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NEW RECORDS OF *PUCCINIA HELIANTHI* SCHW. ON *CYCLACHAENA XANTHIIFOLIA* (NUTT.) FRESEN. FROM UKRAINE

Key words: *Puccinia helianthi*, *Cyclachaena xanthiifolia*, morphology, LSU sequences, Ukraine

Abstract

In September 2012 a rust fungus on *Cyclachaena xanthiifolia* was recorded in two localities near Odessa, Ukraine (46°0' N, 29°40' E and 46°25' N, 30°10' E). Sequences of the 28S subunit of the nuclear ribosomal DNA show that the rust on *C. xanthiifolia* is conspecific with *Puccinia helianthi*. Ukraine is apparently the only country outside of the USA from which *P. helianthi* has been noted on *C. xanthiifolia*.

During a mycological investigation in south-western Ukraine the uredinal and telial stages of a leaf rust fungus were recorded on *Cyclachaena xanthiifolia* (Nutt.) Fresen. (syn. *Iva xanthiifolia* Nutt.) (*Asteraceae*) in two localities:

1. Odessa oblast, Sarata town, near bus station (46°0' N, 29°40' E), 20.09.2012 (soc. *Oidium* sp., *Erysiphales*), coll. V.G. Korytnianska; and,

2. Odessa oblast, Bilhorod-Dnistrovskiy district, on bank of the Dniester River, in weeds along a road (46°25' N, 30°10' E), 25.09.2012, coll. V.G. Korytnianska.

Prior to these findings there has been only a single known collection of a rust fungus on this plant in Ukraine. The mycological herbarium of the M.G. Kholodny Institute of Botany (*KW*) stores a specimen of rust on *Iva* collected in 1926 in Bila Tserkva (49°47'

N, 30°07' E) identified as *Puccinia xanthifoliae* Ellis & Everh. The packet contains *notae criticae* written by Prof. V.G. Tranzschel: «the fungus corresponds with the description of *P. xanthifoliae*, the species known from America only and from there introduced to Kiev region, but also resembles *P. helianthi*. Could *P. helianthi* infect *Iva*?». In his «Conspectus Uredinalium URSS», Tranzschel (1939) cited this specimen of *P. xanthifoliae*, with a similar note, as the only record of this species for the former Soviet Union.

Apparently, J.W. Baxter was the first who clearly argued that *P. xanthifoliae* and *Puccinia helianthi* Schw. are conspecific. In «Notes on Rocky Mountain rust fungi» (Baxter, 1959) he wrote «the two rusts cannot be readily distinguished one from the other except on a host basis. In the writer's opinion *P. xanthifoliae* should be treated as a variety of *P. helianthi*». This idea was supported by successful greenhouse inoculations of *Helianthus annuus* with urediniospores from *C. xanthiifolia* and by reciprocal inoculations carried out several years later (Cummins, Baxter, 1962). This approach was universally adopted and in modern mycological literature *P. xanthifoliae* is regarded as a synonym of *P. helianthi*.

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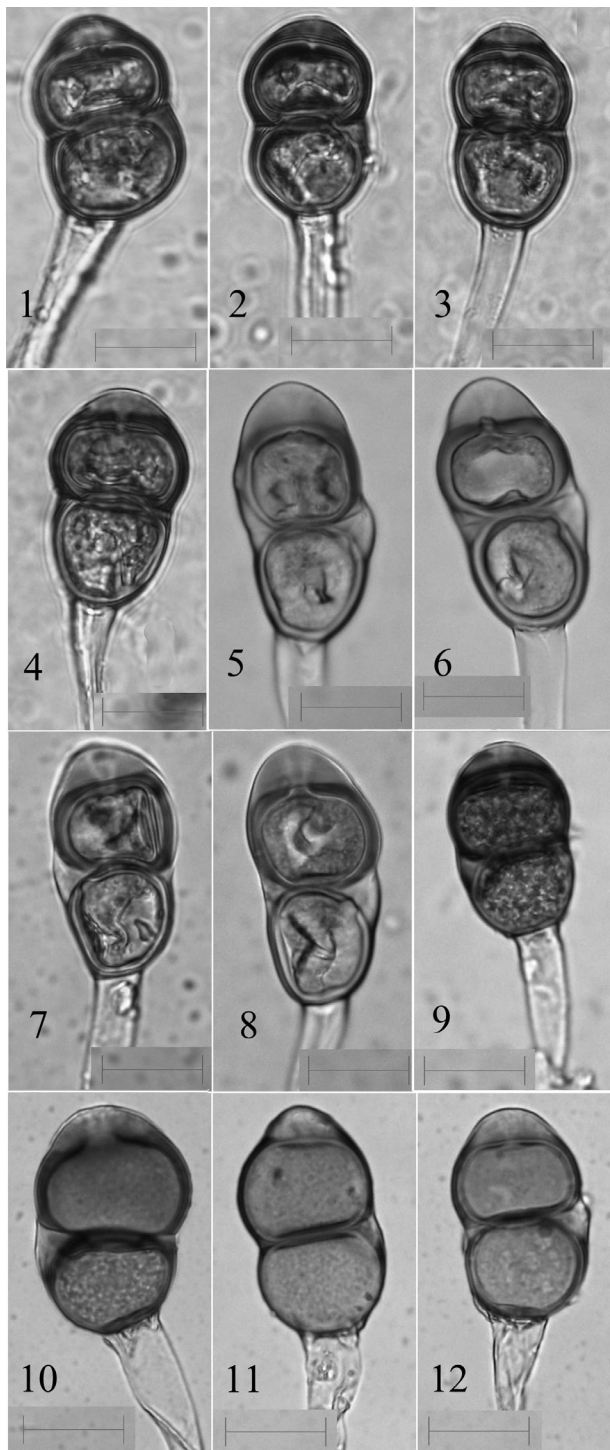
Puccinia helianthi is characterized by considerable variability but variations within a single specimen are no less than between collections on different hosts or between collections from different regions as has been demonstrated by extensive studies on this subject by J.A. Parmelee (1967), who particularly stressed that «there is no morphological basis for subspecific division of *P. helianthi*».

Our microscopic study did reveal some difference between Ukrainian specimens of rust on *Cyclachaena xanthiifolia* compared to those on *Helianthus annuus*: on *C. xanthiifolia* the germ pore of the lower cell of the teliospore is usually covered by a semi-translucent umbo, which never occurs in teliospores from *H. annuus*, the umbo over the germ pore of the upper cell is paler and better separated from the cell wall, and the pedicel is shorter, such that the telia appear more compact (Figure). Taking into account the information adduced in the previous paragraph and our limited sampling, it is reasonable to consider these characters as displaying a range of phenotypic variation within a single species.

The identity of the rust fungi on both *H. annuus* and *C. xanthiifolia* from Ukraine was confirmed by DNA sequence analysis carried out in the Department of Botany and Plant Pathology of Purdue University using primers and protocols of Aime (2006). Sequences of the 28S subunit of the nuclear ribosomal DNA (LSU) for Ukrainian specimens were obtained for three specimens on *H. annuus* from Ukraine, two specimens on *C. xanthiifolia* from Ukraine, and one specimen of *P. helianthi* on *H. annuus* from North Dakota, USA. Generated sequences were approximately 900 bp in length, and all six shared 100% sequence identity. Additional information on materials used is provided in Table.

Cyclachaena xanthiifolia is native to North America between the Mississippi River and western states (Strother, 2006). Due to deliberate and accidental introductions its modern area includes almost all continents. In Ukraine *C. xanthiifolia* appeared as a cultivar in Kiev Botanic Garden but soon escaped and in 1842 was noted on Kiev streets (Protopopova, 1973). At present it is quite established as a weed throughout this country.

Intriguingly, most records of rust on *C. xanthiifolia* are confined to the native area of the host (Arizona, Colorado, Idaho, Iowa, Kansas, Nebraska, New Mexico, South Dakota). The reason why Ukraine is the only country outside the USA where *P. helianthi* has been noted on *C. xanthiifolia* remains unclear.



1–4 — *Puccinia helianthi* on *Helianthus annuus*. Teliospores. Kamianets-Podilsky (48°40' N, 26°34' E), 1949, 5–8 — *Puccinia helianthi* on *Cyclachaena xanthiifolia*. Teliospores. Bila Tserkva (49°47' N, 30°07' E), 1926, 9–12 — *Puccinia helianthi* on *Cyclachaena xanthiifolia*. Teliospores. Sarata (46°0' N, 29°40' E), 2012. Scale bars — 20 μ

Collection information for specimens examined. Collections are vouchered in the Arthur Herbarium (PUR) at Purdue University

Host Species	Coll. #	Location	Coll. Date	GenBank #
<i>Helianthus annuus</i>	2097/T10 (U1478)	Ukraine: Mykolaiv oblast, Berezanka district, Tashine	6-X-2012	KF214724
<i>Helianthus annuus</i>	2101/T10 (U1481)	Ukraine: Mykolaiv oblast, Berezanka district, Koblevo	6-X-2012	KF214726
<i>Helianthus annuus</i>	2138/T10 (U1482)	Ukraine: Odessa oblast, Odessa	30-IX-2012	KF214727
<i>Cyclachaena xanthiifolia</i>	2093/T10 (U1479)	Ukraine: Odessa oblast, Bilhorod-Dnistrovskiy district	25-IX-2012	KF214728
<i>Cyclachaena xanthiifolia</i>	2087/T10 (U1480)	Ukraine: Odessa oblast, Sarata district	20-IX-2012	KF214723
<i>Helianthus annuus</i>	R. Stack s.n.(U863)	USA: North Dakota, Fargo	15-IX-2005	KF214725

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НОВІ ЗНАХІДКИ *Puccinia helianthi* SCHW. НА *CYCLACHAENA XANTHIIFOLIA* (NUTT.) FRESEN. З УКРАЇНИ

У вересні 2012 р. у двох локалітетах на території Одеської обл. (46°0' N, 29°40' E і 46°25' N, 30°10' E) відзначено розвиток іржавстого гриба на *Cyclachaena xanthiifolia*. Послідовності субодиноці 28S ядерної рибосомальної ДНК підтвердили належність гриба на *C. xanthiifolia* до виду *Puccinia helianthi*. Вірогідно, Україна — єдина, крім США, країна, де *P. helianthi* зареєстрована на *C. xanthiifolia*.

Ключові слова: *Puccinia helianthi*, *Cyclachaena xanthiifolia*, морфологія, послідовності LSU, Україна.

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НОВЫЕ НАХОДКИ *Puccinia helianthi* SCHW. НА *CYCLACHAENA XANTHIIFOLIA* (NUTT.) FRESEN. ИЗ УКРАИНЫ

В сентябре 2012 г. в двух локалитетах на территории Одесской обл. (46°0' N, 29°40' E и 46°25' N, 30°10' E) отмечено развитие ржавчинного гриба на *Cyclachaena xanthiifolia*. Последовательности субъединицы 28S ядерной рибосомальной ДНК подтвердили принадлежность ржавчинника на *C. xanthiifolia* к виду *Puccinia helianthi*. По-видимому, Украина является единственной, кроме США, страной, где *P. helianthi* зарегистрирована на *C. xanthiifolia*.

Ключевые слова: *Puccinia helianthi*, *Cyclachaena xanthiifolia*, морфология, последовательности LSU, Украина.