

NEW RECORDS OF *MILESINA BLECHNI* AND *MILESINA KRIEGERIANA* (PUCCINIALES) FROM THE UKRAINIAN CARPATHIANS

Tykhonenko Yu.Ya., Hayova V.P. New records of Milesina blechni and Milesina kriegeriana (Pucciniales) from the Ukrainian Carpathians. — Ukr. Bot. J. — 2015. — 72(1): 46–49.

Two species of *Milesina* (Pucciniales) collected in Gorgany Nature Reserve (Nadvirna District, Ivano-Frankivsk Region) in September 2014 are reported, *M. blechni* (Syd. et P. Syd.) Arthur ex Faull on *Blechnum spicant* (L.) Roth and *M. kriegeriana* (Magnus) Magnus on *Dryopteris carthusiana* (Vill.) H.P. Fuchs. These species have not been recorded in Ukraine for about a hundred years. Both rusts were found in very humid sites. Numerous observations of the same host plants under less humid conditions revealed no fungi. Descriptions, micrographs (SEM and LM) and distribution maps for the studied fungi are provided.

Key words: Pucciniaceae, rust fungi, *Dryopteris*, *Blechnum*, morphology, distribution, Ukraine.

Introduction

During our mycological survey in Gorgany Nature Reserve (Nadvirna District, Ivano-Frankivsk Region) in September 2014, rust fungi parasitizing two species of ferns, *Blechnum spicant* (L.) Roth and *Dryopteris carthusiana* (Vill.) H.P. Fuchs, were observed and collected. Both specimens were examined in the laboratory and identified as species of *Milesina* Magnus (Pucciniaceae). Rust fungi of this genus have not been noted in Ukraine for nearly hundred years. Moreover, they found to be rarely recorded in most European countries. They are therefore reported here as interesting rare finds.

Materials and methods

Specimens collected in the field were labelled and dried for further treatment. Urediniospores mounted in water or lactic acid were investigated by light microscopy. Photomicrographs were taken under Primo Star microscope, Canon A300 digital camera and AxioVision 4.7 software, used as well for measurements of microstructures. For scanning electron microscopy, samples were covered with an ultrathin coating of gold by ion beam sputtering unit JFC-1100. Images were obtained by scanning electron microscope JEOL JSM-6060 LA.

Analysis of general distribution is based on the data from published sources (Majewski, 1977; Poelt, Zwetko, 1997; Tănase, Negrean, 2007; etc.) and databases available through the Internet, including GBIF Portal (<http://data.gbif.org>), USDA Fungal Database (Farr, Rossman, 2014), The Fungal Records Database of Britain and Ireland (<http://www.fieldmycology.net/frdbi/frdbi.asp>), etc.

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The specimens are deposited in the Mycological Herbarium of the M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine (KW).

Results and discussion

The synonymic names, description of uredinial stage, host plants and distribution data of the studied species are provided below. Original illustrations and distribution maps are followed by information on their morphology and ecology of these species.

Milesina blechni (Syd. et P. Syd.) Arthur ex Faull, *Annl. mycol.* 8(5): 491. 1910. — *Melampsorella blechni* Syd. et P. Syd., *Annl. mycol.* 1(6): 537. 1903. — *Milesia blechni* (Syd. et P. Syd.) Arthur ex Faull, *Contrib. Arnold Arbor.* 2: 37. 1932.

Uredinia hypophyllous, scattered or grouped on greenish-brown areas, pustular, 0.2–0.4 mm in diameter, yellowish, rupturing at a centrally placed stoma of the overlying epidermis (Fig. 1, a). Urediniospores colourless, obovoid to ellipsoid, 26–45 × 15–23 μm, walls thin, 0.7–1.0 μm thick, with scattered rather coarse echinulation (Fig. 1, c, e).

Distribution in Ukraine: On *Blechnum spicant* (L.) Roth: Ivano-Frankivsk Region, Kosiv, 48° 19' N, 25° 5' E, 06.1914 (Wróblewski, 1916); Ivano-Frankivsk Region, Verkhovyna, 48° 9' N, 24° 48' E, 06.1914 (Wróblewski, 1916); Ivano-Frankivsk Region, Verkhovyna District, Pozhyzhevsk, 48° 8' N, 24° 31' E, 31.08.1911 (Wróblewski, 1922); Ivano-Frankivsk Region, Nadvirna District, Gorgany Nature Reserve, Chernyk parcel, south-west of Chernyk village, 18 quarter, forest of *Picea abies* (L.) H. Karst. and *Abies alba* Mill., along road at forest edge, 48°28' N 24°20' E, 10.09.2014, V.P. Hayova.

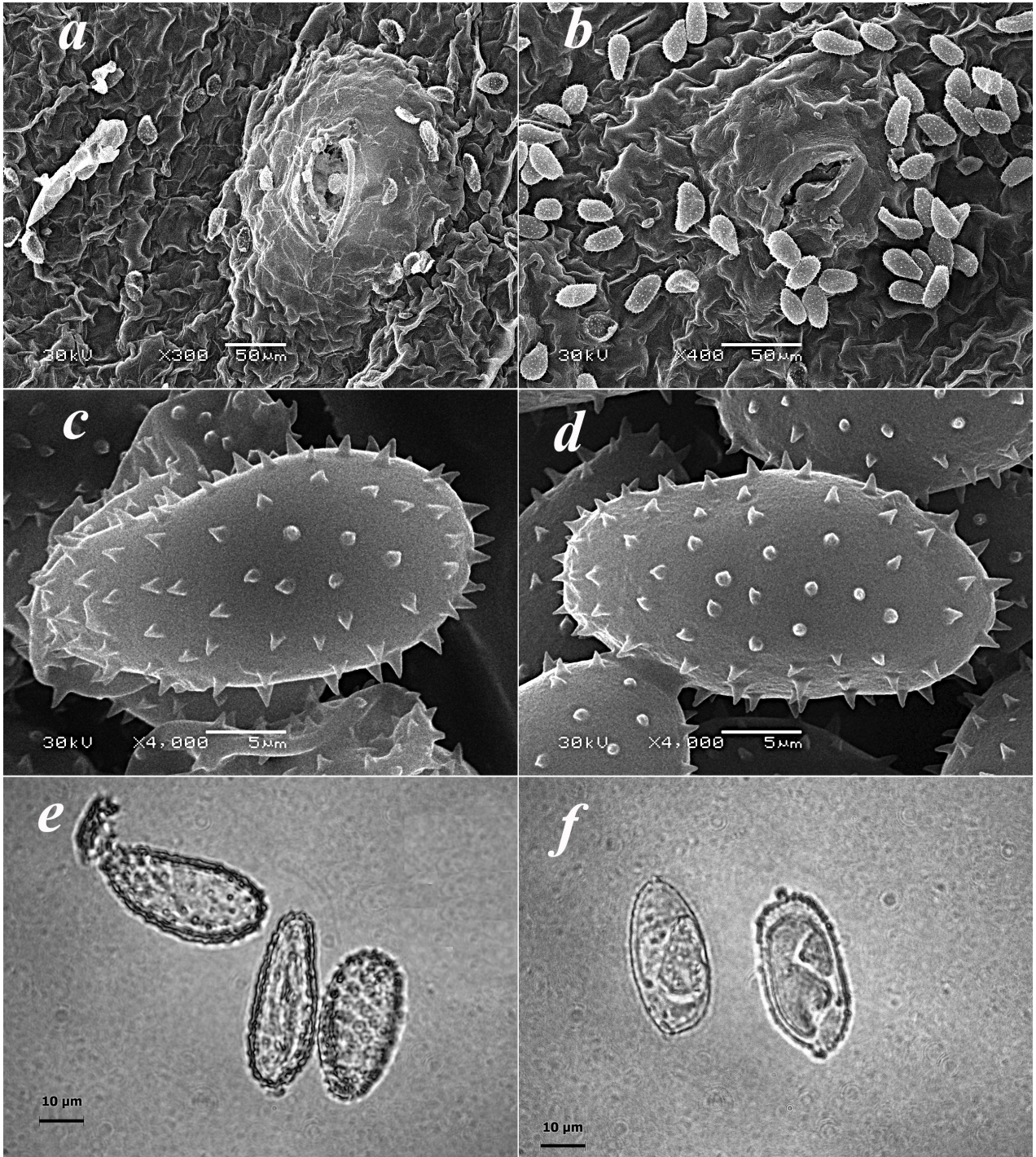


Fig 1. *Milesina blechni* on *Blechnum spicant*: a – uredinium, c, e – urediniospores; *Milesina kriegeriana* on *Dryopteris carthusiana*: b – uredinium, d, f – urediniospores (a, b, c, d – SEM, e, f – LM). Scale bars: a, b – 50 μm; c, d – 5 μm; e, f – 10 μm

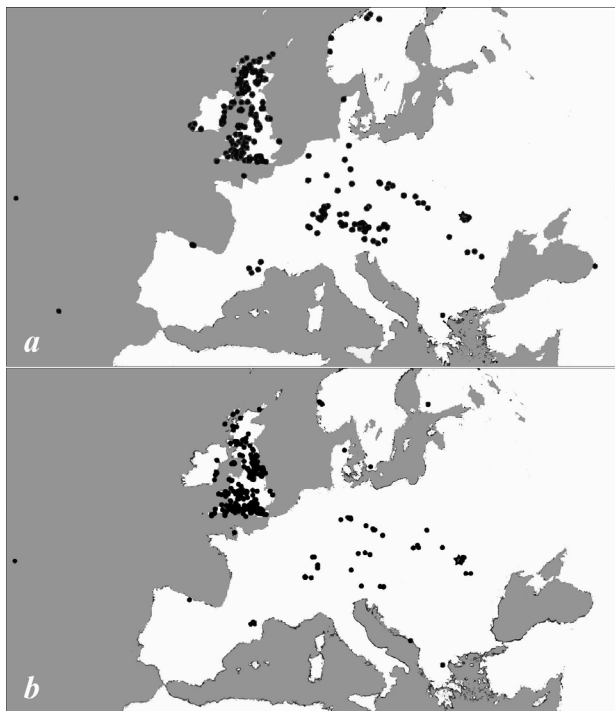


Fig. 2. Distribution maps for *Milesina blechni* (a) and *Milesina kriegieriana* (b)

General distribution: Austria, Belgium, Czech Republic, Denmark, France, Georgia, Germany, Greece, Ireland, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Ukraine, United Kingdom (Fig. 2, a).

Milesina kriegieriana (Magnus) Magnus, *Bull. Inst. Bot. Univ. Belgrade* 27: 325. 1909. — *Melampsorella kriegieriana* Magnus, *Bull. Inst. Bot. Univ. Belgrade* 19: 581. 1901. — *Milesia kriegieriana* (Magnus) Arthur, *Mycologia* 7(4): 176. 1915.

Uredinia hypophyllous, scattered or grouped on greenish-brown areas, pustular, 0.1–0.3 mm in diameter, covered by brownish epidermis with centrally placed stomatic pore (Fig. 1, b). Urediniospores colourless, obovoid to ellipsoid, 23–48 × 15–22 μ, walls thin, up to 1 μ thick, clearly echinulate (Fig. 1, d, f).

Distribution in Ukraine: On *Dryopteris carthusiana* (Vill.) H.P. Fuchs: Ivano-Frankivsk Region, Kolomyia District, Kniazhdvir, 48° 33' N, 24° 53' E, 09.1913 (Wróblewski, 1916); Ivano-Frankivsk Region, Nadvirna District, Gorgany Nature Reserve, Chernyk parcel, Novobudova, 36 quarter, forest of *Picea abies* (L.) H. Karst. and *Abies alba* Mill., forest edge, 48°24' N 24°22' E, 09.09.2014, V.P. Hayova. On *D. dilatata* (Hoffm.) A. Gray: Ivano-Frankivsk Region, Kolomyia, 48° 31' N, 25° 2' E, 05.1914 (Wróblewski, 1916); Iva-

no-Frankivsk Region, Kosiv District, Zawojely, 48° 12' N 24° 35' E, A. Wróblewski. On *D. filix-mas* (L.) Schott: Ivano-Frankivsk Region, Kolomyia District, Kniazhdvir, 48° 33' N, 24° 53' E, 09.1913 (Wróblewski, 1916); Ivano-Frankivsk Region, Kosiv District, Kosmach, 48° 19' N, 24° 48' E, 23.06.1916 (Wróblewski, 1922).

General distribution: Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Montenegro, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Ukraine, United Kingdom (Fig. 2, b).

Dryopteris filix-mas is also parasitized by *M. carpatorum* Hyl., Jørst. et Nannf., a species which is known to occur in Europe (former Czechoslovakia, Norway, Ukraine, UK) and Eastern Asia. *Milesina carpatorum* is distinguished from *M. kriegieriana* by its urediniospore size and surface ornamentation. The former species has much smaller urediniospores (17–26 × 12–16 μ) as well as smaller and more dense echinulations scattered on their surface. In addition, *M. carpatorum* has not been reported on any other species of the genus *Dryopteris* Adans., except *D. filix-mas*.

Aecial stages of *Milesina* species, so far unrecorded in Ukraine, develop on *Abies* spp. The spermagonia and aecia display similar morphological features which are of little value in distinguishing *Milesina* species. Thus, in this genus uredinia and urediniospore size, spore surface ornamentation and identity of the uredinial host are determining for species delimitation.

Both *M. blechni* and *M. kriegieriana* are apparently European species; few reports of their occurrence outside Europe we regard as a result of long-distance dispersal or misidentification. Interestingly, the analysis of their distribution has shown that almost all known up to now records of these rusts are confined to mountainous or coastal regions. This is particularly well demonstrated within the relatively more explored areas with respect to rust fungi associated with ferns; for example, in the British Isles these species have been more rarely reported from inland localities.

The studied species are ecologically similar as they both show strong association with hygrophilous microhabitats, while their host plants frequently occur under less humid conditions. In this respect, a very relevant observation was made by N.W. Legon regarding one of the specimens of *M. kriegieriana* collected in South Somerset (United Kingdom): «Host plant common along the steep sided banks but the only ones with the rust were in a very damp micro-climate at the edges of a flooded culvert alongside the trackbed» (<http://www.field->

mycology.net/frdbi/frdbirecord.asp?pg=6). Similarly, M. Wilson and D.M. Henderson (1966) commented: «Uredospore production is most abundant on moribund leaves lying in damp conditions near the ground rather than on the functional leaves freely exposed in the air». Both our specimens were also collected in very humid sites on the montane forest fringes: *M. kriegeiana* — on the moist slope near springs, *M. blechni* — in a shallow ditch along the pathway. Our numerous observations of the same host plants and other fern species under less humid conditions revealed no fungi.

It can be suggested that *M. blechni* and *M. kriegeiana* occur in other localities in the Ukrainian Carpathians. The fact that up to now they have been extremely rarely reported from this region can be explained by a specific morphological trait of the *Milesina* and *Uredinopsis* species. In general appearance, the representatives of these two genera are fairly distinct from the common rust fungi. Unlike the majority of rusts, they have colourless (white in mass) urediniospores, whereas uredinia embedded in host tissue can be confused with the sporangia clustered into sori on fertile leaves of the host plant.

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Тихоненко Ю.Я., Гайова В.П. Нові знахідки *Milesina blechni* та *Milesina kriegeiana* (Pucciniales) з Українських Карпат. — Укр. ботан. журн., — 2015. — 72(1): 46—49.

Інститут ботаніки імені М.Г. Холодного НАН України, м. Київ

Повідомляється про знахідки на території природного заповідника «Горгани» (Івано-Франківська область, Надвірнянський район) двох видів роду *Milesina* Magnus, які не реєструвалися в Україні вже протягом майже ста років: *Milesina blechni* (Syd. et P. Syd.) Arthur ex Faull на *Blechnum spicant* (L.) Roth і *Milesina kriegeiana* (Magnus) Magnus на *Dryopteris carthusiana* (Vill.) Н.Р. Fuchs. Обидва види знайдені в дуже вологих місцезнаходженнях. Ураження живильних рослин цих видів у сухіших оселищах не спостерігалось. Робота ілюстрована шістьма мікрофотографіями виявлених іржавих грибів і картами їх поширення.

Ключові слова: Pucciniastreae, іржаві гриби, *Dryopteris*, *Blechnum*, морфологія, поширення, Україна.

Тихоненко Ю.Я., Гаева В.П. Новые находки *Milesina blechni* и *Milesina kriegeiana* (Pucciniales) из Украинских Карпат. — Укр. ботан. журн., — 2015. — 72(1): 46—49.

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Сообщается о находках на территории природного заповедника «Горганы» (Ивано-Франковская область, Надворнянский район) двух видов рода *Milesina* Magnus, которые не регистрировались в Украине уже на протяжении почти столетия: *Milesina blechni* (Syd. et P. Syd.) Arthur ex Faull на *Blechnum spicant* (L.) Roth и *Milesina kriegeiana* (Magnus) Magnus на *Dryopteris carthusiana* (Vill.) Н.Р. Fuchs. Оба вида собраны в очень влажных местонахождениях. Развитие ржавчины на питающих растениях этих видов в более сухих биотопах не наблюдалось. Работа иллюстрирована шестью микрофотографиями обнаруженных ржавчинников и картами их распространения.

Ключевые слова: Pucciniastreae, ржавчинные грибки, *Dryopteris*, *Blechnum*, морфология, распространение, Украина.



Uredinia of *Milesina blechni* on *Blechnum spicant* (1) and *M. kriegeriana* on *Dryopteris carthusiana* (2). Photos: V.P. Hayova, Yu.Ya. Tykhonenko (see pp. 46-49)

Урединії *Milesina blechni* на *Blechnum spicant* (1) і *M. kriegeriana* на *Dryopteris carthusiana* (2).
Фото: В.П. Гайова, Ю.Я. Тихоненко (див. сс. 46-49)