

# *Neoerysiphe galii*, a new powdery mildew fungus in Israel

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**Abstract.** Information about *Neoerysiphe galii* (Erysiphales), a powdery mildew fungus new for Israel, is provided. The necessity of additional examination of *Neoerysiphe* and *Golovinomyces* specimens collected on *Galium* species is emphasised since some of these host species can be infected, apart from *N. galii* and *G. riedlianus*, by another fungus similar to *G. cichoraceorum*.

**Key words:** Erysiphales, Israel, *Neoerysiphe galii*, powdery mildew fungi

## Introduction

The first collections of powdery mildew fungi in Israel were made by Rayss (1940, 1947, 1959). Later, many researchers studied this group of fungi (Chorin 1946, 1961; Palti 1959, 1971, 1975, 1977, 1988; Chorin & Palti 1962; Eshed & Wahl 1970, 1975; Wahl *et al.* 1979; etc.), but they concentrated mainly on powdery mildews of agricultural groups of plants. Therefore, we have continued investigations of the species composition of Erysiphales, above all, drawing attention to species parasitizing wild plants. Recently, we reported a new powdery mildew fungus for Israel known as *Neoerysiphe cumminsiana* (U. Braun) U. Braun on *Crepis* spp. and *Phagnalon rupestre* (L.) DC. (Voytyuk *et al.* 2004). *Neoerysiphe galii* (S. Blumer) U. Braun is the second species of this genus recorded for the first time in Israel.

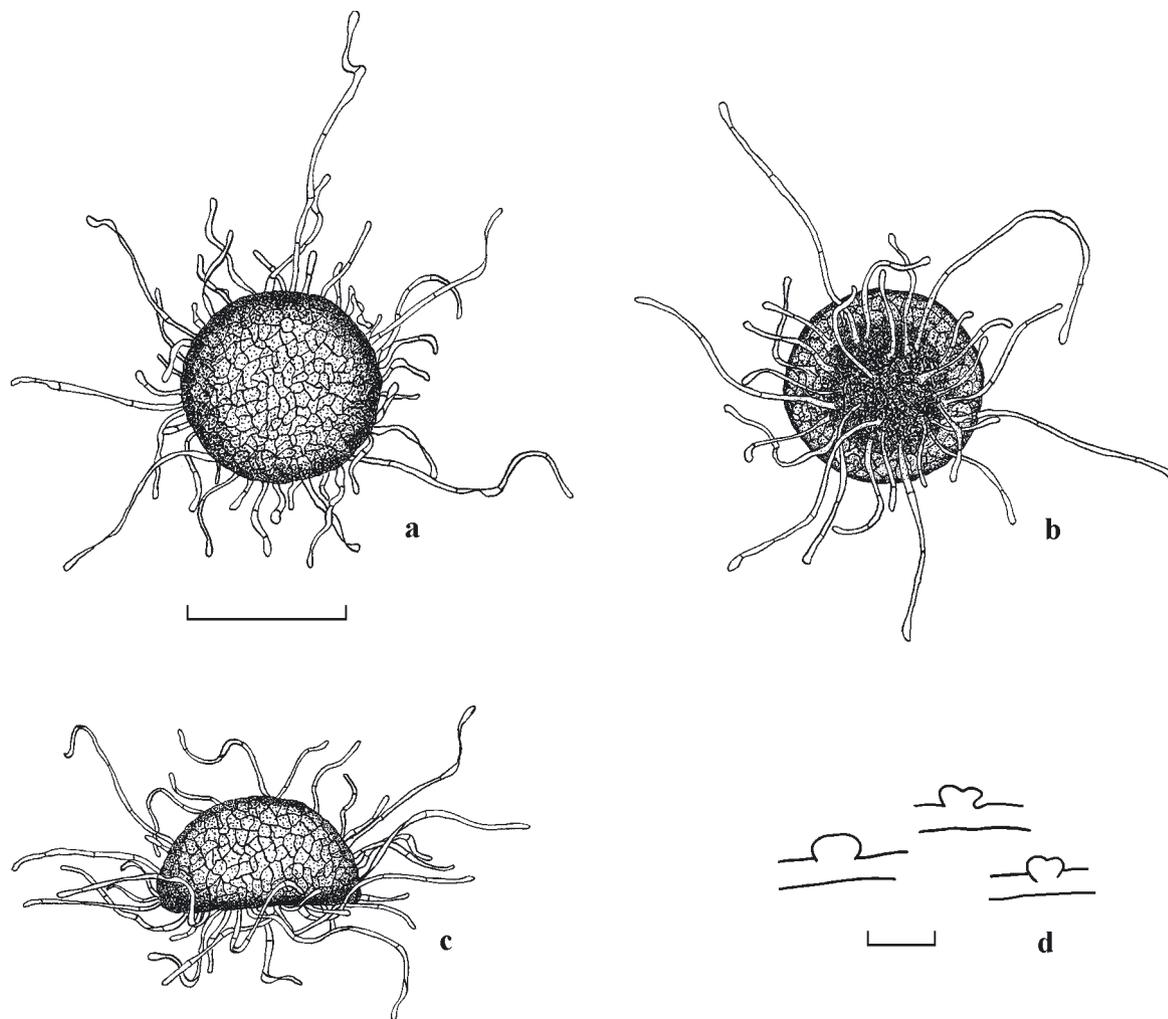
The fungus was described by Blumer (1933) as *Erysiphe galii* S. Blumer. The main features included simple (unlobed) appressoria and asci and spores maturing only after overwintering. Later, based on morphological characteristics of anamorphs, Heluta (1988) split the genus *Erysiphe* R. Hedw. ex DC. into *Erysiphe* s. str. and *Golovinomyces* (U. Braun) Heluta. Thus, this species became known as *Golovinomyces galii* (S. Blumer) Heluta. However, on the basis of specific morphological characters, especially conidium surface features seen under the scanning electron microscope, formation of ascospores after overwintering, morphology of appressoria,

and results of molecular investigations, five species from the genus *Golovinomyces*, including *G. galii*, were transferred to a new genus called *Neoerysiphe* U. Braun (Braun 1999). Thus, the current accepted name of the former *Erysiphe galii* is *Neoerysiphe galii* (S. Blumer) U. Braun. The species is very similar morphologically to *N. galeopsidis* (DC.) U. Braun and *N. cumminsiana*. All three taxa have chasmothecia (fruit bodies) equally depressed (concave) in the lower part and completely mature on dead parts of hosts only after winter, i.e., in a new vegetation period. *Neoerysiphe galii* differs from *N. galeopsidis* by the color of the appendages (they are hyaline, to yellowish, but not brownish), from both *N. galeopsidis* and *N. cumminsiana* by the mainly nipple-shaped to slightly lobed appressoria (with two lobes, not moderately lobed or multilobed). In addition, *N. galii* was recorded on host plants from Rubiaceae, *N. cumminsiana* on Compositae (Asteraceae), and *N. galeopsidis* on Labiatae (Lamiaceae).

## Materials and Methods

During our studies on phytopathogenic fungi of Israel, some specimens of *Neoerysiphe galii* on *Galium aparine* L. (Rubiaceae) were collected from one locality. In natural regions of Israel such as Mount Carmel, Golan Heights, and the Galilee Mountains (where most species of *Galium* occur) we did not find any other evidence of this fungus. However, it is a quite common species in some European regions, including the Ukraine (Heluta 1989).

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**Fig. 1.** *Neoerysiphe galii* (S. Blumer) U. Braun: **a-c** – chasmothecia (**a** – view from above, **b** – bottom view, **c** – side view), **d** – appressoria. Scale bars: **a-c** = 100  $\mu\text{m}$ ; **d** = 10  $\mu\text{m}$

The specimens are listed below. The names of collecting points and natural regions of Israel are given according to Feinbrun-Dothan & Danin (1998).

## Results

Using light microscope examinations, it was shown that the Israeli and Ukrainian specimens had mycelium mainly effused on stems, leaves, and fruits. Features of appressoria fully agreed with their description made by Braun (1995), but not by Shin (2000). The appendages of chasmothecia were in the lower half, very variable, sometimes longer than chasmothecium diameter, septate. Differentiation between mycelium and appendages was easy on internodes of stems, but difficult on fruits and nodes because of dense mycelium. In all cases, asci were immature. All these features correspond to *N. galii*.

*Neoerysiphe galii* (S. Blumer) U. Braun, *Schlechtendalia* 3: 50, 1999. — *Erysiphe galii* S. Blumer, *Beitr. Kryptogamenfl. Schweiz* 7(1): 243, 1933. — *Alphitomorpha communis* Wallr., *Verh. Ges. Naturf. Fr. Berlin* 1: 31, 1819, p.p. — *Erysiphe communis* Wallr. : Fr., *Syst. Mycol.* 3: 239, 1829, p.p. — *Erysiphe martii* Lév. *Ann. Sci. Nat., Ser. 3, Bot.* 15: 166, 1851, p.p. — *Golovinomyces galii* (U. Braun) Heluta, *Ukrain. Bot. Zhurn.* 45(5): 62, 1988. (Fig. 1)

**Mycelium** amphigenous on all green parts of host plants, effused or patches. **Appressoria** nipple-shaped to slightly lobed. Anamorph is *Oidium* s. str., conidia ellipsoid-ovoid, subcylindric or doliform, ca 20–38  $\times$  12–18  $\mu\text{m}$ . Mycelium evanescent to subpersistent. **Chasmothecia** scattered or subgregarious, 90–180  $\mu\text{m}$  in diam, cells of the peridium obscure, irregularly shaped, 7–18 (–24)  $\mu\text{m}$  diam. Appendages in the lower half of chasmothecia, number variable, few to numerous, length variable, sometimes poorly developed and very short, shorter than diameter of chasmothecium,

sometimes 2-3 times longer, mycelium-like, often interwoven, differentiation between mycelium and appendages sometimes difficult, narrow, ca 3-9 µm wide, thin-walled, septate, simple, hyaline. **Asci** and **ascospores** were not developed.

*Specimens examined:* On *Galium aparine* L. **ISRAEL:** Yizre'el Valley, Qiryat-Tiv'on, Simtat Alivne St., 12 May 2004, S.O. Voytyuk (HAI 0445). **UKRAINE:** Poltava oblast, Kobelyaky region, Luchky village, 2 Jul 2004, V.P. Heluta.

## Discussion

According to Braun (1987), *N. galii* occurs throughout Europe, Central Asia, China, and in the Balearic and Canary Islands. The species was recorded on *G. aparine*, *G. ruthenicum* Willd., *G. spurium* L., *G. tricornutum* Dandy, and *G. vailantii* DC. In Israel 25 *Galium* species occur (Feinbrun-Dothan & Danin 1998); three (*G. aparine*, *G. spurium*, and *G. tricornutum*) are listed as host plants of *N. galii* (Braun 1987).

It is worth noting that species of the genus *Galium* can be affected by another powdery mildew fungus – *Golovinomyces riedlianus* (Speer) Heluta (Speer 1969). The fungus has very similar features to the above-mentioned species, e.g., conidial state *Oidium* s. str., and causes similar symptoms. However, *G. riedlianus* has chasmothecia, which mature before winter, and usually disporous asci. Heluta (1989) collected samples in southern Ukraine on *G. verum*, which completely agree with *G. riedlianus*. Other *Galium* species (*G. aparine*, *G. mollugo* L., and *G. spurium*) were affected by *N. galii* or *Golovinomyces* sp. The second was similar to *G. cichoraceorum* (DC.) Heluta and *G. orontii* (Castagne) Heluta. Thus, *Golovinomyces* sp. might be a third species on *Galium*. Therefore, host range of these powdery mildews and their geographical distribution should be updated.

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