

Diseases of forest trees associated with phytoplasma infection

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Witches' brooms of shrubs and trees have been widely distributed throughout the world. They are used for propagation to get new selections of dwarf types that fit in the small yards and do not grow very much.

Witches' brooms are valuable resources of unique plant material in breeding programs and they are an important element of gene resources.

However, the aetiology of the growth abnormalities and the health status of their progeny is unknown.



The grafting of witches' brooms has been done since 1974, and is the origin of such dwarf evergreens as *Picea abies* 'Maxwellii' (1874) and 'Tabulaeformis' (1890), *Pinus nigra* 'Hornibrookiana' (1932) or *P. sylvestris* 'Beauvronensis' (1891).

Dr. Sidney Waxman (1923-2005; The University of Connecticut Storrs, USA) selected 34 distinctive witches' brooms cultivars, which were named and introduced to the nursery industry.



Phytoplasmas in conifer plants

Witches' brooms on coniferous trees were considered as a result of bud mutation (Liese, 1933; Fordham, 1967; Waxman, 1975; Vrgoc, 2002).

Phytoplasma-like structures were observed by EM in conifer plants of the family *Pinaceae*, *Taxodiaceae* and *Cupressaceae* with leaf yellowing, shoot proliferation and stunting (Koyama, 1970; Gopo et al., 1989; McCoy et al., 1989).

More recently, Paltrinieri et al. (1998) reported that in Italy *Cypress* species with shoot fasciation symptoms were naturally infected with X-disease phytoplasma (group 16SrIII), by PCR-RFLP analysis.

Very recently, on the basis of PCR amplification of 16S rDNA and sequence analysis Schneider et al. (2005) indicated that *Pinus sylvestris* and *P. halepensis* trees with shoot proliferation symptoms have been associated with a new taxon '*Candidatus Phytoplasma pini*' infection. The incidence of '*Ca. Phytoplasma pini*' in *P. sylvestris* trees with ball-like structures in Poland was confirmed by Śliwa and Kamińska (2007).

Picea abies trees with stunted growth, shoot fasciation and proliferation symptoms were naturally infected with phytoplasmas belonging to X-disease group, 16SrIII (Kamińska and Śliwa, 2008).

Conclusions

- The phytoplasmas so far detected in conifer trees have been established in the forest ecosystems for a very long time ago, so the woody plants provide a long-lived phytoplasma-reservoir.
- To date little is known about the incidence and potential significance of '*Candidatus Phytoplasma pini*' and '*Ca. Phytoplasma pruni*' in conifer plants.
- Research to date has demonstrated that phytoplasmas contribute to disease symptomatology within a casual complex, but the potential impact of phytoplasma infection on woody plants is unknown.
- Phytoplasmas can increase plant susceptibility to fungus infection and other damaging factors and lead to premature senescence and decline, but this is only hypothesis.

Selected references

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