichen-forming and lichenicolous fungi *Arthonia molendoi* (Heufl. ex Frauenf.) R. Sant., *Caloplaca decipiens* (Ach.) Blomb. & Forssell, *C. mogoltanica* S.Y. Kondr. & Kudratov, *C. trachyphylla* (Tuck.) Zahlbr., *C. xantholyta* (Nyl.) Jatta, *Protoparmeliopsis garovaglii* (Körb.) S.Y. Kondr., *P. muralis* (Schreb.) M. Choisy, and *Muelleriella pygmaeum* (Körb.) D. Hawksw. are for the first time recorded for the Esfahan Province [4].

New Taxa

***Zwackhiomyces esfahanensis* S.Y. Kondr. & B. Zarei-Darki sp. nova**

Zwackhiomyces species lichenicola isnsignis peritheciis semi-immersis ad superficialibus globosis 100—150(200) μm diam., ascis (1-2-)4-sporis 72—84 \times 9.5—11.0 μm , ascosporis 0-1-septatis levibus (24)29—34(36) \times (5)6—7 μm .

Type: Iran: Esfahan Province, about 250 km to the south of Tehran and about 80 km to the north of the Esfahan City, to the E of suburbs of Natanz settlement, Karkas

Hunting-Prohibited Region, to the south of Abdaraz farm and 6 km to NE of Kalherud village, 51°36'58"E 33°24'38"N, 2530 m alt., community with *Malva sylvestris* L. var. *sylvestris*, *Bromus tectorum* L., *Valeriana cymbicarpa* C.A. Mey., *Amygdalus communis* L., on rocks, on thallus of *Protoparmeliopsis garovaglii* (Körb.) S.Y. Kondr., 19.IV.2010 B. Zarei-Darki (1333), S.J. Khajeddin et al. (*KW-L* — holotype).

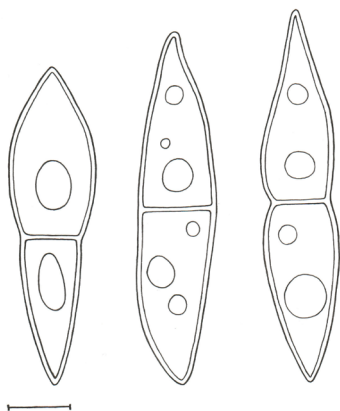


Fig. 1. Ascospores of *Zwackhiomyces esfahanensis* S.Y. Kondr. & B. Zarei-Darki. Scale 5 μ m

Diagnosis:

Ascomata perithecioid, from entirely sunked when young to half-immersed, black to black aeruginose, pyriform or rarely spherical, 100—150(200) μ m in diam., pigment extracellular, the wall in K- or more blackish grey, centrum with oil droplets. Paraphyses present, linear, branched, with oil droplets, 1.2—2.0 μ m thick; asci cylindrical, K/I-, all apically slightly thickened, (1-2-)4-spored, 72—84 \times 9.5—11.0(12.0) μ m; ascospores 1(-2) seriate, hyaline, 0- 1- septate, smooth-walled, (24)29—34(36) \times (5)6—7.0(7.2) μ m, cells usually with 1—2 guttules equal or one somewhat larger and wider, as with distinct constriction at the septum, as widely fusiform (and without constriction). Conidiomata unknown.

Host: *Protoparmeliopsis garovaglii* (Körb.) S.Y. Kondr. (thallus and especially in apothecia).

Distribution: It is so far known from two collections from distant localities in Karkas protected area of Esfahan Province of Iran.

Taxonomic notes: *Zwackhiomyces esfahanensis* is similar to *Z. physciicola* Alstrup but differs in having 4-spored asci, much shorter ascospores and in forming sometimes somewhat cecidonii-like galls on host thallus of *Protoparmeliopsis garovaglii*.

A key to the species of *Zwackhiomyces* has recently been published by Calatayud et al. [1], which should be complemented by additional four taxa (see [2, 3]).

When comparing new species *Zwackhiomyces esfahanensis* with the species of the genus *Zwackhiomyces* on macrolichens (couplets 17—22 in the key [1]), the following two species must be checked: *Zwackhiomyces kantvilasii* S.Y. Kondr., which differs in having larger pseudothecia (140—200 vs. 100—150 μ m in diam. in *Z. esfahanensis*), in having mainly 6-spored asci, and much shorter and narrower ascospores (14.5—18.0

× 3.5—5.5 vs. 29—34 × 6—7 μm in *Z. esfahanensis*), and in growing on *Parmotrema perlatum*; and *Zwackhiomyces physciicola* Alstrup which differs in having 4-6 spored asci (vs. (1-2)-4-spored in *Z. esfahanensis*) and having much shorter and narrower ascospores (18—22 × 5.5—6.5 vs. 29—34 × 6—7 μm in *Z. esfahanensis*) and growing on *Physcia* spp.

When comparing the new species *Zwackhiomyces esfahanensis* with species of the genus *Zwackhiomyces* on crustose lichens (couplets 2—16 in the key mentioned [1]), the following species must be checked: *Zwackhiomyces lecanorae* (Stein) Nik. Hoffm. & Hafellner, which differs in having larger pseudothecia (150—250 vs. 100—150 μm diam. in *Z. esfahanensis*, in having mainly 6-spored asci, in having only simple ascospores (vs. 0—1 septate ascospores in *Z. esfahanensis*), and in growing on species of the *Lecanora dispersa* aggr.; *Zwackhiomyces sphinctrinoides* (Zwackh) Grube & Hafellner and *Z. sphinctriniformis* Grube & Hafellner, both having usually pyriform pseudothecia with the wall composed of a clear inner layer and a dark outer layer as well as strongly or slightly ornamented much smaller ascospores. Furthermore, ascospores in *Z. sphinctrinoides*, growing on *Lecanora campestris* (Schaer.) Hue, are strongly ornamented and much shorter and narrower (16—23 × 4—5 vs. 29—34 × 6—7 μm in *Z. esfahanensis*), and ascospores in *Z. sphinctriniformis*, growing on *Psora lurida* (Ach.) DC., are slightly ornamented and shorter (15.5—23.0 × 4.5—6.5 vs. 29—34 × 6—7 μm in *Z. esfahanensis*); *Zwackhiomyces dispersus* (J. Lahm ex Körb.) Triebel & Grube differs in having much wider asci (14—18 vs. 9.5—11.0 μm wide in *Z. esfahanensis*), much wider ascospores (7—8 vs. 6—7 μm wide in *Z. esfahanensis*), and growing on *Protoblastenia rupestris* (Scop.) J. Steiner; and *Zwackhiomyces berengerianus* (Arnold) Grube & Triebel having wider asci (11—14 vs. 9.5—11.0 μm diam. in *Z. esfahanensis*), much wider ascospores (5—8 vs. 6—7 μm wide in *Z. esfahanensis*), and growing on *Mycobilimbia berengeriana* (A. Massal.) Hafellner & V. Wirth.

Other specimen examined: IRAN: Esfahan Province, about 250 km to S of Tehran, about 80 km to N of the Esfahan City, to the E of suburbs of Natanz settlement, Karkas Hunting-Prohibited Region, to the S of Abdaraz farm and 7 km to the NE of Kalherud village, 51°36'58"E 33°24'38"N, 2530 m alt., community with *Delphinium lanigerum* Boiss. & Hohen., *Melica persica* Kunth, *Pistacia atlantica* Desf., on rocks, on thallus of *Protoparmeliopsis garovaglii*, 15.III.2010 B. Zarei-Darki K2(3), S.J. Khajeddin et al. (TEH).

***Zwackhiomyces zareii* S.Y. Kondr. sp. nova**

Zwackhiomyces species lichenicola insignis peritheciis semi-immersis ad superficialibus globosis (200)250—320 μm diam., ascis (6-)8-sporis 80—105 × 12—13 μm, ascosporis (0)1—(2—3) septatis levibus 24—31(36) × (5)7.0—8.5 μm.

Type: IRAN: Esfahan Province, about 250 km to S of Tehran, about 80 km to N of the Esfahan City, to E of suburbs of Natanz settlement, Karkas Hunting-Prohibited Region, to the NE of Tajrehbala farm, 11 km to the E of Abyaneh settlement, 51°28'12"E 33°36'00"N, 2859 m alt., plant community with *Pseudosedum multicaule* (Boiss. &

Buhse) Boriss., *Bromus tomentellus* Boiss., *Tulipa biflora* Pall., *Euphorbia heteradenia* Jaub. & Spach, on rocks, on *Rhizoplaca melanophthalma*, 02.V.2010 B. Zarei-Darki (2115, 2117—2120), S.J. Khajeddin, Safavi, Barati, Golshahi (2117 *KW* — holotype, 2115 — *TEH* — isotype, 2118 — *UPS* — isotype, 2119 — *H* — isotype, 2120 — *LD* — isotype).

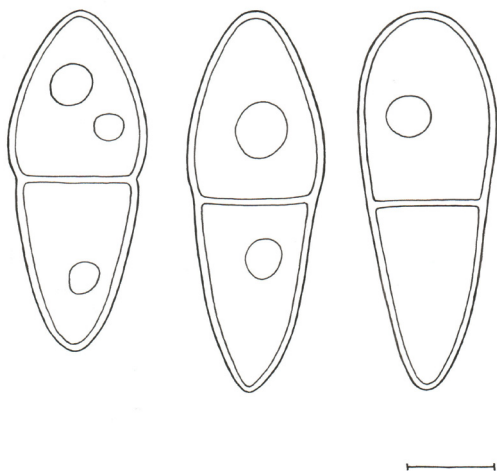


Fig. 2: Ascospores of *Zwackhiomyces zarei* S.Y. Kondr.

Diagnosis:

Ascomata perithecioid, from entirely sunked when young to half-immersed, scattered or aggregated in young healthy host apothecia from 3 to 10 or more, black to black eruginose, spherical or slightly vertically elongated, (180)200—330(380) μm in diam., pale brown to dirty hyaline in the immersed parts, pigment extracellular, wall to 24—30 μm thick [to 36—48 μm at the ostiole* and 16—30 μm at the basis], centrum often with numerous oil droplets to 7(8) μm in diam. Paraphyses present, more or less linear, branched 1.2—2.0 μm thick, often with oil droplets; asci cylindrical, K/I-, all apically slightly thickened, (6)8-spored, (72)80—105(120) \times (11)12—13.0(14.5) μm ; ascospores 1(2) seriate, hyaline, (0)1-(2-3-) septate**, smooth-walled, (19)24—31(36) \times (6.5)7.0—8.5(9.0) μm , cells usually with 1—2 guttules, equal or one somewhat larger and wider, as with distinct constriction at the septum, as widely fusiform (and without constriction). Conidiomata indistinct, to 0.1—0.2 mm in diam., conidia bacilliform, 4—5 \times 0.7—0.8 μm .

* In overmature perithecia upper portion near the ostiole is often broken and only hollows of old perithecia gaped from the host thallus seen, which often seem to be black apothecia with broken margin.

**Only one collection [ZD 3181] with 2—3-septate ascospores was observed within this study, may be it will be recognised as a separate taxon in the future.

Host: *Rhizoplaca melanophthalma* (thallus and sometimes apothecia) and *R. peltata*.

Distribution: It is so far known from numerous collections from a number of distant localities in Esfahan Province of Iran.

Taxonomic notes:

When comparing the new species *Zwackhiomyces zareii* with other *Zwackhiomyces* species on macrolichens (couplets 17—22 in the key of Calatayud et al. [1]), three species must be checked: *Zwackhiomyces coepulonus* (Norm.) Grube & R. Sant., which differs in having smaller pseudothecia (150—250 vs. 200—330 μm diam. in *Z. zareii*), mainly 6-spored asci, shorter ascospores (15—21 \times 5.5—8.5 vs. 24—31 \times 7.0—8.5 μm in *Z. zareii*), and in growing on *Rusavskia elegans* and *Caloplaca* spp., as well as two more species growing on *Peltigera* spp.: *Zwackhiomyces kizskianus* D. Hawksw. & Miądl. having shorter and much wider ascospores (19.5—25.5 \times 8.5—13.0 vs. 24—31 \times 7.0—8.5 μm in *Z. zareii*) and wider asci (14—15.5 vs. 12—13 μm wide in *Z. zareii*) and *Zwackhiomyces peltigeriae* Miądl. & Alstrup having much shorter and narrower ascospores (13—16 \times 3.5—6.0 vs. 24—31 \times 7.0—8.5 μm in *Z. zareii*) and much smaller semi-immersed pseudothecia (170—200 vs. 200—330 μm in diam. and mainly sunked in *Z. zareii*).

When comparing the new species *Zwackhiomyces zareii* with species of *Zwackhiomyces* on crustose lichens (couplets 2—16 in the key of Calatayud et al. [1]), also three species must be checked: *Zwackhiomyces lacustris* (Arnold) Orange, which differs in having smaller (150—250 vs. 200—330 μm diam. in *Z. zareii*), mainly 6-spored asci, much wider ascospores (9—12 vs. 7.0—8.5 μm wide in *Z. zareii*), and growing on *Ionaspis lacustris* (With.) Lutzoni; *Zwackhiomyces dispersus* in having much wider asci (14—18 vs. 12—13 μm wide in *Z. zareii*) and shorter ascospores (17—25 vs. 24—31 μm long in *Z. zareii*), and growing on *Protoblastenia rupestris*; and *Zwackhiomyces berengerianus* having somewhat shorter and narrower ascospores (17—30 \times 5—8 vs. 24—31 \times 7.0—8.5 μm in *Z. zareii*), somewhat wider asci (11—14 vs. 12—13 μm wide in *Z. zareii*) and growing on *Mycobilimbia berengeriana*.

Zwackhiomyces zareii is similar to *Cercidospora epipolytropa* (Mudd) Arnold and *C. macrospora* (Uloth) Hafellner & Nav.-Ros., but differs from both these taxa in having much larger and entirely dark perithecia and much longer and especially wider ascospores.

A number of specimens of *Rhizoplaca melanophthalma* from Esfahan province damaged by lichenicolous fungus determined as *Cercidospora melanophthalma* Hafellner, Nav.-Ros. & Etayo [nom. nudum] will wait for the valid publication of this taxon. *Zwackhiomyces zareii* is also similar to this taxon, but differs from it in having larger ascomata and much wider ascospores.

Other specimens of examined: Iran: Esfahan Province, about 250 km to the south of Tehran, about 80 km to the north of the Esfahan City, to the E of suburbs of Natanz settlement, along the Teheran-Yezd highway 7, Karkas Hunting-Prohibited Region, Varguran village, 6.5 km to the N of Targh settlement, towards Natanz settlement, 51°26'30"E 33°55'51"N, 1970 m alt., community with *Melica persica* Kunth, *Astragalus (malacothrix) mollis* Bieb. *Pistacia atlantica* Desf., on rock, on *Rhizoplaca peltata*, 15.IV.2010 B. Zarei-Darki (975), S.J. Khajeddin, Safavi, Barati,

Golshahi (*TEH*); 1 km to the N of Kesheh village, 51°46'31"E 33°24'24"N, 2550 m alt., community with *Malcolmia africana* (L.) R. Br., *Euphorbia bungei* Boiss., *Nonnea pulla* (L.) DC., *Tulipa biflora* Pall., on rocks, on *Rhizoplaca melanophthalma* growing together with *Rhizoplaca peltata*, 18.IV.2010 B. Zarei-Darki (1202), S.J. Khajeddin, Safavi, Barati, Golshahi (*KW-L*); 1 km to the north of Kesheh village, Natanz settlement, 51°46'31"E, 33°24'24"N, 2550 m alt., community with *Malcolmia africana* (L.) R. Br., *Euphorbia bungei* Boiss., *Nonnea pulla* (L.) DC., *Tulipa biflora* Pall., on rocks, on *Rhizoplaca melanophthalma*, 18.IV.2010 B. Zarei-Darki (1203), S.J. Khajeddin, Safavi, Barati, Golshahi (*UPS*); to the south of Abdaraz farm and 6 km to NE of Kalherud village, 51°36'58"E 33°24'38"N, 2530 m alt., community with *Malva sylvestris* L. var. *sylvestris*, *Bromus tectorum* L., *Valeriana cymbicarpa* C.A. Mey., *Amygdalus communis* L., on rocks, on *Rhizoplaca melanophthalma* and *R. peltata*, 19.IV.2010 B. Zarei-Darki (1335), S.J. Khajeddin, Safavi, Barati, Golshahi (*KW-L*); 8.5 km to the W of Natanz settlement, 51°50'00"E 33°30'00"N, plant community with *Bromus tomentosus* Trin., *Poa bulbosa* L., *Geranium tuberosum* L., *Berberis integririma* Bunge., *Veronica cappillipes* Nevski, *Cicer oxyodon* Boiss. & Hohen., *Lonicera nummulariifolia* Jaub. & Spach, *Tanacetum polycephalum* Schultz-Bip., on rocks, on *Rhizoplaca melanophthalma*, 29.IV.2010 B. Zarei-Darki (1775, 1784), S.J. Khajeddin, Safavi, Barati, Golshahi (*H*); Ghatibala farm, 10 km to the E of Natanz settlement, 51°49'10"E 33°32'56"N, 1846 m alt., plant community with *Astragalus glaucacathus* Fisch., *Arrhenatherum kotschyi* Boiss., *Carduus pycnocephalus* L., *Andrachne telephioides*, *Centaurea iberica* Trev. ex Spreng., *Phalaris minor* Retz., on rocks, on *Rhizoplaca melanophthalma*, 30.IV.2010 B. Zarei-Darki (1937), S.J. Khajeddin, Safavi, Barati, Golshahi (*TEH*); 2 km to the S of Bidhend village, 14 km to the E of Natanz settlement, 51°46'60"E 33°29'20"N, 2465 m alt., plant community with *Descurainia sophia* (L.) Webb. ex Prantl., *Myostis stricta* Link, *Nonnea pulla* (L.) DC., *Hyosyamus pusillus* L., *Adonis aestivalis* L., on rocks, on *Rhizoplaca melanophthalma*, which is also infected by unknown ascomycete, growing together with *Rusavskia* cf. *elegans*, *Melanelia* sp. and *Physcia* sp., 04.V.2010 B. Zarei-Darki (2341, 2342, 2344, 2349), S.J. Khajeddin, Safavi, Barati, Golshahi (*TEH, LD, LE, KW-L*); Varguran village, 6 km to the N of Targh settlement, towards the Natanz settlement, 51°48'52"E 33°24'43"N, 2127 m alt., plant community with *Psychrogeton amorphoglossus* (Boiss.) Novopokr., *Melica persica* Kunth, *Lepidium persicum* Boiss., *Helichrysum polyphyllum* Ledeb., on rocks, on *Rhizoplaca melanophthalma* growing together with *Candelariella* sp., 26.V.2010 B. Zarei-Darki (3181), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*KW-L*) [only here 1(—2—3)- septate ascospores observed]; the same locality, on *Rhizoplaca melanophthalma* growing together with *Rusavskia* cf. *elegans* damaged by *Arthonia molendoi* (Heufl. ex Frauenf.) R. Sant., *Dimelaena oreina* (Ach.) Norman and *Acarospora* sp., 26.V.2010 B. Zarei-Darki (3183), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*UPS*); the same locality, on young lobes of *Rhizoplaca* sp. growing together with *Rhizoplaca peltata*, with *Rusavskia* cf. *elegans* (Link) S.Y. Kondr. & Kärnefelt, *Acarospora* sp. with *Muellerella pygmaea* (Körb.) D. Hawksw. ssp. *pygmaea*, *Caloplaca trachyphylla* (Tuck.) Zahlbr. and *Aspicilia desertorum* (Kremp.)

Mereschk., 26.V.2010 B. Zarei-Darki (3189), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*KW-L*); the same locality, on *Rhizoplaca melanophthalma* growing together with *Aspicilia contorta* aggr. and *Caloplaca trachyphylla* damaged by *Muelleriella pygmaea* ssp. *pygmaea* and *Acarospora stapfiana*, 26.V.2010 B. Zarei-Darki (3190), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*TEH*); the same locality, on *Rhizoplaca melanophthalma* growing together with *Caloplaca* cf. *intrudens* H. Magn., and *Aspicilia* sp., 26.V.2010 B. Zarei-Darki (3191), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*KW-L*); the same locality, on *Rhizoplaca melanophthalma* growing together with *Aspicilia desertorum* (Kremp.) Mereschk. and *Caloplaca* cf. *biatorina* (Trevis.) J. Steiner, 26.V.2010 B. Zarei-Darki (3194, 3204), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*UPS, KW-L*); Varguran village, 7 km to the N of Targh settlement, towards the Natanz settlement, 51°54'39"E, 33°26'41"N, 2005 m alt., plant community with *Bunium persicum* (Boiss.), *Scabiosa olivieri* Coult, *Tanacetum polycephalum* Schultz-Bip, *Allium scabriscapum* Boiss. & Ky, on rocks, 28.V.2010 B. Zarei-Darki (3424), S.J. Khajeddin, Safavi, Barati, Golshahi, Eganeh (*TEH*);

Specimen of *Zwackhiomyces* cf. *sphinctrinoides* (Zwackh) Grube & Hafellner examined: Iran: Esfahan Province, about 250 km to S of Tehran, about 80 km to N of the Esfahan City, to E of suburbs of Natanz settlement, along the Teheran-Yezd highway 7, Karkas Hunting-Prohibited Region, 15 km to N of Soh settlement and about 12 km to W of Abyaneh settlement, 51°27'11"E, 33°35'05"N, 2664 m alt., plant community with *Anemone biflora* DC., *Pseudosedum multicaule*, *Bromus tomentellus* Boiss., *Tulipa biflora* Pall., *Euphorbia heteradenia* Jaub. & Spach., on rock, on *Protoparmeliopsis*, 02.V.2010 B. Zarei-Darki (14), S.J. Khajeddin, Safavi, Naghipur, Jabbari (*KW-L*).

Kazakhstan: Almaty, Botanical garden of Almaty city, forest of *Malus domestica*, on silicate rock outcrops, on *Rhizoplaca* cf. *chloroleuca*, 11.IV.1998 S.Y. Kondratyuk (9802) (*KW-L*).

Specimen of examined:

Kazakhstan: Almaty, Botanical garden of Almaty city, forest of *Malus domestica*, on silicate rock outcrops, on *Rizhoplaca peltata* damaged also by lichenicolous fungus *Lichenocodium lecanorae* (Jaap) D.L. Hawksw., 11.IV.1998 S.Y. Kondratyuk (9802) (*KW-L*).

The first data on lichen-forming and lichenicolous fungi of Mooteh and Karkas protected areas show that species diversity of these groups of fungi is very high and they are in urgent need of further special investigations.

Acknowledgement

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НОВІ ВИДИ ЛІХЕНОФІЛЬНИХ ГРИБІВ РОДУ *ZWACKHIOMYCES* (*XANTHOPYRENIACEAE*, *ASCOMYCOTA*) З ПРОВІНЦІЇ ЕСФАХАН (ІРАН)

Наведено описи, порівняння з близькоспорідненими видами та ілюстрації двох нових для науки видів роду *Zwackhiomyces* (зокрема: *Z. esfahanensis* S.Y. Kondr. & B. Zarei-Darki та *Z. zarei* S.Y. Kondr.). Крім того, вперше для Ірану наведено три види: лишайник (*Caloplaca intrudens* H. Magn.) та два види ліхенофільних грибів (*Zwackhiomyces sphinctrinoides* (Zwackh) Grube & Hafellner і *Zwackhiomyces coepulonus* (Norman) Grube & R. Sant.), а також для провінції Есфахан (один вид лишайника — *Protoparmieopsis garovaglii* (Körb.) S.Y. Kondr. та два види ліхенофільних грибів — *Arthonia molendoi* (Neufl. ex Frauenf.) R. Sant. і *Muelleriella pygmaeum* (Körb.) D. Hawksw.). Три види ліхенофільних грибів (*Zwackhiomyces sphinctrinoides*, *Lichenocodium erodens* M.S. Christ. & D.L. Hawksw. та *L. lecanorae* (Jaap) D.L. Hawksw.) указані вперше для Казахстану.

Ключові слова: ліхенофільні гриби, *Zwackhiomyces*, Xanthopyreniaceae, Іран.

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НОВЫЕ ВИДЫ ЛИХЕНОФИЛЬНЫХ ГРИБОВ РОДА *ZWACKHIOMYCES*
(*XANTHOPYRENIACEAE, ASCOMYCOTA*) ИЗ ПРОВИНЦИИ ЭСФАХАН (ИРАН)

Приведены описания, сравнение с близкородственными видами и иллюстрации двух новых для науки видов рода *Zwackhiomyces* (в частности: *Z. esfahanensis* S.Y. Kondr. & B. Zarei-Darki и *Z. zareii* S.Y. Kondr.). Кроме того, впервые для Ирана приведены три вида (лишайник — *Caloplaca intrudens* H. Magn. и два вида лихенофильных грибов — *Zwackhiomyces sphinctrinoides* (Zwackh) Grube & Hafellner и *Zwackhiomyces coepulonus* (Norman) Grube & R. Sant.), а также для провинции Эсфахан (один вид лишайника — *Protoparmeliopsis garovaglii* (Körb.) S.Y. Kondr. и два вида лихенофильных грибов — *Arthonia molendoi* (Heufl. ex Frauenf.) R. Sant. и *Muelleriella pygmaeum* (Körb.) D. Hawksw.). Три вида лихенофильных грибов (*Zwackhiomyces sphinctrinoides*, *Lichenoconium erodens* M.S. Christ. & D.L. Hawksw. и *L. lecanorae* (Jaar) D.L. Hawksw.) указаны впервые для Казахстана.

К л ю ч е в ы е с л о в а: лихенофильные грибы, *Zwackhiomyces*, *Xanthopyreniaceae*, Иран.