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اطلاعات جدید درباره زنگ‌های ایران

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چکیده

پنج گونه و یک وارثه جدید به شرح زیر برای نخستین بار از ایران به جهان علم معرفی می‌شود: *Uromyces matinii* روی *Gagea dubia*، *Uromyces arasbaranensis* روی *Silene italica*، *Uromyces taleshensis* روی *Colchicum* sp.، *Uromyces kaviriae* روی *Kaviria gossypina*، *Uromyces iranensis* روی *Cirsium rhizocephalum* و *Puccinia calcitrapae* var. *cirsii-rhizocephali* و *Hordeum vulgare* ترکیب جدید *Puccinia suaveolens* var. *karajensis* برای *Puccinia punctiformis* var. *karajensis* روی *Cirsium arvense* و نام‌های *Peristemma sonchicola* و *Uromyces liboschitzii* در جایگاه نام‌های جدید پیشنهاد می‌شود. تعدادی اسامی مترادف جدید و میزبان‌های جدید برای زنگ‌های ایران معرفی و گزارش می‌شود. گونه‌های زنگ *Puccinia aristidae* روی *Stipagrostis plumosa*، *Puccinia hibisci-trioni* روی *Abelmoschus* و *esulentus* و *Alcea* sp. روی *Puccinia marrubii* و *Marrubium crassidens* و *Puccinia tatarica* روی *Mulgedium tataricum*، اعضای جدید برای فلور زنگ‌های ایران گزارش می‌شود. مرحله اسیومی گونه زنگ *Puccinia kopetdaghensis* برای نخستین بار شرح داده می‌شود. کلید شناسایی برای گونه‌های شناخته شده *Uromyces* روی اعضای جنس‌های *Gagea* و *Silene* ارائه می‌شود.

واژه‌های کلیدی: تاکسونومی، قارچ شناسی، Pucciniales، تنوع زیستی، آرایه‌های جدید.



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New Findings on Rust Fungi from Iran

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Abstract

Five new species and a new variety of rust fungi (Pucciniales) are described from Iran: *Uromyces martinii* on *Gagea dubia*, *Uromyces arasbaranensis* on *Silene italica*, *Uromyces taleshensis* on *Colchicum* sp., *Uromyces kaviriae* on *Kaviria gossypina*, *Uromyces iranensis* on *Hordeum vulgare*, and *Puccinia calcitrapae* var. *cirsii-rhizocephali* on *Cirsium rhizocephalum*. *Puccinia suaveolens* var. *karajensis* is proposed as a new combination for *Puccinia punctiformis* var. *karajensis* on *Cirsium arvense*. The following new names are made: *Peristemma sonchicola* and *Uromyces liboschitzii*. Several new synonyms (syn. nov.) for already-known rust species are proposed. Several new hosts (matrix nov.) for different rust fungi are also reported. *Puccinia aristidae* on *Stipagrostis plumosa*, *Puccinia hibisci-trioni* on *Abelmoschus esculentus* and *Alcea* sp., *Puccinia marrubii* on *Marrubium crassidens*, and *Puccinia tatarica* on *Mulgedium tataricum* are reported as new members for Iranian rust mycobiota. The aecial state of *Puccinia kopetdaghensis* is newly described. Identification keys for world-known *Uromyces* species on the genera *Gagea* and *Silene* are provided.

Keywords: Taxonomy, Mycology, Pucciniales, Biodiversity, New Taxa.

Introduction

Urediniology in Iran is 160 years old now. The starting point of studying the rust fungi in the country is the report of *Puccinia asparagi* on *Eremurus velutinus* Boiss. & Buhse made by Buhse (1860). Of course, Buhse chose the wrong name for the *Eremurus* rust which was described as *P. eremuri* by Komarov 35 years later (Abbasi, 2020). Since 1860, many Iranian and foreign botanists and mycologists have studied the rust fungi of Iran. All these efforts around urediniology have been summarized in previously-published papers by the author (Abbasi, et al. 1996; Abbasi, 2001; Abbasi, 2003) and in a recently published book about the biodiversity of rust fungi in Iran (Abbasi, 2020). The result of this longitudinal study on rust fungi leads to the introduction of 659 rust taxa from Iran.

Material and Methods

The materials used in the present study were mainly those collected by the author or members of the department of botany at the Iranian Research Institute of Plant Protection, Tehran, during the last 30 years. Some specimens were also herbarium samples from the University of Tehran Fungal Herbarium (UTFH) and the herbarium of the Ministry of Agriculture (Iran) sitting on those herbaria for a long time. Concerning the methodology of the research, all rust-infected specimens were studied by stereomicroscope prior to the study by microscope. The sori structure, shape and color, and the infection pattern were studied under the stereomicroscope. All microscopic slides were made by looking at the rust sori under the stereomicroscope. In this case, having dirt and dust on the slides could be prevented, and making slides from uredinia and telia separately was easily possible. In some cases, especially to see sori anatomy or to deal with covered telia, a surgery blade was used to make several cross-sections from sori by hand again under the stereomicroscope. Different mounting media were used for slide preparation including Lactophenol, Lactic acid in glycerol, and distilled water. Lactophenol was the best to get a clear view of rust spores under the microscope and most of the spores could quickly provide full turgor by using this montant. However, for some specimens (i.e. most of asteraceous rusts), even by using lactophenol, getting to full turgor was hard. Water was used for those specimens which were perfect to get full turgor quickly. A small amount of spores was put on each slide and boiled very gently. For this reason, most of the spores, especially urediniospores, were located in the side view. All measurements were made in water. Fifty spores were randomly measured in each case and measuring shrinking spores or those that were not on the side view was avoided. To study the spore wall ornamentation and the number and arrangement of germ pores, microscopic preparations made in lactophenol and slides were studied using Differential Interference Contrast (DIC) and microscopy (BH2 Olympus compound microscope). To describe morphological features, the terminology proposed by Cummins and Hiratsuka (2003) and Kirk et al. (2008) was followed. All photomicrographs were taken at 400x or 1000x with a Dino-Eye Eyepiece Camera using DinoCapture 2.0 software (AnMo

Electronics Corporation, Taiwan). The studied materials have been deposited at the Ministry of Agriculture (Iran) and the University of Tehran (UTFH) herbaria.

Results and Discussions

Coleosporium tussilaginis (Pers.) Tul., *Annls Sci. Nat., Bot., sér. 4 2*: 136 (1854), emend. U. Braun (1981).

Syn: *Coleosporium petasitis* (DC.) de Bary, *Microscopic fungi*: 213 (1865).

On *Petasites hybridus* (L.) "G. Gaertn., B.Mey. & Scherb." (Asteraceae), Golestan province, Deraznow area, 2017, leg. M. Bakhshi (IRAN17416F), (II)+III.

Urediniospores $22.5-30 \times 17.5-20 \mu\text{m}$, globoid, ellipsoid or oblong, wall colorless, 1.5-2 μm thick, densely verrucose, verrucae rod-shaped, 1-1.5 μm high. Teliospore wall up to 13 μm thick at the apex. *Petasites hybridus* is a new host for *C. tussilaginis* in Iran. Recently, the aecial state of *C. tussilaginis* has been reported from Golestan province on *Pinus eldarica* Medw. (Abbasi et al., 2018).

Melampsora helioscopiae (Pers.) G. Winter, *Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.1*: 240 (1881) [1884]

On *Euphorbia kopetdaghi* (Prokh.) Prokh. (Euphorbiaceae), Golestan province, Golestan national park, Almeh bifurcation towards Sulgerd, 22 VI 1993, leg. Termeh et al. (IRAN47320/2), II.

Uredinia amphigenous is small, round scattered on the leaf surface. Urediniospores obovoid, ellipsoid and more or less globose (angular spores also present), $18.5-28.5 \times 16-20 \mu\text{m}$, wall 2-2.5 μm thick, finely and densely echinulate, spines 1 μm apart. Uredinial paraphyses mostly capitate, the diameter of the head is 16-24 μm , wall 2.5-4.5 μm thick sometimes slightly thicker at apex up to 6.5 μm . This specimen named as *M. helioscopiae* based on the shape of paraphyses and urediniospores with 2-2.5 μm wall thickness. *Euphorbia kopetdaghi* (sect. *Pithyusa*) is a new host for *M. helioscopiae*. There is at least one known record of the above rust on the sect. *Pithyusa* viz. *E. glareosa* Pall. ex M. Bieb was reported by Gauemann (1959). Recently, Ali et al. (2016) described *M. pakistanica* on *E. helioscopia* from Pakistan. Judging from the protologue of what they have seen is probably *M. helioscopiae* which is quite common on this widely distributed host species from Europe to western Asia. They have not compared their Pakistani specimens with authentic European specimens of *M. helioscopiae* morphologically and molecularly. Moreover, the description is not accurate, that is, urediniospore features are mentioned as "spore surface evenly echinulate, with spine distance of 3-7 μm " which is absolutely wrong. SEM pics clearly show dense echinulation on the spore surface with echinulae less than 3 μm apart. The presence of thick-walled urediniospores (wall up to 4 μm thick) and teliospores (wall up to 4.5 μm thick) can not be confirmed from the provided poor photomicrographs. They have also considered *M. occidentalis* and *M. medusa* as *Euphorbia* rust which is another piece of wrong information provided by them.

Peristemma sonchicola M. Abbasi, **nom. nov.** – MycoBank MB 838145

Replaced synonym: *Uredo sonchi* Schumach., Enum. pl. (Kjbenhavn) 2: 229 (1803)

Other synonyms:

Aecidium sonchi Westend., Bull. Acad. R. Sci. Belg., Cl. Sci., sér. 2 12: no. 6 (1857)

Miyagia pseudosphaeria (Mont.) Jørst., Nytt Mag. Bot. 9: 78 (1962) [1961] [Nom. inval., Art. 41.1 (Shenzhen code)]

Peristemma sonchi (Roberge ex Desm.) Syd., Anns mycol. 19(3-4): 175 (1921)

Peristemma pseudosphaeria (Mont.) Jørst., Friesia 5(3-5): 278 (1956)

Puccinia pseudosphaeria Mont., in Webb & Berthelot, Hist. nat. Iles Canar. (Paris) 3(2): 89 (1840)

Puccinia sonchi Roberge ex Desm., Anns Sci. Nat., Bot., sér. 3 11(2): 274 (1849)

The *Sonchus* rust has been attributed to different rust genera including *Aecidium*, *Uredo*, *Puccinia*, *Miyagia* and *Peristemma*. The fungus is mostly known as a *Puccinia* species among literature and has typical uredinia and telia which both have been surrounded by one layer of dark brown paraphyses in the upper part consisting of swollen tips and are more or less free. Sydow (1921) considered the fungus close to the genus *Miyagia*. However, he pointed out that peridium-like structures around uredinia and telia show some differences with type species of *Miyagia* viz. *M. anaphalidis* Miyabe. For this reason, he established a new genus *Peristemma* based on a previously known species *Puccinia sonchi* Roberge ex Desm., 1849. Jørstad (1956) reviewed nomenclatural history for *Sonchus* rust and established another combination to name this rust viz. *Peristemma pseudosphaeria* based on an older basionym *Puccinia pseudosphaeria* Mont., 1840. Jørstad (1956) did not mention *Uredo sonchi* Schumach, 1803 among his list of synonymy which is definitely the oldest name attributed to *Sonchus* rust. As clarified by Sydow (1921) and Jørstad (1956), considering *Sonchus* rust under the name *Miyagia* is not supported. Moreover, the name *Miyagia pseudosphaeria* established by Jørstad (1962) is Nom. inval. [Art. 41.1 (Shenzhen code)]. *Sonchus* rust was kept under the genus *Peristemma* in this study and a new combination based on *Uredo sonchi* which is the oldest name for the fungus, was made. As the combination *Peristemma sonchi* (Roberge ex Desm.) Syd., is already occupied, a new name *Peristemma sonchicola* is therefore proposed.

Phragmidium potentillae (Pers.) P. Karst., Bidr. Känn. Finl. Nat. Folk 31: 49 (1878)

Syn.: *Phragmidium hendersonii* Bahç. & Kabakt., Mycotaxon 93: 327 (2005) (syn. nov.)

On *Potentilla hirta* L. (Rosaceae), Golestan province, Golestan National Park, Almeh, 19 VII 1991, leg. Abbasi & Fatehi, (IRAN10422F); (II)+III

On *Potentilla* sp. (Rosaceae), Mazandaran province, Nava, 22 VIII 1968, leg. Shahidi & Navaie (46-19UTFH)

Judging from description of *Ph. hendersonii* provided by Bahcecioglu, Kabaktepe, and Yildiz (2005). This new taxon differs from *Ph. potentillae* in having up to 7 celled teliospores with a bigger size. They have also considered 1 (rarely 2) germ pores in each teliospore cell. First of all, the number of germ pores in the genus *Phragmidium* is 2 or usually 3 in each cell (Cummins & Hiratsuka 2003) which clearly shows what Bahcecioglu et al. (2005) described germ pores, is not

appropriate. Studying two above Iranian specimens on *Potentilla* spp., also showed up to 6 celled teliospores in sori. Interestingly, 6 celled teliospores were missing in some sori and present in others on the same specimen (i.e. specimen no. 46-19). In addition, data about the number of teliospore cells and dimensions in *Ph. potentillae* among literature were reviewed (Table 1). Table 1 clearly shows overlapping of *Ph. hendersonii* features with those of *Ph. potentillae*. Thus, *Ph. hendersonii* is considered as a synonym of *Ph. potentillae* here. These results are in accordance with those obtained by Wei (1988) who found that the number of teliospore cells should not be taken as a basis to separate *Ph. potentillae* into different species.

Table 1. Comparison of Morphological Features between *Phragmidium Hendersonii* and *Ph. Potentillae*

<i>Phragmidium</i> species	Urediniospores Spore size μm / wall thickness μm	Teliospores spore size μm / cell number / pedicel length μm	Reference
<i>Ph. hendersonii</i>	18-30 \times 16-20 / 1-2	44-110 \times 20-26 / (2)3-7 / up to 220	Bahcecioglu <i>et al.</i> (2005)
	20-26 \times 16-20 / 1.5	43-80 \times 21-26 / (2)3-6 / up to 150	Majewski (1977)
<i>Ph. potentillae</i>	18-29 \times 15-25 / 1.5-2	35-110 \times 22-30 / 2-7 / 40-170	Kuprevich & Ulyanishchev (1975)
	17-28 \times 13-25 / 1.2-2	32-108 \times 18-30 / 1-7, mostly 5-6 / 60-240	Gaeumann (1959)
<i>Ph. potentillae</i> IRAN10422F	—	45-100 \times 25-32.5 / (3)4-6 / up to 200	Current study
<i>Ph. potentillae</i> 46- 19UTFH	23-30 \times 15-19 / 1.5	37.5-95 \times 27.5-30 / (1) 3-6 / up to 125	Current study

Puccinia aeluropodis Ricker [as 'aeluropi'], J. Mycol. 11(3): 114 (1905)

On *Aeluropus littoralis* (Gouan) Parl. (Poaceae), Persian Gulf, Lavan Island, 5 V 2002, leg. M. Amini-Rad (IRAN38042P), III.

Few telia were present on both sides of the infected leaves. These sori were black, oblong, pulvinate, and more or less compact. Teliospores were mostly broadly obovoid or broadly ellipsoid with round apex. Mesospores were also present. This is common to see population of *P. aeluropodis* in Sothern Iran with mostly broadly ellipsoid or broadly obovoid teliospores (see Abbasi & Minassian, 2005). The rust is widely distributed from N. Africa east to Siberia, India and China (Gjaerum, 1986). However, this is the first report of the rust species from one of the Persian Gulf Islands.

Puccinia aethionematis Koshk., Notul. syst. Sect. cryptog. Inst. bot. Acad. Sci. U.S.S.R. 14: 126 (1961)

On *Thlaspi maassoumii* Mozaff. (Brassicaceae), Zanjan province, Gheidaar, 3 VII 1974, leg. Termeh & Moussavi (IRAN2524F), III.

The rust species originally described from Turkmenistan on *Aethionema sagittatum* Boiss. The fungus has been previously reported on *Aethionema trinervium* (DC.) Boiss., from Iran (Abbasi, 2004). To the best of our knowledge, this is the first report of the rust species on the genus *Thlaspi*. Moreover, *T. massoumii* is a new host (matrix nova) for rust. *Puccinia thlaspeos* Ficinus & C.

Schub., other reported rust on the genus *Thlaspi*, differs from *P. aethionematis* in having larger teliospores (30-50 μm vs 32-44 μm) with a yellowish wall.

Puccinia arenariae (Schumach.) J. Schröt., Hedwigia 19: 38 (1880)

Syn. *Puccinia herniariae* Unger

On *Herniaria incana* Lam. (Caryophyllaceae), Mazandaran province, Chalus valley, Pol-e Zangouleh, 10 VII 1956, leg. Sabeti, III (IRAN4693P)

This leptoform rust has hypophyllous telia which were reddish-brown, exposed, elliptic, compact, and pulvinate. These sori were mostly in groups confluent with each other, sometimes in a circle around a central sorus. Teliospores were fusoid, ellipsoid, or clavate, 27.5-45 \times 12.5-17.5 μm , rounded or pointed above, slightly to visibly constricted at the septum, wall pale yellow to light yellowish-brown, smooth, about 1.5 μm thick at sides and up to 7.5 μm at the apex (Fig. 1). The rust on *Herniaria* is generally referred to *P. herniariae*. Above rust, the specimen was compared with authentic material of *P. arenaria* on its type host *Moehringia trinervia* (L.) Clairv., from Lower Austria (F. Petrak Mycoteca generalis no. 845). Both specimens were indistinguishable and similar. This comparison convinced the author to consider *P. herniariae* as a synonym of *P. arenariae* as also considered by some other uredinologists (i.e. Wilson & Henderson, 1966). This is the first report of *P. arenariae* (= *P. herniariae*) on *H. incana* from Iran. Ebrahimi and Minassian (1975) mentioned an uredinial state of rust on *Herniaria* from Khuzestan province (SW of Iran) with no name. To my knowledge, there is no known rust with uredinial state on *Herniaria* so far; thus, the above report is doubtful.

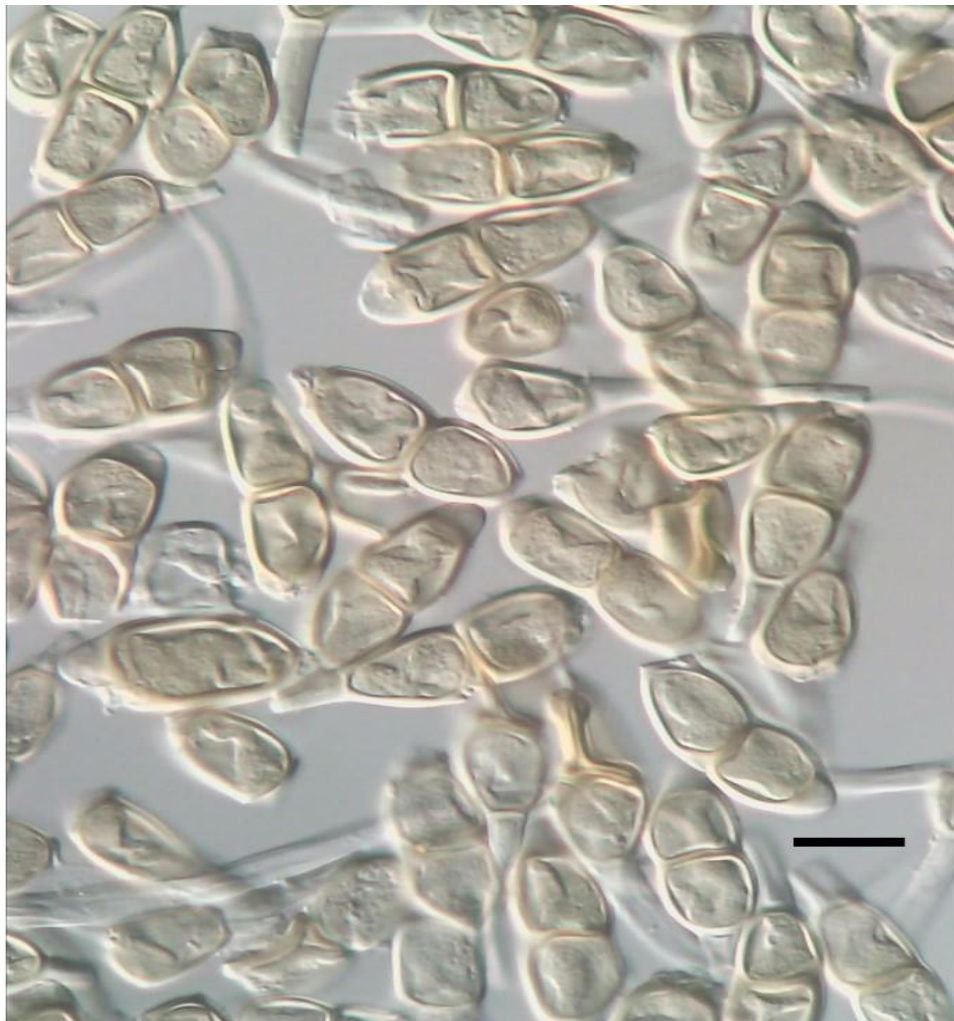


Figure 1. *Puccinia arenariae* on *Herniaria incana*, Teliospores (Bar=20 μ m)

Puccinia aristidae Tracy, J. Mycol. 7(3): 281 (1893)

On *Stipagrostis plumosa* Munro ex T. Anderson (Poaceae), East Azarbaijan, Marand, 20 VIII 1968, leg. Abaie & Modjib (IRAN3762F), (II)+III

The above specimen was originally identified by Viennot-Bourgin et al. (1970) as *P. aristidicola* Henn. This rust species was originally described from Argentina and considered as a synonym for another American species viz. *Puccinia vexans* Farl. (Cummins, 1971). A study of the specimen revealed that Viennot-Bourgin identification was not correct. On the specimen, uredinia were missing. Urediniospores were present on the surface of telia. These spores were ellipsoid or obovoid, sometimes angular, 24-30 \times 18-22 μ m, with 2-4 germ pores. Germ pores were equatorial, more or less equatorial, or equatorial with one subapical pore. Urediniospore wall was golden brown, 2-3 μ m thick, finely and densely verrucose. Telia were mainly on the adaxial surface of infected leaves, exposed, compact, confluent, and covered almost entire upper side of the leaves. Teliospores were 34-57 \times 20-28 μ m, oblong, ellipsoid, broadly-ellipsoid or broadly-obovoid,

rounded or obtuse at apex, often attenuated below (Fig. 2). Teliospore wall was smooth, 2-3.5 μm thick at sides, up to 12 μm thick at apex, chestnut-brown, mostly paler at the bottom and at the external part of apical thickening. Pedicels were colorless, thick-walled and up to 162 μm long. Few mesopores were present. The above specimen is not *P. vexans* which has echinulate urediniospores with 7-8 scattered germ pores (Cummins, 1971). All above features fit well with those of *P. aristidae* mentioned by Cummins (1971). *Puccinia aristidae* is a new member of Iranian rust flora.



Figure 2. *Puccinia aristidae* on *Stipagrostis plumosa*, Teliospores (Bar=20 μm)

Puccinia calcitrapae var. *calcitrapae* DC. in Lamarck & de Candolle, Fl. franç., Edn 3 (Paris) 2: 221 (1805) emend. Braun (1981)

On *Cirsium hygrophyllum* Boiss. (Asteraceae), Mazandaran province, Haraz road, on trail from Nava to Parvar, 3 VIII 1993, M. Abbasi (IRAN8658F), II+III

Urediniospores have a conspicuous smooth patch above the hilum. Teliospores dimension (37-50 \times 19-26 μm) fit well description of *P. calcitrapae* emended by Braun (1981). To my knowledge, *C. hygrophyllum* is a new host for the above rust.

Puccinia calcitrapae* var. *cirsii-rhizocephali M. Abbasi **var. nov.** – MycoBank MB 838222 – (Fig. 3)

Etymology: Named after the host species *Cirsium rhizocephalum* C.A.Mey. (Asteraceae).

TYPE: on *Cirsium rhizocephalum* C.A.Mey. (Asteraceae), Alborz province, Gachsar towards Gajereh, Varangrood, 2450 m, 9 VII 1977, leg. F. Termeh & F. Matin (IRAN8656F), II+III.

Diagnosis– differing from *P. calcitrapae* var. *calcitrapae* DC. emend. Braun (1981) in having broadly-ellipsoid or broadly-obovoid teliospores and with teliospore width >26 μm .

Telia on both sides of infected leaves are mostly hypophyllous, black, and exposed. Urediniospores in telia are 28-30 \times 27-28 μm , more or less globose, wall dark cinnamon brown, mostly 2 μm thick, thicker (up to 5 μm) at the base, echinulate, echinulae missing on the area above the hilum, germ pores 3-4 equatorial. Teliospores are broadly-ellipsoid or broadly-obovoid, 33-42 \times 26-32 μm , wall chestnut brown, 2 μm thick, germ pore of upper cell subapical, of the lower one more or less equatorial or close to the septum.

Based on the emended description of *P. calcitrapae* provided by Braun (1981), this species has ellipsoid-ovoid teliospores with a mean spore width <25 μm . In contrast to the type variety, *P. calcitrapae* var. *cirsii-rhizocephali* var. nov., has broadly-ellipsoid or broadly-obovoid teliospores with a mean spore width >26 μm . A comparison of teliospores of above new variety with those in type variety (IRAN8656F) is provided in Fig. 3.

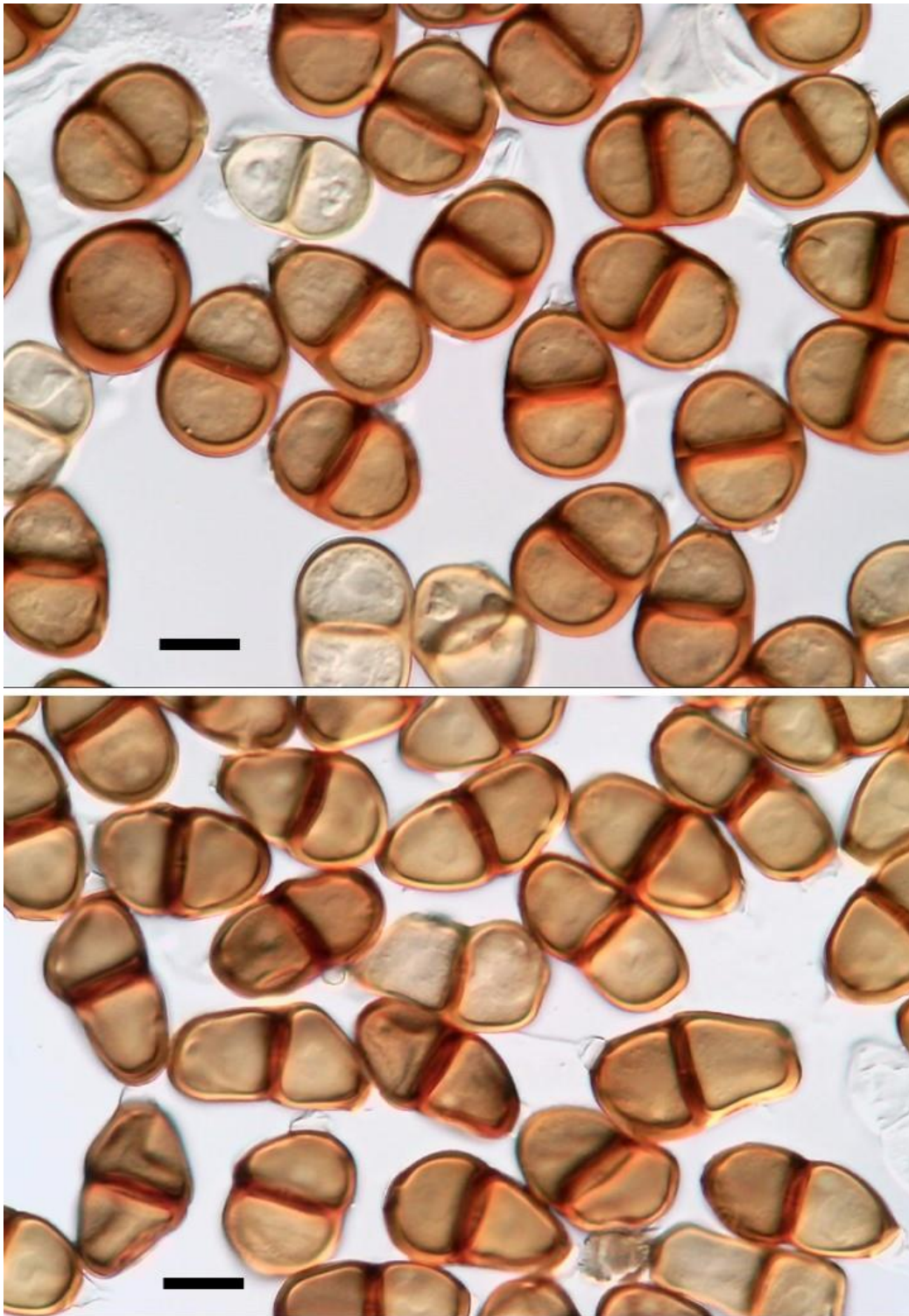


Figure 3. *Puccinia calcitrapae* var. *cirsii-rhizocephali* var. nov., teliospores from holotype (top); *P. calcitrapae* var. *calcitrapae* on *Cirsium hygrophyllum* (IRAN8658F), teliospores (bottom), Bar=20 μ m.

Puccinia gaubae Petr. & Esfand., *Annls mycol.* 39(2/3): 210 (1941)

Syn: *Puccinia melitenensis* Kabakt., Mutlu & Karakuş (syn. nov.)

On *Campanula stevenii* subsp. *beauverdiana* (Fomin) Rech.f. & Schiman-Czeika (Campanulaceae), Alborz province, Dizin, Siah mount, alt. 3000 m, 23 VI 1982, leg. Moussavi et al. (IRAN15990F), III

Puccinia gaubae is montane rust mostly found in high elevations. The fungus was originally described on *C. stevenii* M.Bieb., from Iran (Petraik & Esfandiari 1941). Abbasi (2003) extended the original description of the rust species and reported *C. stevenii* subsp. *beauverdiana* as a new host for the fungus. Another specimen on *C. stevenii* subsp. *beauverdiana* is also reported here from Alborz Mountain. It seems *P. gaubae* occurs quite common on both the type and *beauverdiana* subspecies of *C. stevenii* in Northern Iran (Abbasi 2003). Judging from the description of *P. melitenensis* from Malatya Kale, Turkey on the same host viz. *C. stevenii* subsp. *beauverdiana*. (Kabaktepe et al. 2015), it is quite visible that what authors have seen is *P. gaubae* on the same host from Turkey and they just missed to compare it with that species.

Puccinia graminis Pers., *Neues Mag. Bot.* 1: 119 (1794)

Syn.: *Aecidium haussknechtianum* Henn. (syn. nov.)

On *Berberis integerrima* Bunge (Berberidaceae), Fars province, Shiraz towards Kazerun, Chehel-Cheshmeh area, 29 VI 2007, leg. E. Ghasemi, (IRAN17429F) O+I; Golestan province, Ghezgaleh, 17 VI 1993, leg. M. Abbasi et al. (IRAN 8637F) III; Golestan province, Tangedol, 16 VII 1991, leg. M. Abbasi et al. (IRAN8659F) I; Tehran province, Khojir National Park, 12 VI 2004, leg. M. Abbasi and Kachooian (IRAN2001F), I; Alborz province, Asara, 19 May 1994, leg. M. Abbasi and R. Fritsch (IRAN8781F), I; Alborz province, Khor road, 30 VI 1996, leg. M. Abbasi (IRAN11465F), I; Alborz province, Allangeh, 22 VII 1946, leg. E. Esfandiari (IRAN6 originally identified as *A. haussknechtianum*) I; Hamedan province, Garin mount, 18 V 1988, leg. A. Karavar et al. (IRAN11466F) I; E Azarbaijan, Orumieh, 18 V 1995, leg. B. Daneshpazhuh (IRAN9149F), I.

On *Berberis crataegina* DC., Alborz province, Khor road, 22 V 1998, leg. Messbah (IRAN11471F) I; Alborz province, Shahrestanak road, 7 VIII 1996, leg. M. Abbasi (IRAN11094F), I.

Aecidium haussknechtianum was originally described on *Berberis crataegina* DC., from Markazi province, Iran (Haussknecht, 1899). Later, the host species was corrected by Bornmuller (1912) as *B. integerrima*. In comparison with the aecial state of *P. graminis*, the distinguishing characters of *A. haussknechtianum* are long aecia up to 2.5 mm and evenly thick-walled aeciospores. During the last 30 years, several specimens of *B. integerrima* and *B. crataegina* infected with aecidium state, have been studied by the author (see above material examined). The aecia shows diversity in size even in one cluster from 0.2 – 1.6 mm. Aeciospores are angular with apical thickness up to 7 µm, covered by several small plugs variable in size. Judging from the above observation, *A. haussknechtianum* is considered as a synonym of *P. graminis*.

Puccinia hariotii Lagerh. [as 'harioti'], Tremö Mus. Aarcheft: 135 (1893)

On *Stachys setifera* C.A. Mey. (Lamiaceae), sine loco, (IRAN3935F) I+III

Rust and host species were identified and reported as *Puccinia mayorii* E. Fisch., on *Sideritis montana* L. by Viennot-Bourgin et al. (1970). Reexamination of the specimen revealed that the host belongs to *S. setifera* and the rust has all morphological features of *P. hariotii* (Moaven, 2004), ophis-form rust, which has been reported a couple of times from Iran on *Stachys* spp. There was no access to *P. mayorii* specimens for comparison. However, judging from the description of the species provided by Gäumann (1959), except for host difference, the rust species is very similar to *P. hariotii*.

On *Stachys setifera* (Lamiaceae), Kermanshah province, Gorji-Biyan, 24 V 1951, leg. Gh. Scharif (518), (IRAN3849F) O+I

Above specimen was reported by Petrak (1953) as *Puccinia epilobii-tetragoni* G. Winter, on *Epilobium* sp. (Onagraceae). A review of the specimen revealed that the host belongs to *S. setifera* (Lamiaceae) and the systemic, dense aecial state on both sides of the leaves mainly lower side, belongs to *P. hariotii*. Aeciospores were diverse in shape and size, mostly angular, 19-26 × 17-24 µm, wall 1.5-2 µm thick, finely verrucose.

There is another report of *P. epilobii-tetragoni* on *E. hirsutum* L. from an unknown locality in Iran (Ershad 1995). The report is originally from Wettstein (1885) on *Epilobium nassirelmulcii* Stapf (= *E. hirsutum*) collected from Hamedan province, Mount Alwand and has nothing to do with Ershad (1995).

Puccinia hibisci-trioni Husseinova, Nov. sist. Niz. Rast. 4: 253 (1967)

On *Alcea* sp. (Malvaceae) East Azarbaijan, Maragheh, leg. Khodaie (IRAN17426F), III

Spermogonia are missing. Telia hypophyllous are mostly dark brown in clusters, teliospores clavate, less often fusiform or broadly obovoid, 37.5-77.5 × 16.5-25 µm, at apex often conically elongated (beaked), attenuated at the base, slightly or not constricted at the septum, wall yellowish-brown to chestnut brown, smooth, 2.5-3.5 µm at sides, up to 12.5 µm at apex, pedicel hyaline, persistent, up to 125 µm long. Mesospores are present.

This species has been originally described from Azerbaijan on *Hibiscus trionum* by Husseinova in 1967 (see Ulyanishchev et al. 1985). Here, the species is reported from Azarbaijan province of Iran on *Alcea* sp. which is a new host for the rust. *Puccinia hibisci-trioni* differs from *P. malvacearum* s.str. (See Aime & Abbasi, 2018) in having darker telia mostly in clusters and beaked teliospores with darker walls. In this research, a *Puccinia* sp. specimen (IRAN16858F) on *Abelmoschus esculentus* (L.) Moench, collected from East Azarbaijan deposited at Iran Herbarium was also re-examined. The morphological features of teliospores in the specimen also fit well with description of *P. hibisci-trioni* and should be named under this taxon.

Puccinia hordei G.H. Otth, Mitt. naturf. Ges. Bern 711-744: 114 (1871) [1870]

On *Ornithogalum cuspidatum* Bertol. (Asparagaceae), Ardebil province, Aghdagh mount, alt. 2600 m, 16 V 1989, leg. F. Termeh et al. (IRAN17490F), O+I

On *Ornithogalum* sp. (Asparagaceae), Bushehr province, Dashtestan, Poshtekuh area, Tange Eram towards Dehrud, alt. 750 m, 25 II 1996, leg. M. Abbasi & B. Daneshpazhuh (IRAN10191F), O+I

Members of the genus *Ornithogalum* have been known as the aecial host of *P. hordei* s.str. (Anikster & Wahl, 1979). To the best of the researcher's knowledge, this is the first report of the occurrence of *Hordeum* rust aecial state on *Ornithogalum* species in Iran.

Puccinia kopetdaghensis Katajev, Notul. syst. Sect. cryptog. Inst. bot. Acad. Sci. U.S.S.R. 7: 174 (1951)

Syn: *Puccinia yahyaliensis* Kabaktepe (syn. nov.)

On *Hypericum perforatum* L. (Hypericaceae), Alborz province, Karaj-Chalus road, on Azadbar road, 8 VII 1997, leg. Abbasi et al. (IRAN10894F), III; *Hypericum scabrum* L. (Hypericaceae), Alborz province, Karaj-Chalus road, Shahrestanak road, the road of Lanir, on Lanir riverbank, 7 VIII 1996, leg. Abbasi (IRAN17451F), I+III; *Hypericum* sp. (Hypericaceae), Alborz province, Karaj-Chalus road, Kandovan, Azadbar, 8 VII 1997, leg. Abbasi et al. (IRAN76512P), III.

Aecia caulicolous is formed in the cluster on spindle-shaped and slightly hypertrophied spots, producing stem canker up to 1 cm in length, aecia roesteloid, with white peridium up to 1.2 mm in length. It tends to shred longitudinally at maturity. It is composed of long and narrow peridial cells, with outer wall smooth, 1.5-2 μm thick, inner wall up to 6 μm thick, densely verrucose with mostly irregular papillae. Aeciospores are 22-29 \times 20-23 μm , ellipsoid, ovoid, more or less globoid or angular, wall 2-3 μm thick, yellowish to pale brown, finely and densely verrucose, with 5-7 conspicuous germ pores with moderate to strong internal ring. Telia was also caulicolous, compact, erumpent, first covered by epidermis later exposed by rupturing the epidermis. Teliospores morphology and dimensions (Fig. 4) fit well with an extended description of the species provided by Abbasi et al. (1996). To my knowledge, this is the first report of the aecial state of *P. kopetdaghensis* which was previously known as a microcyclic rust among uredinology literature (Abbasi et al. 1996). As mentioned above, newly-described aecia were interestingly roestelioid type with well-developed peridium and tend to shred longitudinally at maturity, long and narrow peridial cells, and aeciospores with conspicuous germ pores. All these features fit well with the description of Roestelia type of aecium provided by Sato and Sato (1985).

Puccinia yahyaliensis has been described based on infected *Hypericum scabrum* L. specimen collected from Yahyali, central Turkey. The description of teliospores and their photomicrographs provided in protologue (Kabaktepe, 2015) clearly showed resemblance with *P. kopetdaghensis* originally described on the same host from Turkmenistan (Ulyanishchev 1978). The topotype of *P. kopetdaghensis* was collected from the Kopet Dag region and studied by Abbasi et al. (1996). *Puccinia yahyaliensis* features sound similar to those seen on topotype material of *P. kopetdaghensis* (IRAN8620F). It seems that *P. kopetdaghensis* occurs on *H. scabrum* in Central Asia, Northern Iran, and Turkey. During the project on Micromycetes flora in the Karaj region, Central Alborz (project no. 31305293), the author also collected the above rust on *H. perforatum* which is reported here as matrix nova for the rust.

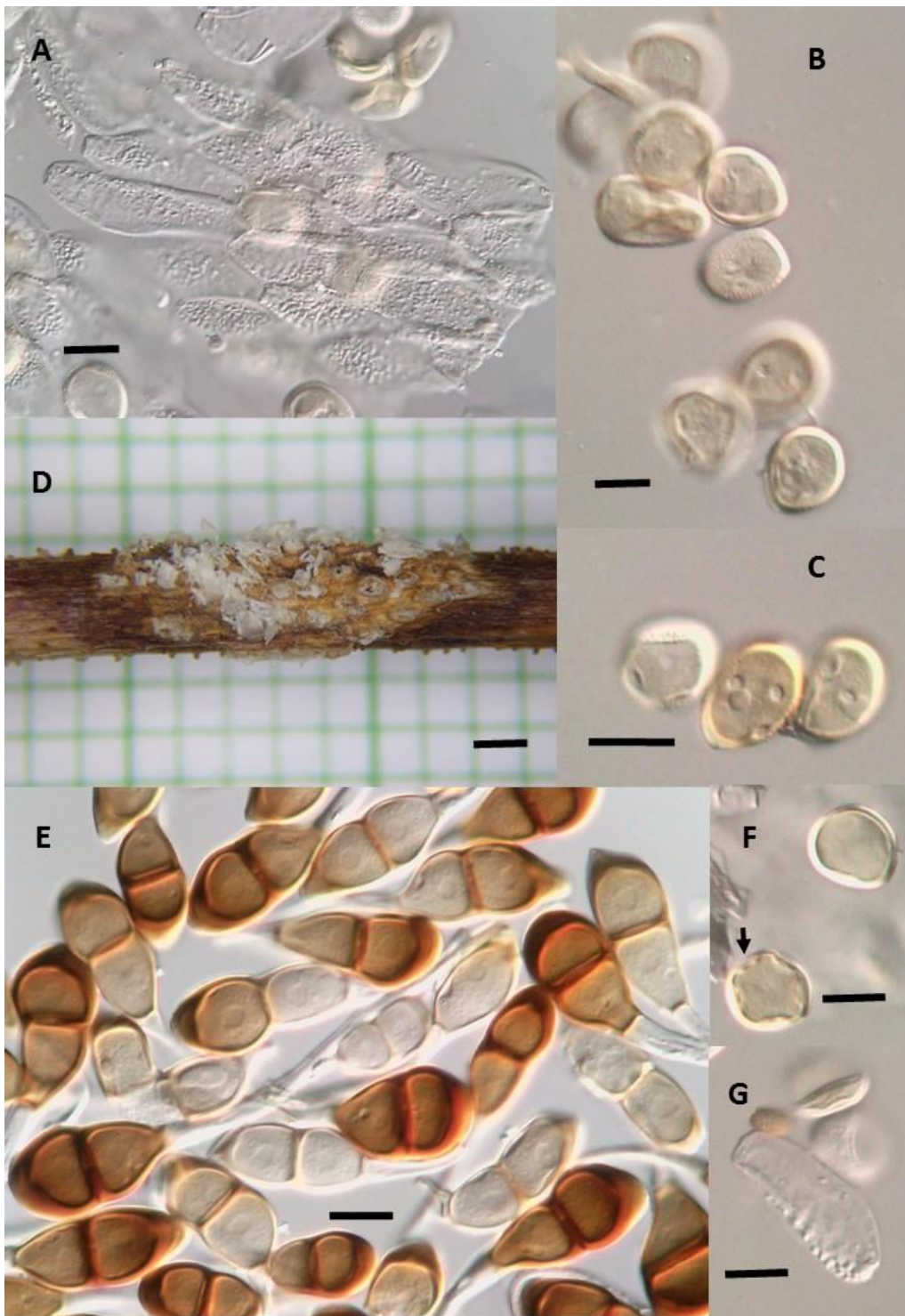


Figure 4. *Puccinia kopetdaghensis*, (A) part of peridium of roestelia type aecidium, bar=20 μ m; (B) pale brown aeciospores, bar=20 μ m, (C) conspicuous germ pores in aeciospores, bar=20 μ m; (D) cluster of roestelia on infected stem, bar=1 mm; (E) teliospores, bar=20 μ m; (F) conspicuous internal ring in aeciospore germ pores, arrow, bar=20 μ m; (G) peridial cell from the side view, bar=20 μ m.

Puccinia marrubii Kabakt., Mutlu, Karakuş & Akata, *Phytotaxa* 272 (4): 281 (2016)

On *Marrubium crassidens* Boiss. (Lamiaceae), Fars province, Arzhan and Parishan protected region, 4 VI 2008, leg. E. Ghasemi (IRAN17454F), III.

Telia were small, black, compact, mainly hypophyllous or on petiols in irregular, oblong or fusiform clusters, sometimes confluent, making large elongated sori along leaf vines and petiols. The leaf deformation was visible on infected plants. Teliospores were variable in size $30\text{-}57\text{-}(65) \times 18.5\text{-}30 \mu\text{m}$, obovoid, broadly obovoid, ellipsoid or oblong, rounded at apex, attenuated below and constricted at the septum. Teliospore wall was smooth, $2\text{-}2.5 \mu\text{m}$ thick at sides, up to $6 \mu\text{m}$ at apex, chestnut to pale chestnut brown, the upper cell was darker than the lower one. Germ pore of the upper cell was apical or sub-apical, of the lower cell at the septum. Teliospre pedicel was persistent, up to $100 \mu\text{m}$ long. These morphological features were quite fit with the description of *P. marrubii* describing from Turkey as a new taxon (Kabaktepe et al. 2016). The only report of *Marrubium* rust is the one made by Ghasemi-Kazeroni (2008) who report a *Puccinia* sp. on *Marrubium anisodon* K.Koch, from Fars province. *Puccinia marrubii* is a new member of the Iranian rust mycobiota. Based on *P. marrubii* protologue (Kabaktepe et al. 2016), the germ pore of the teliospore lower cell is described as 'equatorial in the lower cell'. However, it was below the septum in the Iranian specimen.

Puccinia melanographa Petr., in Reching, Baumgartner, Petrak & Szatala, *Annln naturh. Mus. Wien* 50: 421 (1940) [1939].

On *Lactuca* sp. (Asteraceae), Golestan province, Golestan National park, Sulegerd, 17 V 1992, leg. M. Abbasi et al. (IRAN9162F), I+II+III; on *Lactuca orientalis* (Boiss.) Boiss. (= *Scariola orientalis* (Boiss.) Soják) (Asteraceae), Esfahan province, 19 km S of Delijan, 11 VI 1992, leg. J. Fatehi (IRAN8632F), III; Tehran province, Fasham, Ammameh, alt. 2250 m, 14 IX 1979, leg. B. Daneshpazhuh (IRAN8630F), III.

All above specimens have thick walled broadly ellipsoid teliospores (wall thickness up to $6 \mu\text{m}$) $34\text{-}45\text{-}(55) \times 25\text{-}37 \mu\text{m}$. Teliospores walls were chestnut-brown, finely and distantly (ca. $2 \mu\text{m}$ apart) verrucose, germ pore of the upper cell mostly subapical, in the lower cell in its lower third. Because of thick-walled broadly ellipsoid teliospores, all above specimens would be considered as *P. melanographa*. Specimen IRAN9162F had aecia and uredinia in addition to telial state. Aecia were mostly hypophyllus, sub-epidermal, lacking typical peridium. Aeciospores globoid, semi-globoid or ellipsoid, $21\text{-}25 \times 19\text{-}25 \mu\text{m}$. Aeciospores walls were $1.5 \mu\text{m}$ thick, densely and finely verrucose, verrucae $1\text{-}1.5 \mu\text{m}$ high. Urediniospores were globoid or ellipsoid with 3-7 equatorial to scattered germ pores. Each germ pore was covered by conspicuous echinulate papilla.

The comparison of the above specimens with the authentic specimen of close species *Puccinia lactucarum* P. Syd. (F. Petrak Mycotheca generalis 881) showed that species differed from *P. melanographa* in having urediniospores with 3-4 germ pores, and with teliospores lighter in color, thinner wall ($2\text{-}3.5 \mu\text{m}$ vs $3.5\text{-}6 \mu\text{m}$), and a narrower width range.

Puccinia notobasidis Gonz. Frag., *Brotéria, sér. bot.* 22: 52 (1926)

Syn.: *Puccinia notobasis* Sävul. & Rayss, *Annals Cryptog. Exot.* 8(1-2): 80 (1935)

Puccinia notobasidis Politis, Phragmat. Akad. Athen. 4: 12 (1935) [Nom. illegit., Art. 53.1]

On *Notobasis syriaca* (L.) Cass. (Asteraceae), Ilam province, 11 VI 2003, leg. K. Noorelahi (IRAN11692F), (II)+III.

Telia were semi-compact, on both sides of the leaves mostly circinate, around a central sorus. Urediniospores in telia, 29-33 × 22-26 μm, oblong, ellipsoid or ovoid, wall pale brown, 2 μm thick, evenly echinulate, with 3-4 more or less equatorial germ pores which have been covered with wide hyaline and echinulate papillae. Teliospores were 38-54 × 23-32 μm, ellipsoid, broadly ellipsoid, oblong, obovoid or broadly obovoid, wall 2.5-3 μm thick, chestnut to pale chestnut brown, very finely verrucose, appearing smooth under the light microscope, germ pore in the upper cell apical or subapical, occasionally close to the septum, that of the lower cell close to the septum, pedicel fragile mostly short, but up to 100 μm was also seen. There is only one report of the above rust from Iran under the name *P. notobasis* Sävul. & Rayss, by Viennot-Bourgin et al. (1969) on the same host. Here, the above-mentioned rust species is reported under the appropriate name for the second time.

Puccinia ourmiahensis Vienn.-Bourg., Ann. Inst. Rech. Agron., Ser. C. (Ann. Epiphyt.) 9: 138 (1958)

On *Centaurea ghahremanii* Wagenitz & Esfand. (Asteraceae), Fars province, Shiraz towards Abadeh, Tang-e Saadat-abad, 28 VI 1969, leg. Termeh and Izadyar (IRAN17420F) III.

This is an endemic rust species originally described by Viennot-Bourgin (1958) from West Azarbaijan province on *C. solstitialis* L. The rust species differs from other *Puccinia* spp. on *Centaurea* in having very wide (up to 37 μm width) and thick walled (up to 5 μm) teliospores. Moreover, the germ pore of each teliospore cell has been covered by verrucose papilla which is another unique feature for the species. This is the second report of the above rust from Iran and *C. ghahremanii* is a new host (matrix nova) for the rust.

Centaurea solstitialis, the type host of *P. ourmiahensis* belongs to Sect. *Mesocentron*. However, as mentioned by Wagenitz and Esfandiari (1983), *C. ghahremanii* cannot be assigned to any of the existing sections of *Centaurea* and then, its proximity with *C. solstitialis* is unclear.

Puccinia persistens subsp. *persistens* Plowr. Česká Mykol. 30(2): 103 (1976)

On *Eremopyrum distans* (K.Koch) Nevski (Poaceae) East Azarbaijan province, Sarab to Ardebil, 45 km SW of Ardebil, 1950 m, 6 VII 1991, leg. M. Abbasi (IRAN8563F) II+III

Very scarce rust infection was seen on both sides of the leaves. Urediniospores are yellowish or brown with mostly 7-9 scattered germ pores. Telia were covered by the epidermis, telial paraphyses present, teliospores 41-45(-50) × 15-20.5 × 12-18 μm. These spores were typically brachysporic (L/W₁=2.8). Pedicels with deposition of brown material immediately below the point of the spore attachment. The presence of yellowish-brown urediniospores and brachysporic teliospores are features of subspecies *persistens*. To my knowledge, this is the first report of *P. persistens* on *E. distans* in Iran.

Puccinia striiformoides M. Abbasi, Hedjar. and M. Scholler, in Abbasi, Hedjaroude, Scholler and Goodwin, Rostaniha 5(2): 75 (2005) [2004]

On *Dactylis glomerata* L., (Poaceae), Tehran province, Passghaleh, 10 VII 1947, leg. Gh. Scharif, II+III (IRAN3842F)

The author found handwriting attached to the above specimen which shows the specimen has been identified by Gh. Scharif as *Puccinia dactylidis* (written as “*dactylis*” with quotation marks). *Puccinia dactylidis* is considered as a synonym for *Puccinia graminis* subsp. *graminicola* Z.Urb. (Cummins, 1971). To my knowledge, this specimen was the source for Ershad (1977) who reported it as the first and the only known report of *P. graminis* on *D. glomerata* in Iran. Re-examination of this specimen revealed that it was heavily infected by uredinia and telia of *P. striiformoides*. During the author’s intensive research on the taxonomy of *P. graminis* in Iran (Abbasi et al. 2002) no *D. glomerata* specimen infected by *P. graminis* was found. The plant species is a type host for *P. graminis* subsp. *graminicola* and is still an unreported host for stem rust in Iran.

Puccinia stipina Tranzschel, Krypt.-Fl. Brandenburg (Leipzig) 5a: 477 (1913)

Syn: *Aecidium thymi* Fuckel, Fungi rhenani exsic., suppl., fasc. 7(nos 2101-2200): no. 2113 (1868)

On *Eremostachys* sp. (Lamiaceae), Golestan province, Golestan National Park, Dasht-e Kalpush towards Ghezghaleh, 11 V 1992, leg. M. Abbasi (IRAN17438F), O+I

Spermogonia are hypophyllous, in small clusters, at the center of round circle of aecia. Aecia were mainly on lower side of the leaves, often in groups, arranged in a circle around spermogonia clusters, circular groups of aecia 0.2-0.4 cm, peridium cup-shaped yellowish, lacerate nearly to base, aeciospores 22.5-30 × 20-25 μm, ellipsoid, obovoid or more or less globoid, mostly angular, wall yellowish brown, 2.5 μm thick, always thicker at germ pores, finely and densely verrucose, with visible 5-8 scattered germ pores. Morphological features of the above rust fit well with the description of *P. stipina* aecial state provided by Ulyanishchev (1978). Gäumann (1959) considered *A. thymi* as synonym with *P. stipina*. *Puccinia phlomidis* Thüm., also infect *Eremostachys* spp. in Iran. The rust is mostly seen in the aecial state which differs from the aecial state of *P. stipina* in having systemic aecia covering the whole lower side of infected leaves and aeciospores with colorless walls.

Puccinia suaveolens* var. *karajensis (Aliabadi & M. Abbasi) M. Abbasi, **comb. nov.** – MycoBank MB 838154

≡ *Puccinia punctiformis* var. *karajensis* Aliabadi & M. Abbasi, Mycotaxon 122: 133 (2013) [2012] – Holotype: On *Cirsium arvense* (L.) Scop., Iran, Alborz province, Karaj-Chalus road, 2 km S of Asara, around the river, alt.1750 m, 30 VI 1999, leg. M.Abbasi et al. (IRAN14659F).

Based on the Melbourne code, *P. suaveolens* is the oldest appropriate name for *Cirsium arvense* rust. Then, the *P. punctiformis* var. *karajensis* was renamed as the above mentioned combination. Variety *karajensis* differs from type variety in having dimorphic urediniospores including giant spores with up to 10 scattered germ pores.

Puccinia tatarica Tranzschel, Monogr. Uredin. (Lipsiae) 1(5): 864 (1904)

Syn.: *Uromyces mulgedii* Lindr. Acta Soc. Fauna Flora fenn. 20(no. 9): 18 (1901) [1900-1901]

On *Mulgedium tataricum* (L.) DC. (Asteraceae), Gilan province, around Hashtpar, 3 V 1978, leg. N. Alegha, O+I+III (43-19UTFH)

Spermogonia were mostly hypophyllous, densely covered most part of the leaf surface, rarely epiphyllous in small groups. Aecia are like blisters, immersed in host tissue, opening by a pore, densely covered the lower side of infected leaves, sometimes in scattered small groups on the upper side of the leaves, peridium and peripheral paraphyses were missing and concave spore-bearing structure (hymenium) and aeciospores surrounding by host tissues (type caeoma VI, Sato & Sato 1985). Aeciospores $21-31 \times 20-30 \mu\text{m}$, ellipsoid, globoid, ovoid or sometimes angular, wall colorless, 1-3 μm thick, finely verrucose. Telia have a systemic infection pattern on stem and leaf, first covered by epidermis, later ruptured by longitudinal slits, pulverulent, chestnut brown, densely arranged in rows, covered the whole stem, on leaves amphigenous in rows along the main nerve. Teliospores were mainly one-celled (mesospores) $21-32 \times 17-23 \mu\text{m}$, ellipsoid, obovoid or angular, wall 1.5-3 μm thick, finely verrucose, verrucae were densely scattered or arranged in dense longitudinal rows, with one apical to equatorial germ pore. Two-celled teliospores were rarely seen, $26-38 \times 15-25 \mu\text{m}$, ellipsoid, not or slightly constricted at septum, wall 2 μm thick, finely verrucose, verrucae were similar to those on mesospores, germ pore of upper cell apical, in the lower cell at the bottom by the pedicel (Fig. 5). *Puccinia tatarica* is a new member of Iranian rust flora and differs from other Asteraceous rusts by having mostly mesospores and a demicyclic life cycle. Majewski's concept (Majewski, 1979) who considered *P. tatarica* as a synonym of *P. minussensis* Thüm., is not accepted in the current study. Later taxon is a macrocyclic rust with urediniospores which is missing in *P. tatarica*. Judging from the original description of *U. mulgedii*, (Lindroth, 1901) there is no doubt that the species should be considered as a synonym of *P. tatarica*.

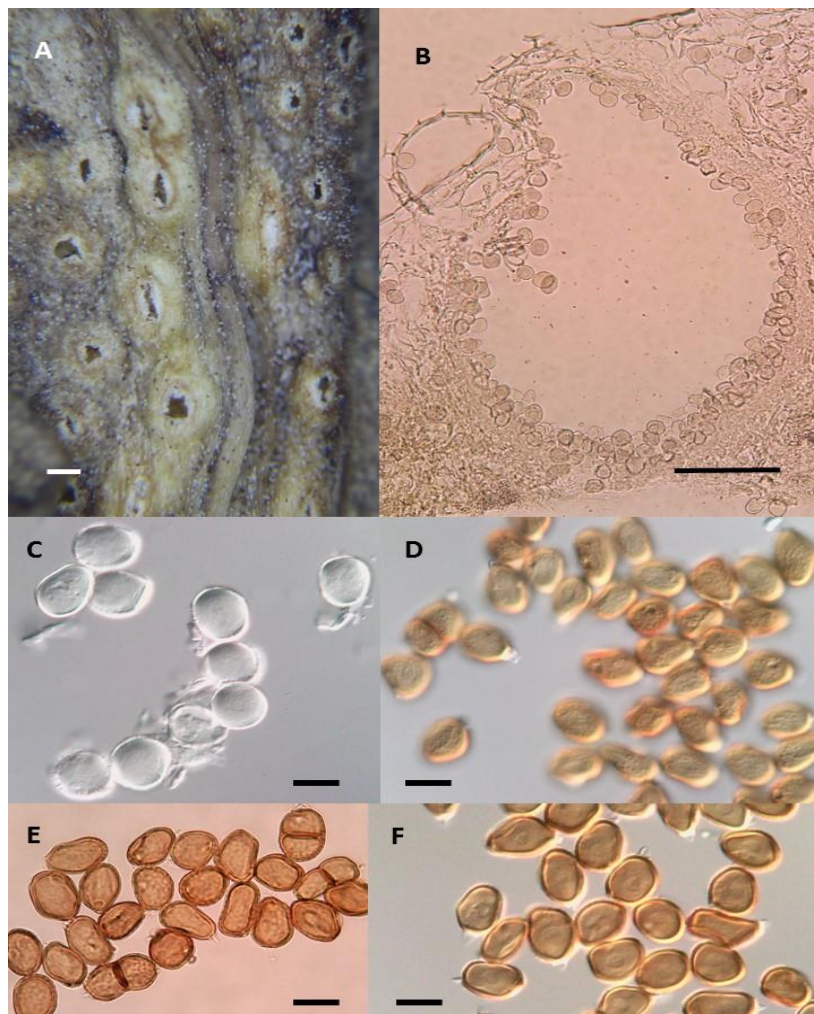


Figure 5. *Puccinia tatarica*, (A) cluster of aecia on leaf, bar= 0.3 mm; (B) cross section of aecium, bar=125 μ m; (C) aeciospores, bar=20 μ m; (D) surface ornamentation of mesospores and teliospore; (E) & (F) mesospores and teliospores, bar=20 μ m

Puccinia triseti Erikss., Annl. Sci. Nat., Bot., sér. 8 9: 277 (1899)

On *Trisetum flavescens* (L.) P.Beauv. (Poaceae), Gilan province, Heiran pass, 850 m, 7 VII 1991, leg. M. Abbasi (IRAN8353F), II+III; Golestan province, Golestan National park, Tang-e Gol, 14 VI 1993, leg. M. Abbasi (IRAN11490F), II+III; West Azarbaijan province, Piranshahr, Silveh village, Sefid Kuh, 1830 m, 1 VII 2010, leg. M. Amini-Rad (IRAN66520P), II+III

Urediniospores were $24-29 \times 17-20 \mu$ m, wall 1.5-2 μ m thick, colorless or light yellowish, finely echinulate, with 6-10 scattered germ pores. Teliospores were $36-55 \times 16-24 \times 13-20 \mu$ m, wall 1-1.5 μ m thick at sides, 5-8 μ m thick above. Pedicels were short, without a brown material deposited below the point of spore attachment. Judging from Markova and Urban (1998), there are two

distinct species of *Puccinia* attacking *Trisetum* viz. *P. triseti* and *P. schismi*. The L/W₁ ratio in above-studied specimens measured 2.49-2.91 which is considered as brachysporic. This is in contrast to *P. schism* which has teliospores with a strong tendency to dolichospory.

Puccinia umbilici Guépin, in Duby, Bot. Gall., Edn 2 (Paris) 2: 890 (1830)

On *Umblicus tropaeolifolius* Boiss., Fars province, Tangaab, 1951, leg. Kashkouli, (IRAN13549/1P) III.

There is only one previous record of the above rust from Iran on *Umblicus* sp. (Ershad, 1977). This record is based on a herbarium specimen (IRAN4016F) collected from Fars province in 1957 and identified by Franz Petrak. *Umblicus tropaeolifolius* is an Irano-turan plant species and new host (matrix nova) for the above rust. Both the above mentioned specimens were re-studied and were fit well with descriptions given by Wilson and Henderson (1966) and Gäumann (1959). However, there were teliospores larger than the above references viz. 22.5–37.5 × 15–29 μm. It seems that *P. umbilici* has a wide distribution range and in addition to Iran, it has been reported from North America, Britain, Europe including the former USSR, Mongolia, China, Pakistan, and Japan (Far & Rossman 2019).

Puccinia xanthii Schwein., Schr. naturf. Ges. Leipzig 1: 73 [47 of repr.] (1822)

On *Xanthium brasiliicum* Vell. (Asteraceae), Gilan province, Bandar Anzali, Ghazian, 7 X 1965, (IRAN 12733P), III.

Telia were small, exposed, compact, on both side of the leaves, predominantly hypophyllous, in close round groups. Stromatic paraphyses were present. Teliospores were variable in shape and size, mostly with <20 μm width, wall up to 12.5 μm thick at apex. To my knowledge, this is the first report of the above rust on *Xanthium brasiliicum* in Iran.

Uromyces acantholimonis Syd. & P. Syd., Annl. mycol. 4(1): 28 (1906)

Syn.: *U. acantholimonis* var. *zagrosicus* Z. Urb. [as 'zagrosica'], Encyclop. Mycol. (Paris) 34(6): 46 (1967) [1965] (syn. nov.)

On *Acantholimon festucaceum* (Jaub. & Spach) Boiss. (Plumbaginaceae), Fars province, Eqdid, 9 VIII 1998, leg. Jamali (IRAN12866F), II+III.

This species was described by Sydow and Sydow (1906) based on material collected from Iran and Central Asia (*Acantholimon* sp. and *A. schirazianum* Boiss.). Part of syntype specimens of *U. acantholimonis* were those collected by Bornmueller in 1892 from Kerman and Fars provinces and reported as *U. limonii* DC., by Magnus (1896). The species is close to *U. armeriae* and *U. limonii*. However, it differs from these two species in having larger urediniospores and teliospores and urediniospores with a thicker wall and more germ pores. A bunch of specimens on *Acantholimon* spp., collected across the country was studied here. Nearly in all of them, urediniospores showed mostly 3-5 germ pores. This is quite different from what Sydow and Sydow (1906) mentioned in the protologue of the rust species viz. urediniospores with 2-3 germ pores. Urban (1967) was the first uredinologist who recognized this feature (i.e. urediniospores) with mostly 3-5 germ pores, based on the material collected from Iraq. He believed this as a newly-found feature in comparison

with the original protologue and described a new variety for the taxon, that is, *U. acantholimonis* var. *zagrosicus* Z. Urb. Moaven et al. (2005) also followed this concept and reported var. *zagrosicus* on *A. latifolium* Boiss., from Iran. As a conclusion, urediniospores with 2-3 germ pores were never seen on all available rust infected *Acantholimon* specimens in Iran including material from syntype locality on *A. festucaceum* (Jaub. & Spach) Boiss., (IRAN12866F) collected from Fars province (Ghasemi Kazerooni et al. 2009). This convinced the author of this study to consider urediniospores with 3-5 germ pores as a unique feature of *U. acantholimonis*, a point which was simply missed by Sydow and Sydow (1906), and also consider *U. acantholimonis* var. *zagrosicus* as a synonym for the species here as “synonym nova”.

Uromyces ornithogali (Wallr.) Niessl, Verh. nat. Ver. Brünn 3: 113 (1864)

=*Uromyces acutatus* Fuckel, Jb. nassau. Ver. Naturk. 23-24: 64 (1870)

≡*Uromyces ornithogali* (Wallr.) Lév., Anns Sci. Nat., Bot., sér. 3 8: 371 (1847), Nom. inval., Art. 35.2 (Melbourne)

On *Gagea fistulosa* (Ramond ex DC.) Ker Gawl. (Liliaceae), Tehran province, Ab-e sard, 11 V 1967, leg. Sabzevari (IRAN 8650F), III; Bakhtiari province, Kuhrang, 24 V 1991, leg. M. Abbasi (IRAN8628F), III; Tehran province, Ab-e sard, 17 IV 1967, leg. Sabzevari (IRAN9365F), III.

This species has been previously reported from Iran by Magnus (1899) on *Gagea* sp., as *U. acutatus*. *Gagea fistulosa* is a new host for the rust in Iran. The report of *U. gageae* on *Gagea lutea* made by Roumi and Azamparsa (2017) also refers to above species and is a case of misidentification. Guyot (1951) considered *U. ornithogali* as a synonym of *U. gageae*. However, comparing authentic materials of *U. gageae* (Fungi Exsiccati Fennici no. 540) with above specimens of *U. ornithogali* revealed that *U. gageae* has smooth teliospore walls which are totally different from verrucose walls in *U. ornithogali* (Fig. 6). Based on above explanation, these two rust taxa should be considered as separate species.

A study of a unique rust specimen on *G. dubia* from Iran revealed differences between that specimen and *U. gageae* and *U. ornithogali*. This specimen is considered as a new species which is described as follow:



Figure 6. (A) *Uromyces ornithogali*, teliospores, IRAN 8650F; (B) *U. gageae*, teliospores, Fungi Exsiccati Fennici no. 540, Bar=20 μm .

Uromyces martinii M. Abbasi, **sp. nov.** – MycoBank MB 838155 – (Fig. 7)

Etymology: The new species is named after Ms. Farideh Matin, the Iranian botanist who identified the host plant.

Diagnosis: This new species differs from *U. gageae* in having teliospores with thin, finely verrucose wall and from *U. ornithogali* in having thin walled teliospores (1.5-2 vs 2-3.5 μm) with less conspicuous verrucae.

Spermogonia, aecia, and uredinia were not seen. Telia were amphigenous, scattered, round or elliptic, covered by lead-colored host epidermis which split longitudinally in mature sori, exposed telia pulverulent, dark chestnut brown. Teliospores differed in shape, obovoid, broadly obovoid, oblong or ellipsoid, 27-37.5 \times 20-22.5 μm , wall 1.5-2 μm thick, cinnamon brown to chestnut brown, verrucose, verrucae scattered or quite often stretched in parallel ridges or elongated warts, pedicels hyaline, fragile, shorter than the spores.

TYPE: on *Gagea dubia* Terracc. (Liliaceae), Mazandaran province, Amol, Filband village, 7 V 1995, leg. Z. Ghanbari (IRAN9364F), III.

Considering the above taxon, four *Uromyces* species have been reported on *Gagea*. These species are distinguished by the following key:

- | | |
|--|-----------------------------------|
| 1-teliospore walls smooth or with anastomosing ridges | 2 |
| 1-teliospore walls verrucose..... | 3 |
| 2-teliospores 25-38 \times 18-26 μm , walls smooth..... | <i>U. gageae</i> |
| 2-teliospores 24-33 \times 18-26 μm , with anastomosed ridges on the wall | <i>U. muscari</i> |
| 3-teliospores 27-37.5 \times 20-22.5 μm , wall 1.5-2 μm thick | <i>U. martinii</i> sp.nov. |
| 3-teliospores 25-48 \times 20-29 μm , wall 2-3.5 μm thick | <i>U. ornithogali</i> |

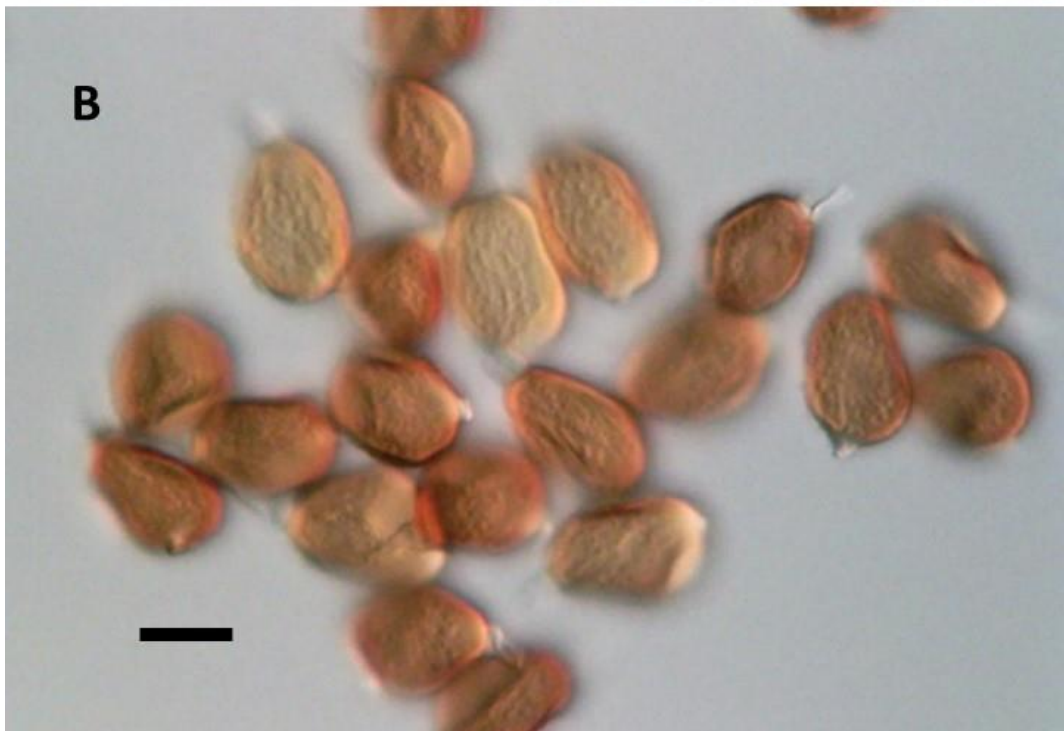
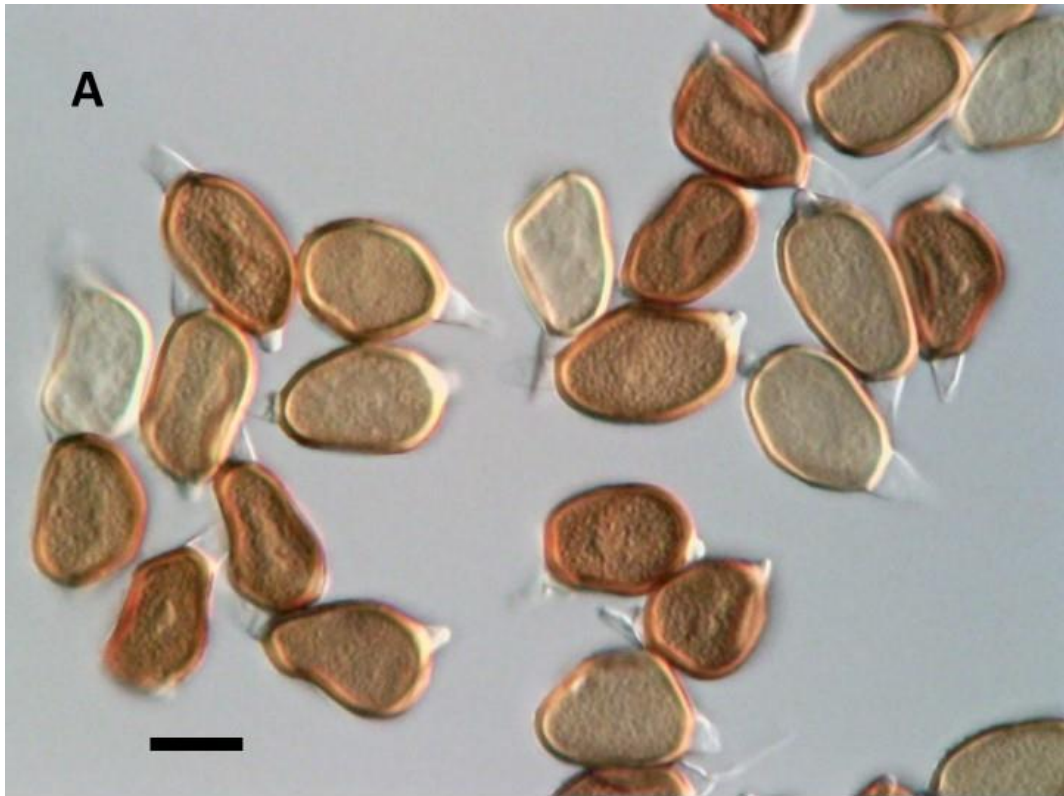


Figure 7. *Uromyces martinii* sp. nov., (A) teliospores from holotype, (B) surface ornamentation of teliospores, Bar=20 μ m

Uromyces punctatus J. Schröt., Abh. Schles. Ges. Vaterl. Kult., Abth. Naturw. Med. 48: 10 (1870) [1869], sensu Gjaerum (1991)

On *Astragalus brachyodontus* Boiss. (Fabaceae), Fars province, Arzhan-Parishan protected area, Galu-Khajeie pass, 13 V 2009, leg. E. Ghasemi, (IRA17436F), (II)+III

Uredinisopres in telia, 21.25-25 \times 18.75-22.5 μ m, were obovoid, more or less globoid or ellipsoid, wall brown or cinnamon brown 2-2.5 μ m thick, finely echinulate, with 3-5 germ pores, the lower number equatorial, and the higher ones more or less scattered. Telia were elliptic or round, pulverulent, and slightly pulvinate, blackish, teliospores 22.5-26.25 \times 20-21.25 μ m, wall chestnut brown, 2-2.5 μ m thick, verrucose, with small papilla at the apex. The specimen fit well with *U. punctatus* sensu Gjaerum (1991). *Astragalus brachyodontus* is reported as a new host (matrix nova) for the rust.

Uromyces tinctoriicola Magnus, Verh. zool.-bot. Ges. Wien 46: 429 (1896)

On *Euphorbia mirzakhaniana*, (Euphorbiaceae), Mazandaran province, Javaher-deh, Samamous mount, 2 VIII 2015, leg. M. Aminirad (IRAN74617P), III; on *E. macroclada* (Euphorbiaceae), Kermanshah province, Rijab, Baba-Yadegar, 14 V 2006, leg. M. Abbasi (IRAN14805F), III; on *E. cheiradenia* (Euphorbiaceae), Tehran province, Kolakchaal peak, northern slope, 1 VII 1999, leg. M. Abbasi and M. Badie (IRAN15181F), III; Shahrestanak, Gilkola spring, 12 VIII 1993, leg. M. Abbasi (IRAN15180F), III; E Azarbaijan province, Bostanabad, 27 VII 1970, leg. M. Izadyar (IRAN8239F), III.

The above rust taxon is distinguished from other *Uromyces* species with verrucose teliospores on *Euphorbia* in having mostly globose teliospores covered by well separated small verrucae. This rust has been originally described from Safin Mount in Iraqi Kurdistan on *E. tinctoria* (= *E. macroclada*) and is common in Iran plateau on members of subsect. *Coniocarpae* including *E. macroclada*, *E. cheiradenia* and *E. seguieriana*. *Euphorbia mirzakhaniana* from the same subsection is a new host (matrix nova) for *U. tinctoricola*.

Uromyces arasbaranensis M. Abbasi, **sp. nov.** – MycoBank MB 838199 – (Fig. 8)

Etymology: The species is named after its type locality Arasbaran Protected Area located in NW of Iran.

Spermogonia and aecia were not seen. Uredinia were cinnamon-brown, amphigenous, scattered, round to elliptic, exposed, pulverulent with remaining host epidermis around sori, mostly 0.2-0.8 mm, sometimes producing chlorotic spots on infected leaves. Urediniospores were 23.75-32.5 \times 17.5-25 μ m, obovoid, ellipsoid, oblong or globoid, wall 1.5-2 μ m thick, pale brown to cinnamon brown, echinulate, echinulae 2-2.5 μ m apart, with 2-3 equatorial germ pores covered by short papilla. Telia are similar to uredinia, but blackish-brown. Teliospores were 23-32 \times 16-23 μ m, obovoid, broadly obovoid, ellipsoid, oblong sometimes angular or irregular in shape, with short

apical papilla, wall chestnut brown, 1.5-2.5 μm thick, finely verrucose, verrucae in short rows, with very short pedicel.

TYPE: on *Silene italica* (L.) Pers. (Caryophyllaceae), East Azarbaijan province, Arasbaran region, Kaleibar, Makidi, 2 VIII 2008, leg. M. Donyadoost (IRAN14286F), II+III.

All known to me is that *Uromyces* species reported on *Silene* have been compared with the above new taxon on Table 2. Viennot-Bourgin (1958) considered three types (group) of *Uromyces* on *Silene*. The first type has a smooth teliospore wall, that is, *Ur. inaequialtus* and *Ur. behenis*. The second group was those similar to *Ur. silenes-ponticae* with delicately verrucose teliospore wall. The third group has only one member viz. endemic species *Ur. silenes-chloraeifoliae* from Iran with large warts located on spore wall distantly and arranged without order. *Uromyces arasbaranensis* sp.nov., was located on the second group and differed from the other members of this group by the combination of thin-walled urediniospores with 2-3 germ pores and thin-walled teliospores.

Uromyces species reported on *Silene* can be distinguished by the following key:

- 1-teliospore wall smooth 2
- 1-teliospore wall verrucose 4
- 2-urediniospores absent, demicyclic rust *Ur. behenis*
- 2-urediniospores present (wall verrucose) *Ur. inaequialtus* (3)
- 3- urediniospore germ pores 2-4 *Ur. inaequialtus*
- 3-urediniospore germ pores 3-6 *Ur. inaequialtus* var. *ecbatanensis*
- 4-verrucae usually arranged in longitudinal or slightly oblique rows 5
- 4-verrucae scattered on spore surface, not in longitudinal rows 6
- 5-urediniospore wall verrucose, with 3-4 germ pores *Ur. suksdorfii*
- 5-urediniospore wall echinulate, with 2-3 germ pores *Ur. doricus*
- 6-teliospores with very fine to small warts 7
- 6-teliospores with large prominent warts spaced and arranged without order
Ur. silenes-chloraeifoliae
- 7-verrucae very fine, hard to see by light microscope *Ur. dianthi*
- 7-Teliospor wall covered with fine warts (visible by light microscope) 8
- 8-urediniospores with 2 germ pores 9
- 8-urediniospores with more than 2 germ pores also present 10
- 9-urediniospores 26-33 \times 21-28 μm *Ur. cuenodii*
- 9-urediniospores 19-30 \times 17-23 μm *Ur. silenes-ponticae*
- 10-urediniospores with 3-4 germ pores, teliospore wall up to 3.5 μm thick, covered by small to moderate warts, mostly on *Silene* section *Melandrium* *Ur. schroeteri* (= *Ur. verrucosus*)
- 10-urediniospores with 2-3 germ pores, teliospore wall mostly 2 μm thick, covered by fine warts ***Ur. arasbaranensis* sp.nov.**

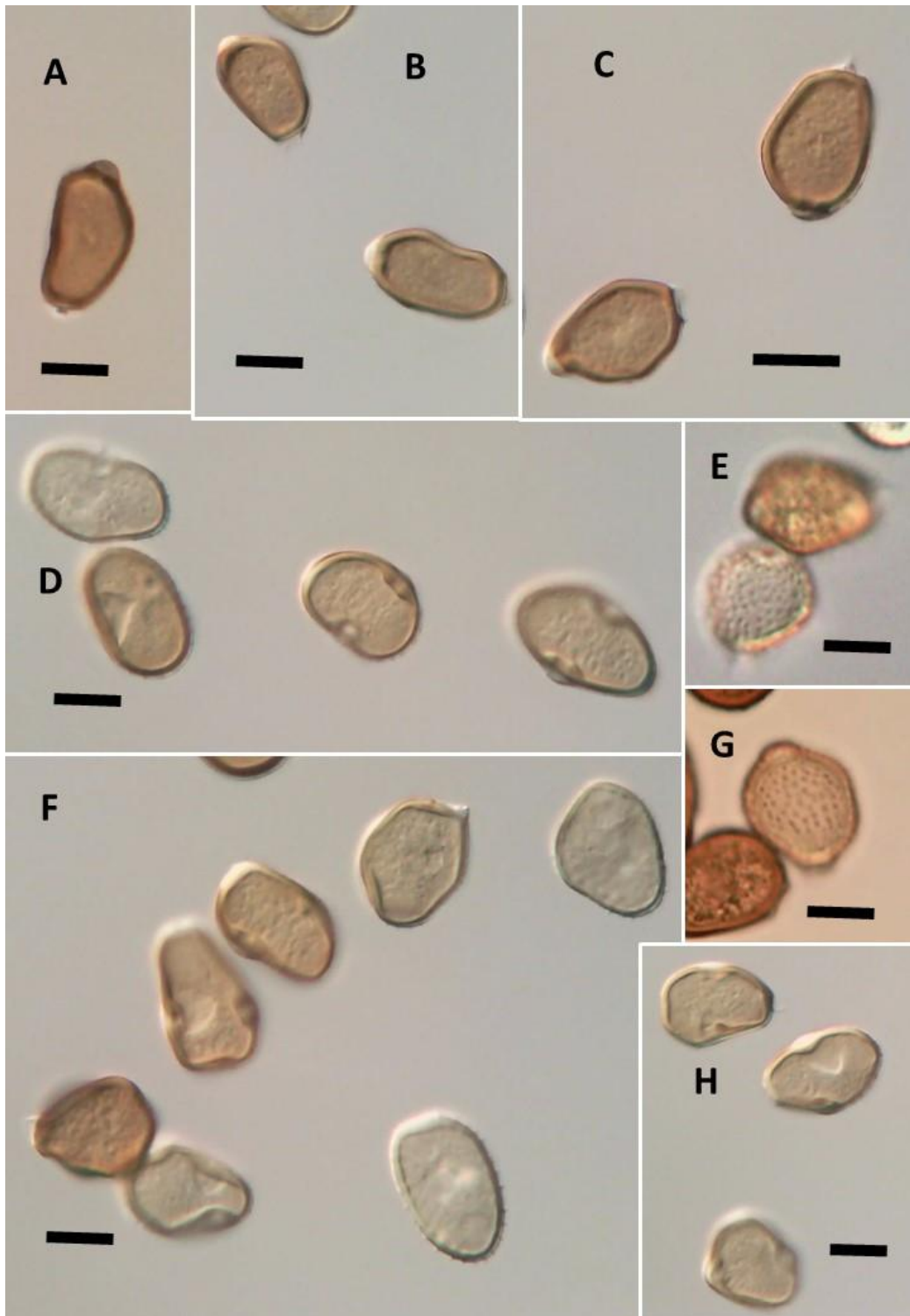


Figure 8. *Uromyces arasbaranensis* sp. nov., on *Silene italic* from holotype, (A-C) teliospores, (D, F, H) urediniospores, (E and G) surface ornamentation of teliospores, Bar=20 μ m

Uromyces taleshensis M. Abbasi, **sp. nov.** – MycoBank MB 838205 – (Fig. 9)

Etymology: The species is named after its type locality Talesh region in Gilan province, NW of Iran.

Spermogonia, aecia, and uredinia were not seen. Telia were chestnut-brown to dark-brown, amphigenous, scattered, or in small groups, fusiform, first covered by the epidermis, later rupturing with a longitudinal slit, exposed sori pulverulent with conspicuous remaining host epidermis around or on top of sori, mostly 0.2-0.5 cm (up to 1.3 cm in confluent telia). Teliospores were 30-42.5 \times 25-32.5 μ m, obovoid, broadly-obovoid, ellipsoid, oblong or more or less globoid, wall chestnut-brown, distinctly rugose, 2.5-3.5 μ m thick at side, up to 6 μ m at apex, with very short (mostly less than 4 μ m) fragile pedicel.

TYPE: on *Colchicum* sp. (Colchicaceae), Gilan province, Talesh region, VI 1974, leg. Ekrami (UTFH 31-19), III.

Uromyces colchici Masee is the only *Uromyces* species reported on the genus *Colchicum*. This species has been originally described from Britain and is sporadically distributed across Europe and Central Asia (Kuprevich and Ulyanishchev 1975, Wilson and Henderson 1966). *Uromyces colchici* is characterized by having smooth teliospore wall and a broad flat hyaline papilla at teliospore apex. *Uromyces taleshensis* sp. nov., differs from *Ur. colchici* in having teliospores with distinctly rugose wall and missing flat papilla at apex. Teliospores of *Ur. taleshensis* sp. nov. have a distinct apical thickness (up to 6 μ m) instead of flat hyaline papilla.

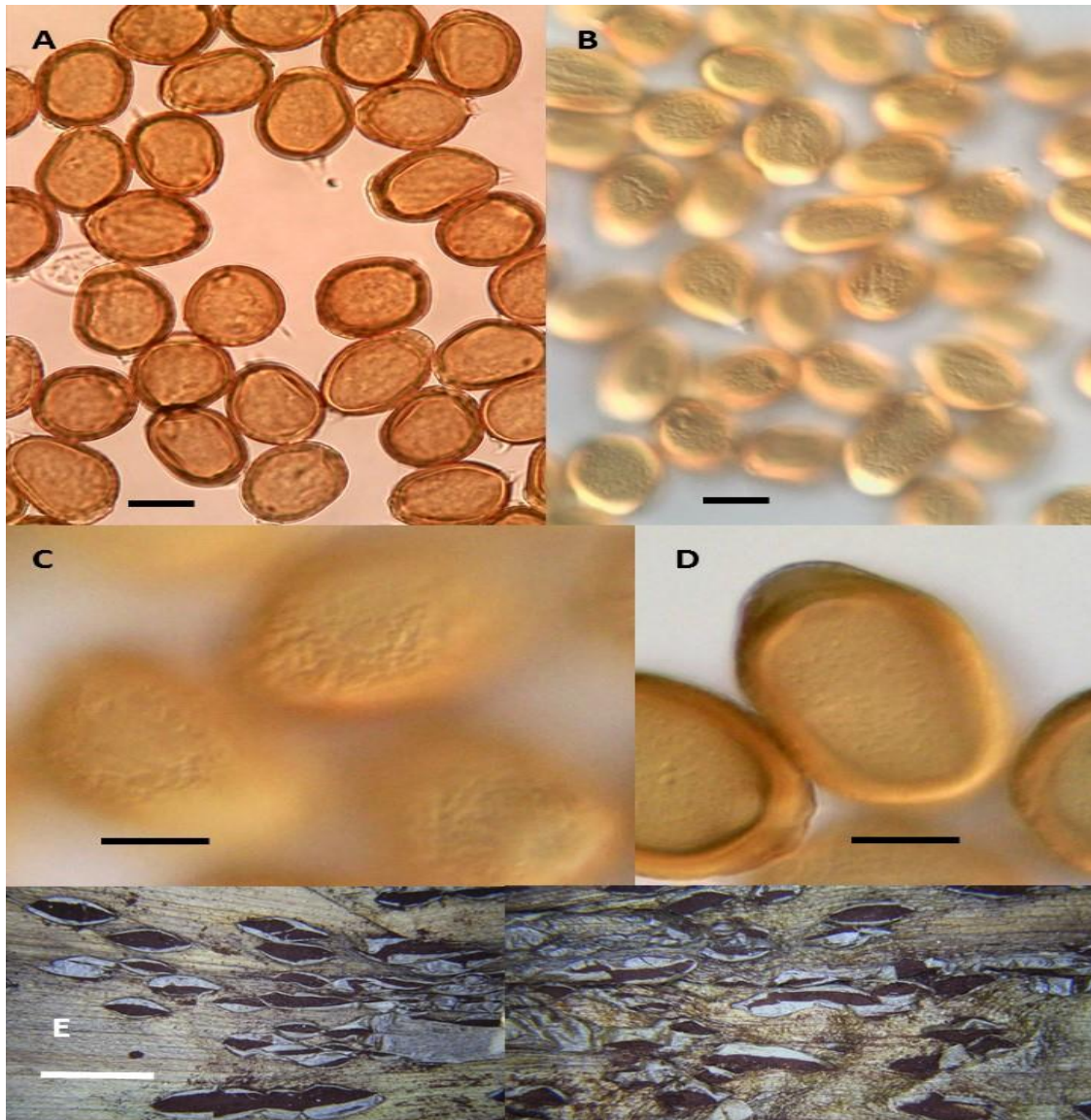


Figure 9. *Uromyces taleshensis* sp. nov., (A) teliospores, bar=20 μm; (B & C) rugose ornamentation of teliospores, bar=20 & 10 μm respectively; (D) apical thickness in teliospore, bar=10 μm; (E) telia on infected leaf, bar=0.5 cm

Table 2. Overview of *Uromyces* Species Occurring on *Silene*

Rust name	Urediniospore dimension μm	Urediniospore features	Teliospore dimension μm	Teliospore features	Reference
<i>Uromyces behenis</i> (DC.) Unger	Missing / demicyclic	Missing / demicyclic	25-35 \times 20-27	Wall smooth 1.5-2.5 μm at sides, up to 11 μm at apex	Gaeumann (1959)
<i>Uromyces cuenodii</i> Maire**	26-30 \times 22-28	g.p.* 2; wall finely and loosely echinulate; 2-3 μm thick	25-30 \times 22-25	Wall chest nut brown; covered by dense and minute verrucae; 2-3 μm thick	Maire (1919)
<i>Uromyces dianthi</i> (Pers.) Niessl	20-35 \times 18-25	g.p. 3-5; wall echinulate; 2.5-3 μm thick	20-31 \times 18-24	Wall 2-3 μm thick, densely and minutely verrucose; with an apical, flat papilla	Wilson & Henderson (1966)
<i>Uromyces doricus</i> Maire	25-30 \times 22-25	g.p. 2-3; wall echinulate; 2 μm thick	22-30 \times 20-25	With a small hyaline papilla; wall uniformly thick (2-2.5 μm), with distant warts of medium size, usually arranged in longitudinal or slightly oblique rows	Gaeumann (1959)
<i>Uromyces inaequialtus</i> Lasch (= <i>Uromyces silenes</i> (Schltld.) Fuckel & <i>Ur. pulchellus</i> Ellis & Everh.)	21-25 \times 18-23	g.p. 2-4; wall densely verrucose; 2.5-3 μm thick	21-38 \times 18-27	Wall smooth up to 8 μm thick at apex	Gaeumann (1959); Sydow & Sydow (1910)
<i>Uromyces inaequialtus</i> var. <i>ecbatanensis</i> M. Abbasi, Moaven & Soleimani	27-35 \times 20-26	g.p. 3-6; wall densely verrucose; 2-3.5 μm thick	25-41 \times 18-26	Wall smooth up to 7 μm thick at apex	Moaven <i>et al.</i> (2005)
<i>Uromyces schroeteri</i> De Toni [Replaced synonym: <i>Ur. verruculosus</i> J. Schröt.]	21-27 \times 18-21	g.p. 3-4(-5); wall echinulate, 2 μm thick	20-26 \times 17-20	Papillate at the apex; wall up to 3.5 μm thick; finely verrucose	Gaeumann (1959); Sydow & Sydow (1910)
<i>Uromyces silenes-ponticae</i> Const.**	25-30 \times 22.5-25	g.p. 2, wall echinulate; 2.5 μm thick	Globose spores 18.5-20 and sub-globose spores 22.5-27 μm in diam.	Papillate at apex; wall verruculosus brown; 2.5-3 μm thick	Saccardo & Trotter (1925)
<i>Uromyces silenes-chloraefoliae</i> Vienn.-Bourg.	20-24 \times 18-23	g.p. 3-4; wall 2-2.5 μm thick; finely echinulate	18-26 \times 18-26	Papillate at apex; wall 2-2.5 μm ; with large hyaline warts	Viennot-Bourgin (1958)
<i>Uromyces suksdorfii</i> Dietel & Holw. (= <i>Uromyces bethelii</i> Arthur)	19-26 \times 18-23	g.p. 3-4; wall 1.5-2 μm thick; closely and evenly verrucose	19-26 \times 18-23	Wall 3-3.5 μm at sides. 4-6 μm at apex; coarsely verrucose in close longitudinal lines	Arthur (1926)

<i>Uromyces arasarbanensis</i> sp. nov.	23.75-32.5 × 17.5-25	g.p. 2-3; wall 1.5-2 μm thick; echinulate	23-32 × 16-23	Papillate at apex; wall finely verrucose; 1.5-2.5 μm thick	Current research
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*Germ pores

**Morphological features of these two species have overlaps and hard to distinguish from each other

***Uromyces liboschitzii* M. Abbasi, nom. nov.** – MycoBank MB 838207

≡ *Puccinia polycnemi* Libosch., Mém. Soc. Imp. nat. Moscou 5: 76 (1817)

≡ [*Uromyces polycnemi* (Libosch.) Tranzschel, Annls mycol. 5(6): 549 (1907) (later homonym)]

=*Uromyces salsolae* Rabenh., Hedwigia 10(1): 19 (1871)

Tranzschel (1907) proposed *Uromyces polycnemi* (Libosch.) Tranzschel, based on *P. polycnemi* Libosch., as a combination to name the *Uromyces* species on *Salsola* and related genera in Chenopodiaceae. That combination is based on the oldest available name for *Salsola* rust, but a later homonym for previously described *Uromyces polycnemi* ‘McAlpine’ (McAlpine, 1906). To solve the problem, the above new name is proposed for this taxon.

The following studied specimen fit well with the description of *U. liboschitzii* (= *U. salsolae*):

On *Halocharis* sp. (Chenopodiaceae), Golestan province, Maraveh tapeh, 14 V 1990, leg. Ershad (IRAN17447F), II.

Only uredinia were present. Urediniospores obovoid or ellipsoid, 21-26 × 17-20 μm, wall 2-2.5 μm thick, with 7-9(-10) scattered (tending to be bizonate) germ pores.

***Uromyces kaviriae* M. Abbasi, sp. nov.** – MycoBank MB 838208 – (Fig. 10)

Etymology: The species is named after the genus of its host *Kaviria*.

Spermogonia and aecia not seen. Few uredinia were present. Sori were cinnamon-brown, hypophyllous, round to elliptic, exposed, pulverulent with remaining host epidermis around sori. Urediniospores were 21-31 × 16-21 μm, oblong-ellipsoid, oblong, obovoid or ellipsoid, wall 1.5-2 μm thick, pale brown to cinnamon brown, echinulate, echinulae 1.5-2 μm apart, with 8-11 mostly bizonate germ pores with more or less conspicuous internal rings, urediniospores were also present on surface or margin of telia which means uredinia are replaced by telia. Telia hypophyllous, exposed, pulvinate, semi-compact, blackish-brown. Teliospores were 26-32 × 20-25(-27) μm, obovoid, broadly obovoid, ellipsoid, wall smooth, chestnut brown, 1.5-2 μm thick at sides, up to 7 μm (mostly up to 5 μm) thick at the apex, rounded, conical or truncate above, mostly attenuated below, pedicel thin-walled, persistent, up to 87 μm long.

TYPE: on *Kaviria gossypina* (Bunge ex Boiss.) Akhani (= *Salsola gossypina* Bunge ex Boiss.) (Amaranthaceae), Razavi Khorasan province, 7 miles W of Sarakhs, alt. 300 m, 14 VII 1972, leg. M. Iranshahr (IRAN46953P), II+III.

The main rust species reported on the genus *Salsola* s. lat. is *U. salsolae* Rabenh (Kuprevich & Ulyanishchev 1975; Tranzschel 1907). A comparison of two authentic specimens of *U. salsolae* on *Salsola kali* (PUR2781 and 2782) with a type of *U. kaviriae* showed that *Uromyces salsolae* contains mostly globose or subglobose teliospores with a rounded apex and thick-walled pedicels which are missing on the above new rust species. Moreover, urediniospores of *U. salsolae* have up to 8 germ pores different from *U. kaviriae* with up to 11 germ pores (mostly 10). *Uromyces nidificans* Tranzschel is another rust species reported on

Salsola s. lat. (Kuprevich & Ulyanishchev 1975). As mentioned by Tranzschel (1907) who described the fungus species, this rust is identical with *U. salsolae* except making strong witches' broom on the host plant which was missing on type of *U. kaviriae*. There are also doubtful reports of *Uromyces chenopodii-fruticosi* (DC.) M. Abbasi and Aime, (= *U. giganteus* Speg.), on *Salsola kali* from Australia and Canary Islands (Farr & Rossman, 2019). This rust taxon is a species reported on *Suaeda* spp. and has mostly obovoid teliospores with up to 4.5 μm apical thickness (Bruckart et al. 2020).

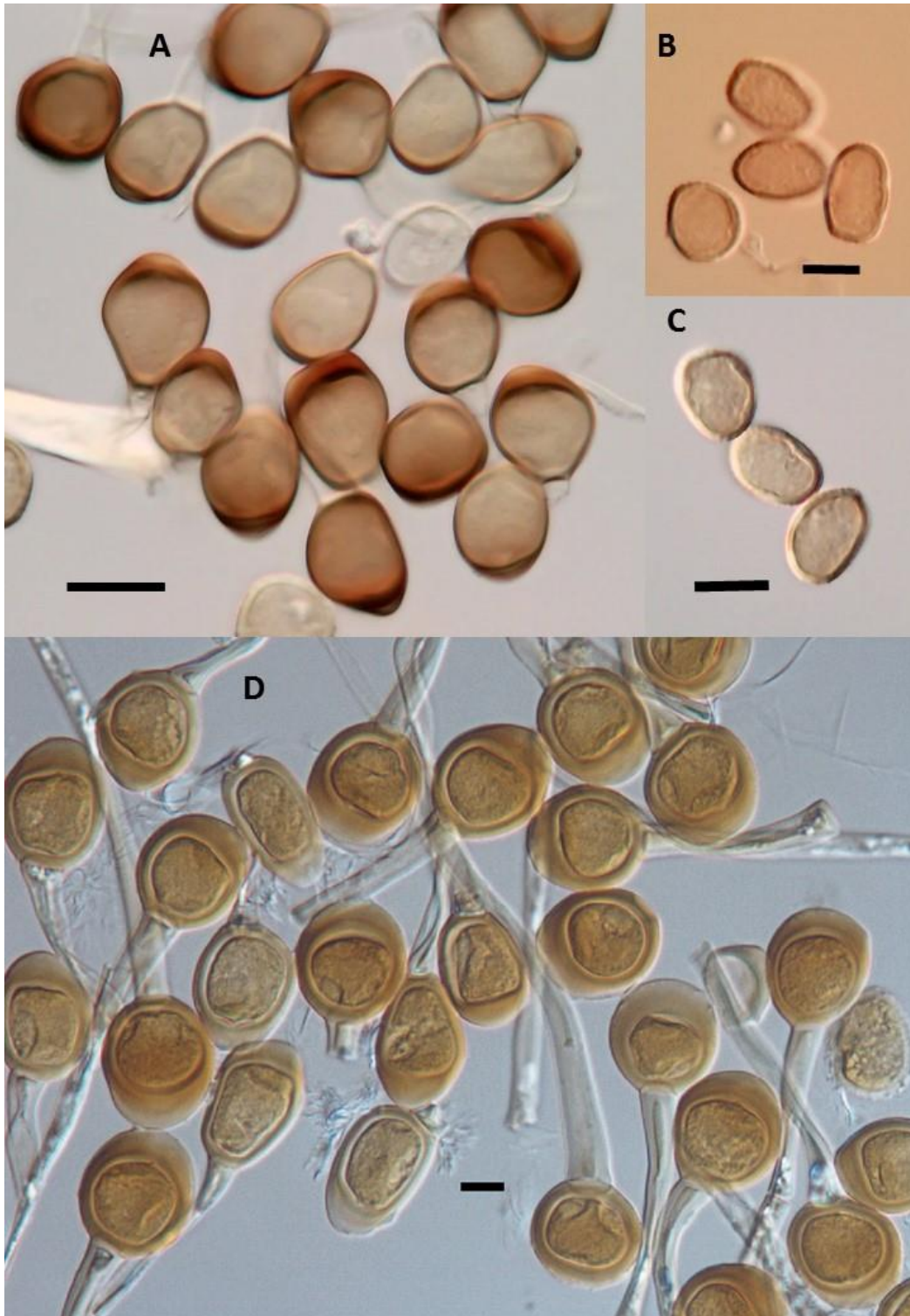


Figure 10. *Uromyces kaviriae* sp. nov., A. teliospores, Bar=20 µm; B. & C. urediniospores, Bar=18 µm, all from holotype; D. *Uromyces salsolae* on *Salsola kali* (PUR2781), teliospores, Bar=10 µm

Uromyces muscari (Duby) Niessl, Verh. nat. Ver. Brünn 3: 114 (1864)

On *Muscari* sp., Kohgiluyeh and Buyerahmad province, Khami mount, 28 IV 1989, leg. J. Fatehi (IRAN7049F), (II)+III

The host plant of the above species was previously reported as *Gagea* sp., By Ershad and Abbasi (1992). To my knowledge, the genus *Gagea* is not among the host range of *Uromyces muscari*. The host plant belongs to the genus *Muscari* and very probably *M. neglectum* which is a common host for *U. muscari* in Iran. Urediniospores were common in telia. These spores were ellipsoid, napiform or in irregular shapes, 28-32 × 20-26 µm, wall hyaline 1.5-2 µm thick, finely echinulate.

Uromyces iranensis M. Abbasi, **sp.nov.** – MycoBank MB 838206 – (Fig. 11)

"*Uromyces iranensis*" is a nomen nudum published by Viennot-Bourgin (1956: C. r. hebd. Séanc. Acad. Sci., Paris 242: 412).

Uredinia amphigenous was oblong to fusiform-oblong, dehiscent by longitudinal slits, orange, powdery, ruptured epidermis conspicuous, urediniospores 22-30 × 22-25 µm, ellipsoid, obovoid or more or less globoid, wall 1.5 µm thick, pale yellowish to yellowish brown, finely and densely echinulate, germ pores 8-11 scattered or tending to be bizonate. Telia were amphigenous, scattered, ellipsoid, oblong or fusiform-oblong, loosely covered by epidermis, mostly exposed by longitudinal slits, exposed telia pulverulent, dark brown, teliospores 17-24 × 15-20 µm, mostly angular, obovoid or ellipsoid spores also present, wall uniformly 1.5-2 µm thick, smooth, often with surface ridges, pedicels thin-walled, hyaline, and usually broken near the spore.

TYPE: on *Hordeum vulgare* L. (Poaceae), Khorasan Razavi province, Dargaz, 5 VII 1953, leg. Scharif & Manoutchehri (IRAN5997F), II+III.

Other material examined: On *Hordeum vulgare* (Poaceae), Khuzestan province, Ahudasht, 10 III 1948, leg. Esfandiari (IRAN5995F), II+III; Esfahan province, Kashan, no date, leg. Viennot-Bourgin (IRAN5996F), II+III; Gilan province, Rezvan-Shahr, 29 V 1996, leg. Razmjo, (IRAN11597F), II+III

The fungus was originally introduced by Viennot-Bourgin (1956) without Latin description (nomen nudum) based on specimens collected from NE (Khorassan Razavi) and SW (Khuzestan) of Iran on cultivated barley. Viennot-Bourgin described urediniospores with hyaline wall and 4-5 germ pores. Restudying those specimens mentioned by Viennot-Bourgin (1956) showed that in contrast with Viennot-Bourgin's description, urediniospores had a yellowish to yellowish-brown wall and the number of germ pores were 8-11. It seems that *U. iranensis* is restricted to cultivated *Hordeum* (Viennot-Bourgin 1956, 1958, 1969). For this reason, Viennot-Bourgin's concept for this rust was followed here and *Uromyces* on cultivated *Hordeum* was considered as a separate taxon.

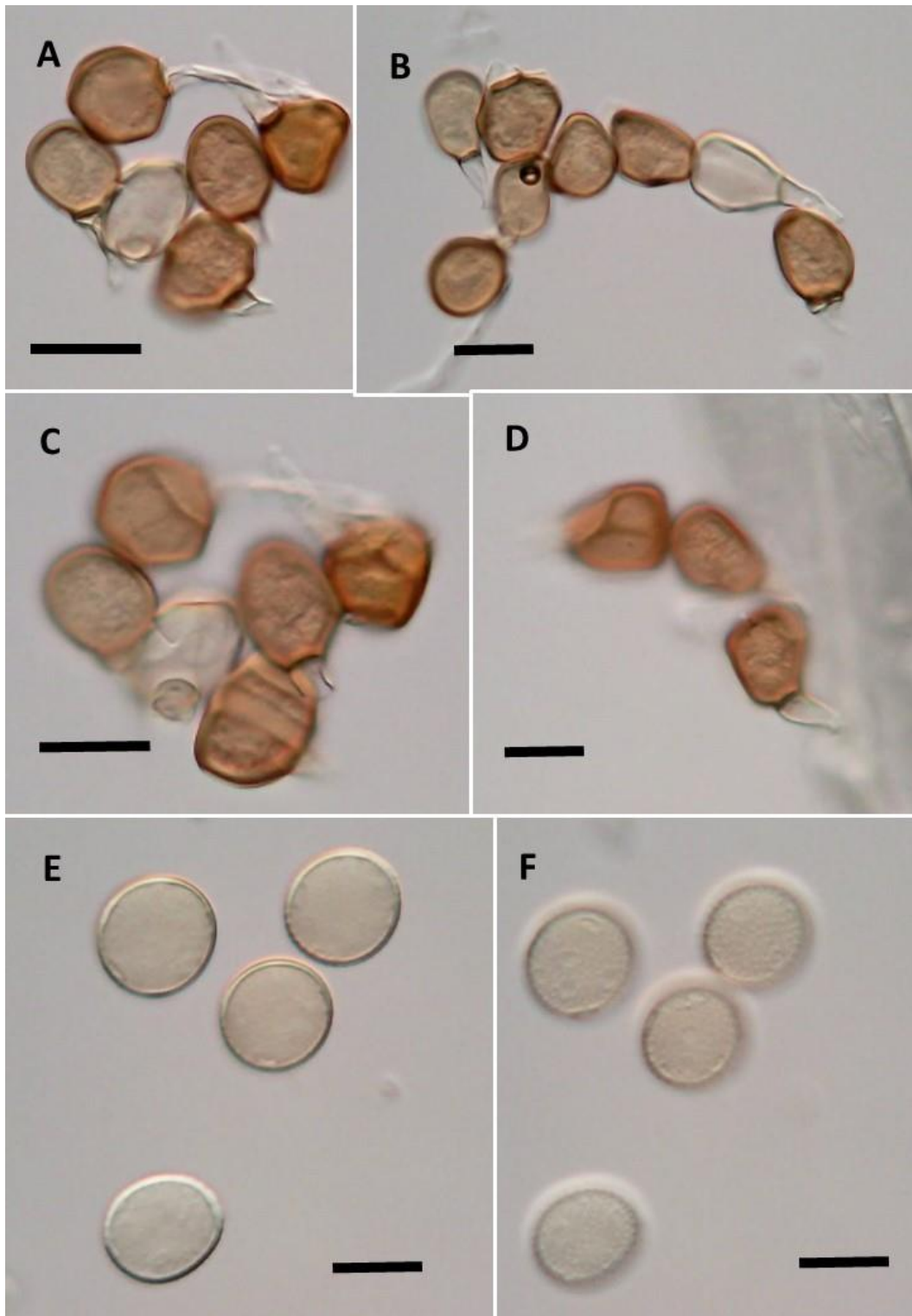


Figure 11. *Uromyces iranensis* sp. nov., on *Hordeum vulgare*, (A-D) teliospores, (E and F) urediniospores, from holotype, Bar=20 µm.

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