Forest Research Institute
Center of Excellence PROFOREST
for Protection of Forest Resources in Central Europe

Current problems of forest protection in spruce stands under conversion

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Preface

Despite long-term research and the treatments carried out every year, the root rot caused by the fungi of the genus *Armillaria* is, beside butt rot, one of the most significant problems of forest protection. The greatest losses are incurred by the forestry administration units in coniferous stands: according to the data from the Regional Directorates of State Forests, the surface of stands in Poland affected by the damage caused by *Armillaria* spp. amounted to 144,000 ha in 1999, whereas in 2003 it was estimated at more than 200,000 ha. The disease occurs in stands of all age classes, both coniferous and broadleaved. The most threatened stands are those in the southern regions of the country (the Regional Directorates of State Forests in Katowice and Wrocław), the north-eastern part of Poland (the Regional Directorates in Olsztyn and Białystok) and its north-western part (the Regional Directorates in Szczecin and Toruń). In these stands, damage caused by the root rot is noted every year. The area of younger stands (aged up to 20 years) affected by the disease rose from 15,000 ha in 1991 to 26,000 in 2000 and almost 35,000 in 2003. The most threatened stands are those of age class I in the area of the Regional Directorate in Olsztyn (about 6 500 ha). In the older stands, the root rot was found in an area of more than 176,000 ha, primarily in the territories of the Regional Directorates of Olsztyn, Katowice and Wrocław.

The physiological stress related to drought (both the winter and spring drought caused by the deep freezing of the soil and the summer drought generated by a shortage of precipitations) increases their susceptibility to the impact of root pathogens and attacks of bark beetles, particularly *Ips typographus* L. and its accompanying species. In consequences, the intensity of spruce mortality drastically grows, taking in many cases the form of a decline of stands. This is especially the case with the areas of the Beskid Śląski and Żywiecki Mountains, where the situation in lower-lying stands is disastrous. The intensive sanitary cuttings, forced by the rate of tree mortality, lead to a progressive thinning of the stands, enhancing their susceptibility to further damage caused by abiotic (wind and snow) and biotic (pathogens and bark beetles) factors.

On 13–14 October 2003, at Ustroń-Jaszowiec, the Scientific Workshop was held on root diseases and insect pests of trees in the converted spruce stands in the areas of the Beskid Śląski and Żywiecki Mountains. The stands in the Forest Districts Ustroń and Wisła were chosen, as they are situated in areas particularly affected by the negative processes described above.

The Workshop was organised by the Forest Research Institute (IBL), the Centre of Excellence PROFOREST (funded by European Commission within the 5th Framework Programme) and the Section of Forest Tree Diseases of the Polish Phytopathological Society, in co-operation with the Regional Directorate of State Forests in Katowice. The participants in the meeting included scientists of the IBL, the Agricultural Universities of Warsaw (SGGW), Poznań and Krakow, the Institute of Pomology and Floriculture as well as the foresters from a large number of Forest Districts, Forest Protection Service, the General Directorate of State Forests, Regional Directorates of State Forests and the Forest Gene Bank in Kostrzyca. The Workshop was also attended by foreign guests (scientists and practitioners) from Germany, Slovakia, the Czech Republic, Russia and Lithuania. A total of 14 scientific papers were delivered at 3 panel sessions.

In the course of the Workshop, the results of the following studies were presented and discussed:

– the identification of areas with the increased occurrence of the *Armillaria* root rot;

– the identification of the *Armillaria* species and their impact on the health condition of stands;

– economic analysis of control measures and the mitigation of the damage caused by the *Armillaria* root rot;

– analysis of the need of sylvicultural practices in the plantations and stands in the areas affected by the disease;

– an assessment of the threat to the Carpathian spruce stands from bark beetles, with particular focus on the Beskidy Mountains;

– the characteristics of the threat to the spruce stands in the Beskidy Mountains in Polish-Czech-Slovak border area affected by fungal diseases and insect pests;

– control strategies and methods designed to reduce the populations of bark beetles and to mitigate the mortality of infested trees.

The survey results and resulting maps concerning the occurrence of the *Armillaria* root rot in Poland were presented. Digital visualisations of the spatial distribution of the threats to coniferous stands at different levels of resolution were developed for selected areas, with a delimitation of areas of intensive root rot occurrence, economic damage and potentially threatened areas (the effect of a discrepancy between the species composition and site conditions, e.g. coniferous plantations on too rich sites) as well as the mortality of spruce stands attacked by bark beetles. This allowed for a spatial assessment of the threat to spruce stands, making it easier to apply adequate forest management procedures.

The *Armillaria* root rot now occurs in an area of about 211,000 ha in stands of all age classes, mostly pine and spruce stands; therefore, the scope of the Workshop had to be limited to the mountain stands of the Beskid Śląski and Żywiecki Moutains which are most threatened by root diseases and bark beetles. In the course of the field session in these areas, research sites were visited, to demonstrate an assessment of the occurrence intensity of the pathogen fruiting bodies, an assessment of the degree of the disease caused by root fungi and the threat of infection, the verification of the *Armillaria* species and the effects of the impacts of pathogens and bark beetles to trees and stands.

The final outcome of the Workshop was the discussion with forest managers in both the stands threatened by the *Armillaria* root rot and the stands where economic damage was already present to a varied degree of intensity. It will allow for the development of strategies on control policies at different decision-making levels and the assessment of the urgency of stand conversion (matching the species composition to the site) or the minimisation of damage in the Forest Districts facing large threats (e.g. Ujsoły, Ustroń and Wisła).

The economic analysis of the costs related to the control of pathogenic *Armillaria* spp. in the damaged and threatened stands provided the information indispensable for taking decisions on the need of control measures.

This knowledge is of particular significance for taking decisions on the urgency of control and intervention measures.

Despite the fact that the principles of control strategies to reduce the populations of *I. typographus* and other accompanying bark beetles in the dying spruce stands are known, in the light of the situation in the Beskid Mountains (but also in other stands affected by the *Armillaria* root rot), it is necessary to set out priorities in forest protection procedures and to select the methods corresponding to the course of the process underway, adequate to qualitatively recognized threat in an individual part of the stands.

The effective application of the protection strategy which was worked out in the course of the Workshop could slow down and – to some extent – control the rate of stand decline, making it possible to undertake silvicultural measures related to the conversion of dying spruce stands. Indeed, should pro-active protection measures fail to be taken, in the nearest future it may become necessary to restore forests over extensive areas instead of the proposed conversion of stands.

Scientific Workshop in Jaszowiec was held in 2003, while the PROFOREST project (within its framework this event was organized) was complet in year 2006, that is why papers were updated before publishing.

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