

Pot marigold, a new host of *Puccinia lagenophorae* in the Czech Republic

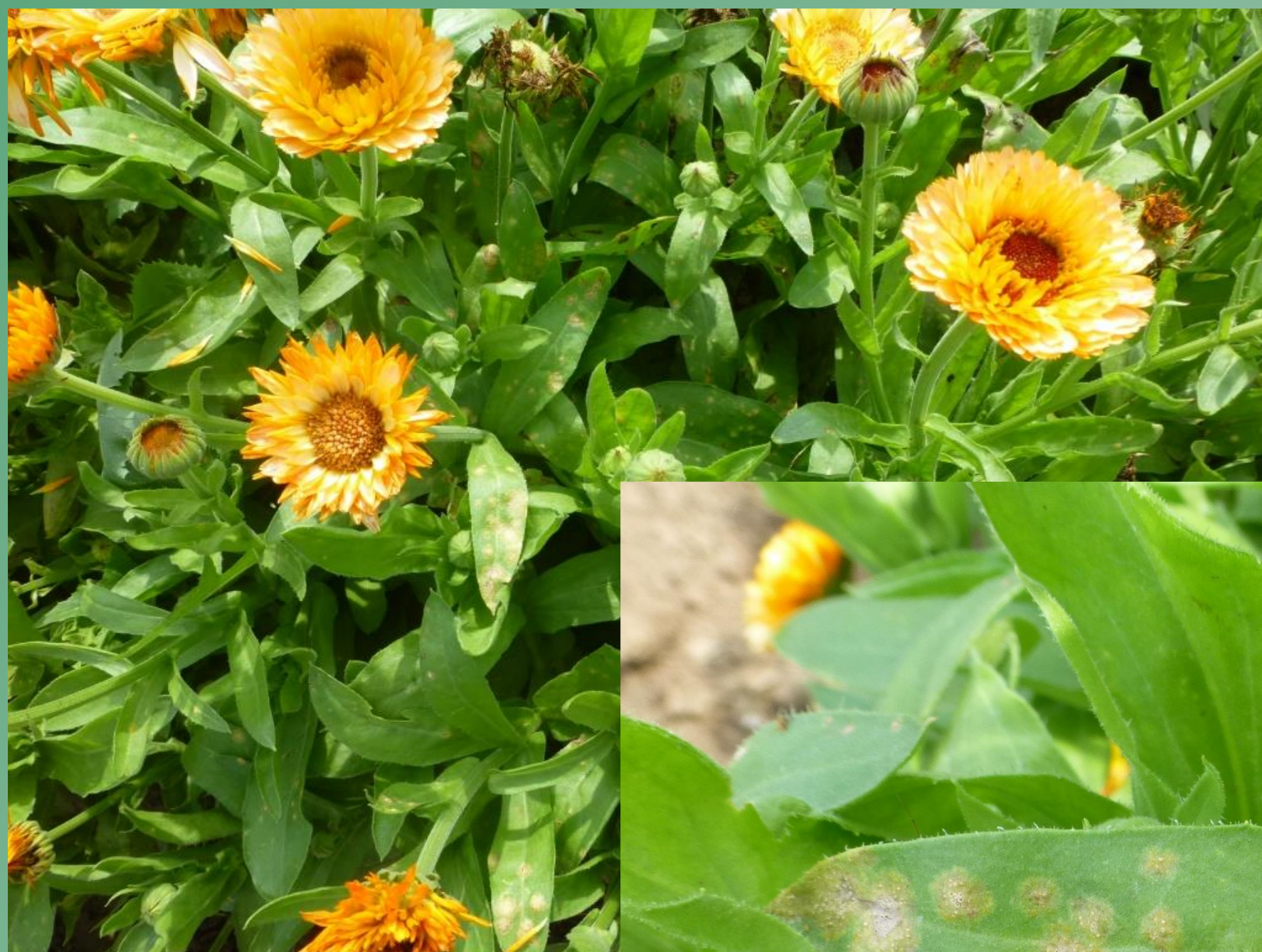
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There are 15 species of *Calendula* genus with *C. officinalis* being the most popular. Pot marigold (*Calendula officinalis* L.) is native to Mediterranean countries but now is grown as an ornamental, medical, culinary, decorative and cosmetic annual herb worldwide. The *Calendula* plant is comprised of carotenoids, flavonoids and essential oils. This gentle and nourishing botanical possesses powerful healing and anti-inflammatory properties.

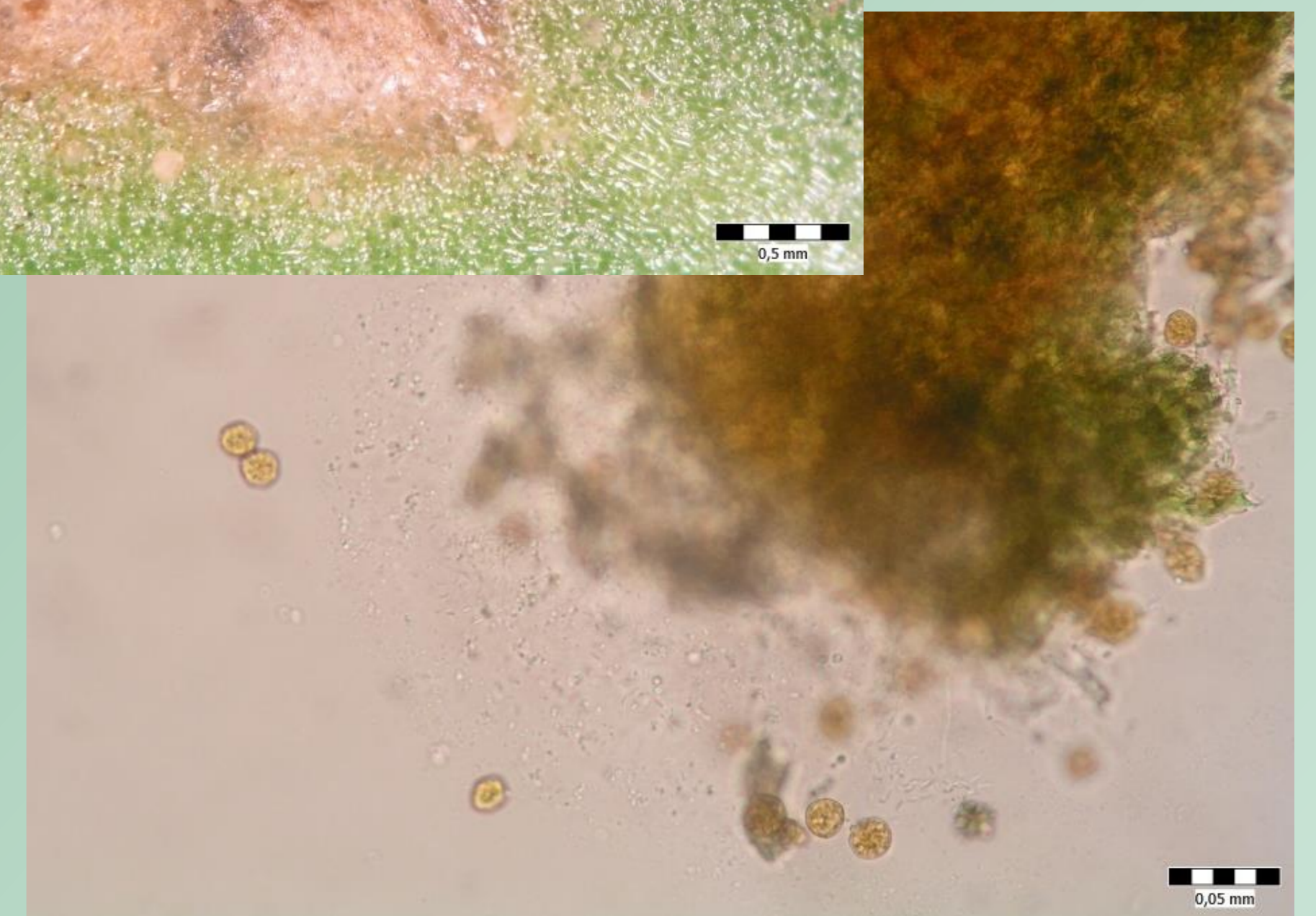
Calendulas are susceptible to powdery mildew (*Golovinomyces orontii*, *Podosphaera fuliginea*) in the landscape. Leaf spot (*Cercospora calendulae*, *Alternaria* or *Colletotrichum* spp.), root rot (*Phytophthora* or *Pythium* spp.), gray mold (*Botrytis cinerea*), viruses (*Tomato spotted wilt virus*, *Cucumber mosaic virus*), aster yellow (Aster yellow phytoplasma), stem rot (*Sclerotinia sclerotiorum*), charcoal root rot (*Macrophomina phaseolina*) and verticillium wilt (*Verticillium dahliae*) were also noticed. *Calendulas* are commonly attacked by aphids, whiteflies and slugs. In our conditions, *calendula* is grown as an ornamental and medicinal plant, on which occurs powdery mildew most often.

In July 2014, rust-infected leaves were sampled from 20 plants of *C. officinalis* in a garden in Lednice in Southern Moravia.



Light green spots were visible on infected leaves, later with sporadic pustules in the middle, on the abaxial surface (Figure 1). The abaxial surface of the infected leaves was covered with powdery golden yellow to orange yellow pustules (0.2–0.5 mm diam.) often arranged in circles, mostly in irregular groups. Sori were round to elongate with white peridium (Figure 2). Aeciospores were subglobose to oval, orange, wall hyaline, finely verrucose, round to obovate, 15–18 × 16–19 μm in diameter (17 × 18 μm average made from 100 aeciospores), arranged in chains (Figure 3). Heavily infected leaves wilted and died. Production of teliospores was not noted. Identification of the pathogen was based on morphological characters, host plant symptoms and the host genus *Calendula*. This rust pathogen was identified as *Puccinia lagenophorae* Cooke 1884 (Pucciniales, Pucciniaceae). The original source of inoculum for these infections is unknown.

P. lagenophorae is an autoecious species forming only repeating aecia (stage I) and telia (stage III). The pathogen is native to Australia and New Zealand, and subsequently reported in most continents on numerous species and genera of the Asteraceae family, approximately 60 host species are known (SCHOLLER 1997). It appeared in Europe in the early 1960s (MAYOR 1962, WILSON & WALSHAW 1963, VIENNOT-BOURGIN 1964, WILSON *et al.* 1963) and rapidly spread on common groundsel (*Senecio vulgaris*). Recently, it was reported in Egypt on *Senecio glaucus* (BAKA 1996) and on common groundsel in California (SCHOLLER & KOIKE 2001) and Canada (BRUCKHART *et al.* 2007).



In the Czech Republic the rust *P. lagenophorae* was found to occur naturally on the weed, *Senecio vulgaris* (URBAN & MARKOVÁ 2009). In Europe the spermogonia were not observed, the aecia are born on systemic mycelium. Aeciospores *P. lagenophorae* need high humidity to germinate, and dry period will reduce epidemic development (KOLNAAR & VAN DEN BOSCH, 2001). The rust is strongly spread by wind-disseminated aeciospores (WILSON & HENDERSON 1966, SCHOLLER 1997). Teliospores are produced only occasionally, e.g. PETRŽELOVÁ *et al.* (2015). The significance of the telial stage in the life cycle is not well understood. Teliospores do not readily germinate and do not infect host plants (MÜLLER-SCHÄRER & RIEGER 1998). The rust in Europe overwinters primarily as mycelium in living overwintering host plants (MÜLLER 1995) and produces aeciospores in the spring and from early summer to autumn. KOLNAAR & VAN DEN BOSCH (2001) observed the effect of temperature (in a range from 10 to 22 °C) on latent period and aeciospore production of *P. lagenophorae* on *Senecio vulgaris*. Both total aeciospore production and net reproductive number increased linearly with increasing temperature.