New records of *Chrysomyxa rhododendri* on *Rhododendron* species

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Abstract

Šafránková I. (2008): **New records of** *Chrysomyxa rhododendri* **on** *Rhododendron* **species.** Plant Protect Sci., **44**: 97–100.

In the spring of 2008, leaf spot was observed on *Rhododendron hippophaeoides* and *Rhododendron obtusum;* the causal agent was identified as the rust *Chrysomyxa rhododendri*. The rust occurs primarily in mountain regions and in the Czech Republic was first observed 105 years ago. In the present study we describe pathogen morphology and symptoms on the two new host species.

Keywords: *Chrysomyxa rhododendri*; *Rhododendron hippophaeoides*; *Rh. obtusum*

Out of almost 5000 described species of rust, about 30 belong to the genus *Chrysomyxa* (Crane 2001). With the exception of five microcyclic species, they are heteroecious species with uredinia and telia on Ericaceae *sensu lato* and Aquifoliaceae (Cummins & Hiratsuka 2003) and spermogonia and aecia on various *Picea* species.

Chrysomyxa rhododendri de Bary was described for the first time by de Bary (1879). In Europe this rust occurs particularly in the Alps (1000–2000 m altitude) and also in other European mountain ranges (Nierhaus-Wunderwald 2000), in Siberia, Japan (Săvulescu 1953), North America (Farr *et al*. n.d.) and in East Asia (Crane 2005). From its native range the rust has spread to ornamental species and cultivars of rhododendron in parks, botanical gardens and nurseries of ornamental plants (Gäumann 1959; Pape 1964; Butin 1996). In places where spruce does not grow it survives by means of urediniospores (Bubák 1906). In the Czech Republic, *Ch. rhododendri* on *Rh. hirsutum* L. was discovered first by Kabát in Mašek's greenhouses at Turnov in 1903, and Bubák (1906) published an isolated finding. Up to now, no other records from the Czech Republic were detected (Marková & Müller, personal communication).

Rhododendron ferrugineum L. and *Rh. hirsutum* are the most frequent telial hosts of *Ch. rhododendri* (Gäumann 1959; Ellis & Ellis 1997), but the fungus has been recorded also on *Rh. dauricum* L., *Rh. indicum* (L.) Sw., *Rh. intermedium* Tausch, *Rh. kaempferi* Planch., *Rh. kiusianum* Mak., *Rh. kotschyi* Simonk, *Rh. lapponicum* L., *Rh. linearifolium* Mak., *Rh. maximum* L., *Rh. oldhami* Max., *Rh. ponticum* L., *Rh. suave* hort. and *Rh. viscosum* Torr. (Gäumann 1959; Bir *et al*. 1982). The aecial hosts are *Picea abies* (L.) Karsten, *P. sitchensis* (Bong.) Carrier, *P. engelmannii* Parry ex Engelm., *P. pungens* Engelm., *P. glauca* (Moench) Voss, *P. mariana* (Mill.) B.S.P. (Ellis & Ellis 1997; Nierhaus-Wunderwald 2000; Ale-Agha *et al*. 2004), *P. morinda* Link and *P. obovata* Ledeb. (Gäumann 1959).

Supported by the Ministry of Education, Youth and Sports of the Czech Republic, Project No. 2B08020.

MATERIAL AND METHODS

The material was studied with a stereomicroscope Olympus SZX12 and light microscope Olympus BX41 (material mounted in 10% lactic acid, 400× magnification). We identified collections on leaves of *Rhododendron hippophaeoides* Balf. et W.W. Sm. cv. Opal and *Rh. obtusum* Planch. cv. Enzet Lilienstein; samples from both species were obtained from the Botanical Garden and Arboretum of Mendel University of Agriculture and Forestry Brno, 10 April 2008, II, leg. Šafránková. The leaves of rhododendron were deposited in the herbarium. According to Farron's database the fungus has already been recorded from *R. hippophaeoides* (Farr *et al*. n.d.)

The first description by de Bary (1879) had been based on observations with low quality microscopes and is not very meaningful nowadays. Therefore, the present, detailed description.

***Chrysomyxa rhododendri* de Bary, Bot. Ztg. 37: 809 (1879)**

syn.: *Chrysomyxa ledi* var. *rhododendri* Savile, *Can. J. Bot.* 33: 491 (1955)

Uredo rhododendri DC., in: de Candolle & Lamarck, *Fl. franç.*, Edn. 3 (Paris) 5/6: 86 (1815).

Spermogonia: irregularly scattered between and next to aecidia, globular, mostly depressed, with a narrow outwards-curling orifice, with no periphyses, light orange, later brown. Spermatia: minute, ellipsoid. Aecia: leathery, heavily compressed, on the longitudinal leaf axis there are extending sacs or tubules (up to 3 mm long) breaking through from yellow-green transverse stripes on the needles, at the time of maturity showing irregular cracks. The cells of the pseudoperidia seen from the side are polygonal, on the radial cut of the pseudoperidia convexly concave; the concave side of the wall lying on the outside is thin and smooth; the inside convex wall is thick, with a structure of columns strongly refracting light which induce the formation of true papillae; the transverse walls are thin, oblique, the cells arranged roof-like. Aeciospores: ellipsoid 17–45 × 12–22 µm, mostly 21–25 × 17–21 µm in size, 23.4 × 20.0 µm in diameter. The wall is 1.5–2 µm thick, with the exception of a smooth longitudinal strip, not always visible, densely covered with small, but distinct, column-like papillae about 1 µm apart. The content is orange-coloured. Uredinia: mostly on the underside of the leaves, round or elongated, scattered or in groups on brown or red spots, sporadically also on the twigs. Urediniospores: in chains between the cells, oval to ellipsoid or irregular, 15–34 × 13–22 µm. The wall is 1–2 µm thick, with a densely papilla-like column structure, the papillae are uneven, 1.5 µm apart. Germ pores are indistinct, content of spores orange. Telia: predominantly on the underside of the leaves, rusty brown, elongated or round, mostly in groups. Teliospores: cylindrically prismatic, 20–30 × 10–14 µm, in the middle of the pile joined into 4–6 cells in rows. The wall is colourless, with the exception of a ring-like thickening on the apical cell (Gäumann 1959).

RESULTS AND DISCUSSION

On the adaxial-side of the leaves the infestation appeared in the form of brown, sporadically antho-cyanic spots (Figure 1); on the abaxial-side

Figure 1. Leaves spots and uredinia *Chrysomyxa rhododendri*

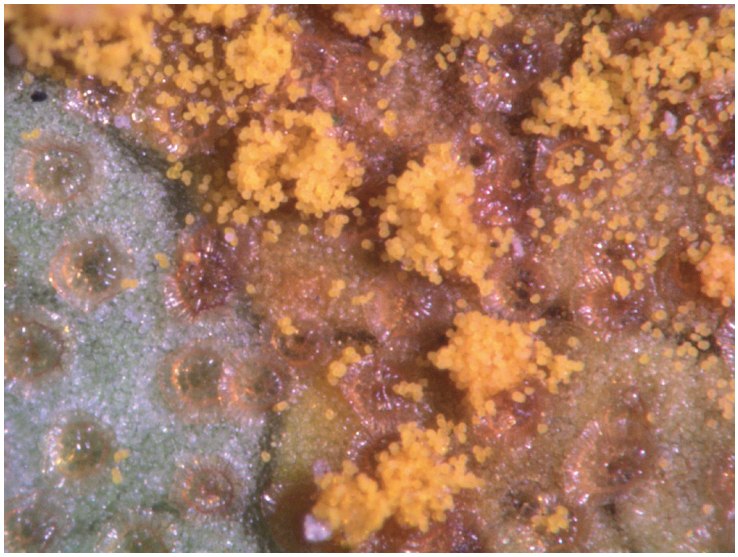

Figure 2. Piles of uredinia on abaxial-side of the leaves

of the leaves and on the site of the spots yellow-orange piles of uredinia were formed (Figure 2) with urediniospores (Figure 3). Heavily infested leaves fell off prematurely.

Description of the found sample: *Chrysomyxa rhododendri* de Bary**,** syn.: *Chrysomyxa ledi* var. *rhododendri* Savile, *Uredo rhododendri* DC.

Uredinia: minute, light yellow to orange, rounded or elongated, 0.12–0.25 mm long, scattered or in groups on the underside of the leaves, at the site of the brown, sporadically antho-cyanic spots on the upper side of the leaves. Urediniospores: round, oblong to ellipsoid or irregular, 17.2–26.1 × 16.3–20.9 µm. The wall is 1–2 µm thick, with a densely papilla-like column structure, the papillae are uneven. Germ pores are indistinct, the spore content orange-coloured. Telia or teliospores were not detected.

In regions of its natural range *Ch. rhododendri* occurs only in areas where native spruce and rhododendron grow together. Epidemics are observed periodically in the subalpine zone. In lower altitudes ornamental rhododendron cultivars are attacked sporadically. We assume that the disease severity depends on the amount of spores on the rhododendron leaves which infect spruce needles in spring. Although *Ch. rhododendri* has been known in the Alps for more than 100 years, never has a massive dieback of infested spruce trees been observed, with the exception of seedlings. The effect on rhododendrons is also negligible (Nierhaus-Wunderwald 2000).

Since the incidence of *Ch. rhododendri* rust is only sporadic, at the present time it is not necessary to deal with rust control on rhododendrons or spruce trees. On ornamental rhododendron species

Figure 3. Urediniospores of *Ch. rhododendri*

only a temporary downgrading of the aesthetical value may occur. However, we cannot exclude that under conditions exceptionally favourable for the spread of the pathogen and when growing highly susceptible species and cultivars of rhododendron the plants will be seriously damaged. In some countries rhododendrons may be treated with fungicides containing the active ingredient bitertanol, mancozeb, dithianon, tebuconazole or difenoconazole (Anonym 2008). Of natural enemies only the fungus *Sphaerellopsis filum* (Biv.) B. Sutton, a parasite of telia, and a hitherto unidentified species of a gall midge are known (Nierhaus-Wunderwald 2000).

Acknowledgements. The author thanks RNDr. Jiří Müller for his valuable suggestions.

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Received for publication August 18, 2008
Accepted after corrections September 23, 2008

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