

Powdery mildew of strawberries in Latvia under field conditions

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Mildew of strawberries is a widespread disease over the world, but it was not detected in Latvia under open field conditions. Mildew of strawberries was noted first in open field in Latvia in 2007, but regular observations were started in Research and Study farm “Vecauce” of LLU in 2008.

Observations were carried out in different varieties in strawberry plantations of different age.

Mildew was determined only in two varieties – ‘Zefyr’ and ‘Kokinskaja rannaja’. Incidence of the disease fluctuated from 9–15 % depending on the age of a strawberry plantation and was higher in 3-year-old plantations. Severity of the disease was not high and did not reach 1 point (evaluation scale 0–5 points).

Morphological properties of *Podosphaera* (chasmothecia and conidia) were described. We suggest, that mildew of strawberries in Latvia was caused by fungus from the genera *Podosphaera* (former *Sphaerotheca*), but more detailed investigations are necessary. The main aim of the research was to estimate harmfulness of strawberry powdery mildew and to clarify life cycle of pathogen in Latvia under field conditions.

Key words: diagnostic, diseases, *Podosphaera*, *Sphaerotheca*.

Introduction. Mildew of strawberries is a widespread disease over the world. Powdery mildew of strawberries was noted only in glasshouses, but was not detected in Latvia under field conditions. There are some possible reasons for emergence of powdery mildew: new varieties and climatic changes. Milder winters might allow overwintering of *Podosphaera* spp. and hot summers increase rate of disease progress (Boland et al., 2004).

The disease damages all aerial plant tissues, including fruits (Maas, 1998).

Systematic of powdery mildew causal agents sharply changed during the last years (Glawe, 2008). The taxonomy of *Erysiphales* recently was revised basing on DNA sequence data. Identification pathogens from *Erysiphales* now require morphology peculiarities of teleomorph and anamorph, incorporates characteristics to the whole

fungus (anamorph plus teleomorph, i. e. the holomorph). Powdery mildew genera are now grouped into five tribes (Heffer et al., 2006).

Podosphaera aphanis and *Podosphaera macularis* were described as causal agents of powdery mildew. Formerly *Sphaerotheca macularis* was thought to be pathogen of strawberries.

Earlier literature findings do not distinguish clearly between the *P. aphanis* and *P. macularis*, but *P. aphanis* is the most important causal agent of powdery mildew in UK (Hal et al., 2008).

DNA analyses of an isolate of the synonymous species *Sphaerotheca aphanis* from strawberry were 100 % identical to *P. aphanis* (Pertot et al., 2007).

Severity of powdery mildew development depends on meteorological factors: temperature (the optimum 15–25 °C) and high relative humidity – higher than 75 %, but less than 98 % (Amsalem et al., 2006). Developing of mycelia in green tissue was observed under all conditions, where the pathogen survived irrespective of visible symptoms, but sporulation was observed from 5–30 °C (Miller et al., 2003).

The main source of infection is chasmothecia (formerly cleistothecia), and time of ripening and liberation of ascospores is important to development of integrated control of powdery mildew. Viable ascospores in the chasmothecia were found from April till June in Norway (Gadoury et al., 2007).

The central aim of research was to estimate harmfulness of strawberry powdery mildew and clarify life cycle of pathogen in Latvia under field conditions.

Object, methods and conditions. Regular observations were carried out in Research and Study farm “Vecauce” of LLU in 2008.

Different strawberry varieties (‘Fratina’, ‘Pegasus’, ‘Polka’, ‘Pandora’, ‘Zefyr’, ‘Honeoye’, ‘Kokinskaja rannaja’), 2-year and 3-year old plantations were evaluated.

Incidence and the severity of powdery mildew were noted in autumn. Incidence of the disease was expressed in percent, but severity in points. A scale of 0–5 was developed to evaluate the severity of mildew: 0 – healthy plant; 1 – first symptoms of the disease; 2 – infected 2–3 leaves; 3 – infected 4–5 leaves; 4 – infected more than 5 leaves; 5 – infected all plant.

Morphological peculiarities of fruit bodies of pathogen were studied and described under microscope at the Institute of Soil and Plant Sciences. Identification of causal agent of strawberry powdery mildew was performed.

Results. Powdery mildew was determined only in two varieties – ‘Zefyr’ and ‘Kokinskaja rannaja’ – in the autumn of 2008.

Incidence of the disease fluctuated from 9–15 %, depending on the age of strawberry plantation, being higher in 3-year-old plantation (Fig. 1). However, severity of the disease was not high and did not achieve 1 point.

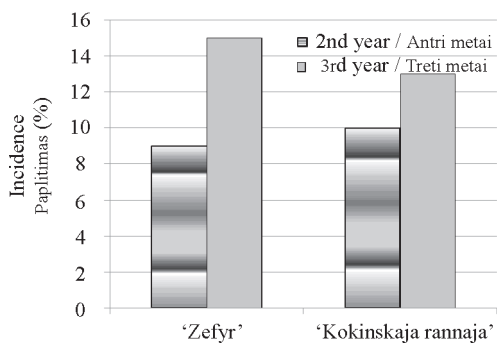


Fig. 1. Incidence of powdery mildew depending on variety and age of plantation
1 pav. Netikrosios miltliges paplitimas, priklausomai nuo veislės ir plantacijos amžiaus

Morphological properties of chasmothecia (former cleistothecium) and conidia were described in the autumn of 2008 (Figs. 2 and 3). We suggest that powdery mildew of strawberries in Latvia was caused by fungus from the genera *Podosphaera* (former *Sphaerotheca*).

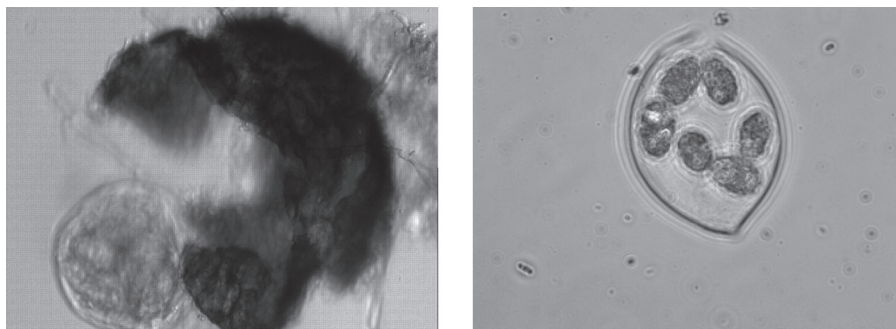


Fig. 2. Chasmothecia with ascus and asco spores of *Podosphaera* spp.
2 pav. Chasmothecia su *Podosphaera* spp. askosporomis ir askais

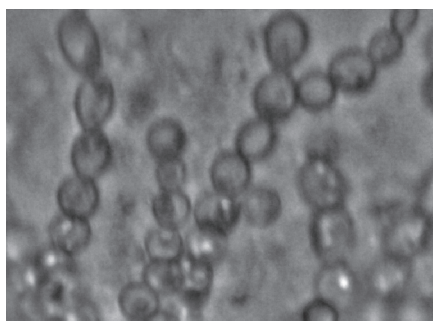


Fig. 3. True conidia chains of pathogen
3 pav. Tikrosios ligos sukēlējo konidijū grandinēs

Discussion. In Latvia, powdery mildew of strawberries was for the first time noted in field in 2007, but this disease has been described all over the world. There are no data available with regard to resistance of strawberry varieties under conditions of Latvia, but different level of resistance was observed.

Identification of species was not done now; more detailed investigations are necessary. Genera *Podosphaera* were established as causal agent of strawberry mildew, related with a new system of pathogen systematic, but most of authors used previous name *Sphaerotheca*.

Chasmothecia is a spherical fruiting body without natural opening. Morphological peculiarities of chasmothecia appendages, number of asci and production of conidia (a single conidium, true chain or pseudochain) are the most important factors for identification of causal agent of mildew. Chasmothecia of *Podosphaera* contain one single ascus, appendages are hypha-like or branched and conidia form true chains (Heffer et al., 2006). Conidia in chains are ellipsoidal to barrel-shaped as reported by others researchers (Santos et al., 2002). Fig. 2 and Fig. 3 show chasmothecia with a single ascus, hypha-like appendages and true chains of conidia.

Investigation of peculiarities of the disease life cycle is a very important task. Control scheme of mildew could be based on incidence of chasmothecia (Berrie et al., 2002). Viable asco spores were detected in Latvia in autumn; investigations are continued. Similar investigations were carried out in Norway, asco spores were found in spring (Gadoury et al., 2007). It means that the same situation is possible in Latvia. However, season most favourable for infection is unclear in Latvia yet.

Conclusions. Powdery mildew of strawberries was first described in Latvia in the autumn of 2008; genera of causal agent were identified as *Podosphaera*.

Further investigations are necessary for precise identification of causal agent and clarification of pathogen life cycle under conditions of Latvia.

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Braškių netikroji miltligė Latvijoje lauko sąlygomis

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Santrauka

Braškių miltligė – visame pasaulyje paplitusi liga, tačiau Latvijoje lauko sąlygomis ji dar nebuvo aptikta. Pirmą kartą atvirame lauke Latvijoje ji pastebėta 2007 metais, o reguliariūs stebėjimai pradėti LLU tyrimų ir studijų ūkyje “Vecauce” 2008 metais.

Stebėtos skirtingos braškių veislės įvairaus amžiaus plantacijose. Miltligė aptikta tik dviejose veislėse – ‘Zefyr’ ir ‘Kokinskaja rannaja’. Ligos paplitimas svyravo 9–15 %, priklausomai nuo braškių plantacijos amžiaus, ir buvo didesnis 3 metų amžiaus plantacijose. Ligos žalingumas nebuvo didelis ir nesiekė 1 balo (vertinant pagal 0–5 balų skalę).

Buvo apibūdintos morfologinės savybės *Podosphaera* (chasmothecia ir konidijų). Spėjame, kad braškių miltligę Latvijoje sukėlė *Podosphaera* (buvusios *Sphaerotheca*) genties grybas, tačiau tam patvirtinti reikalingi nuodugnesni tyrimai. Pagrindinis šių tyrimų tikslas buvo įvertinti braškių netikrosios miltligės kenksmingumą ir išsiaiškinti ligos sukėlėjo vystimosi ciklą Latvijoje lauko sąlygomis.

Reikšminiai žodžiai: ligos, nustatymas, *Podosphaera*, *Sphaerotheca*.

