

# Armillaria spp. – a hidden harmful agent of young and adult stands of Norway spruce in areas influenced by air pollution

V. Longauerová<sup>1</sup>, D. Krajmerová<sup>2</sup>, M. Maľová<sup>1</sup>, R. Leontovyč<sup>1</sup>



1) National Forest Centre - Forest Research Institute Zvolen,  
2) Technical University in Zvolen

www.nlcsk.org

## Introduction

- Damage to forest stands caused by fungal pathogens play an important role in the decline of spruce forests in the Beskids. Data on sanitary felling from the Slovak part of the Beskids since 1972 indicate dramatically increased share of fungal diseases mainly after 2002 (Fig. 1) (Kunca 2009).

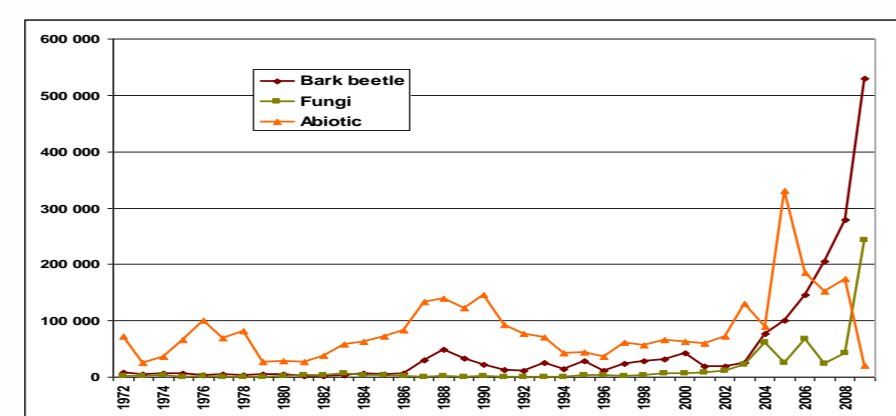


Fig. 1 Amounts of salvage cutting due to groups of damage agents in the Orava region (Slovak part of the Beskids)

- Parasitic fungi of the genus *Armillaria* occur frequently on the roots of planted and naturally regenerated individuals of Norway spruce. Physiological stress caused by the drought and seasonal fluctuations in the water supply seem to be the main factor of its increased pathogenicity. Infection results in the reduced vitality and dieback of old as well as juvenile host trees. In the mountain forests, the impact of *Armillaria* proved to be more severe in the mountain forests with soils acidified due to long-term air pollution.

## Objects

- The objective of our work was to determine the role of different *Armillaria* species in the juvenile growths and cultures, as well as adult forest stands dominated by Norway spruce. Particular attention was paid to the following aspects:
  - Relationship between the condition of host trees and their infection by *Armillaria* species.
  - Differences in the intensity of damage caused by individual species of the genus (i.e. their broad-sense pathogenicity).

## Materials and metode

- The influence of *Armillaria* spp. infection on the vitality of adult and juvenile spruce was analysed at some three sites in the Kysuce region and one site in the Spiš region. Adult trees were studied at two sites (Šadibolovci, Kysuce region , Novoveská Huta – Spiš region) and juvenile trees at three sites (Oščadnica, Zákopčie1, Zákopčie 2 – Kysuce region ) (Fig..2).
- The presence of fungi was assessed at 50 couples of vital (A) and declining trees (B). Pair wise sampling of neighbouring trees with contrasting vitality was done in order to minimize the effect of heterogeneous site conditions For identification of *Armillaria* spp. we used method PCR- RFLP by Lochman (2004)

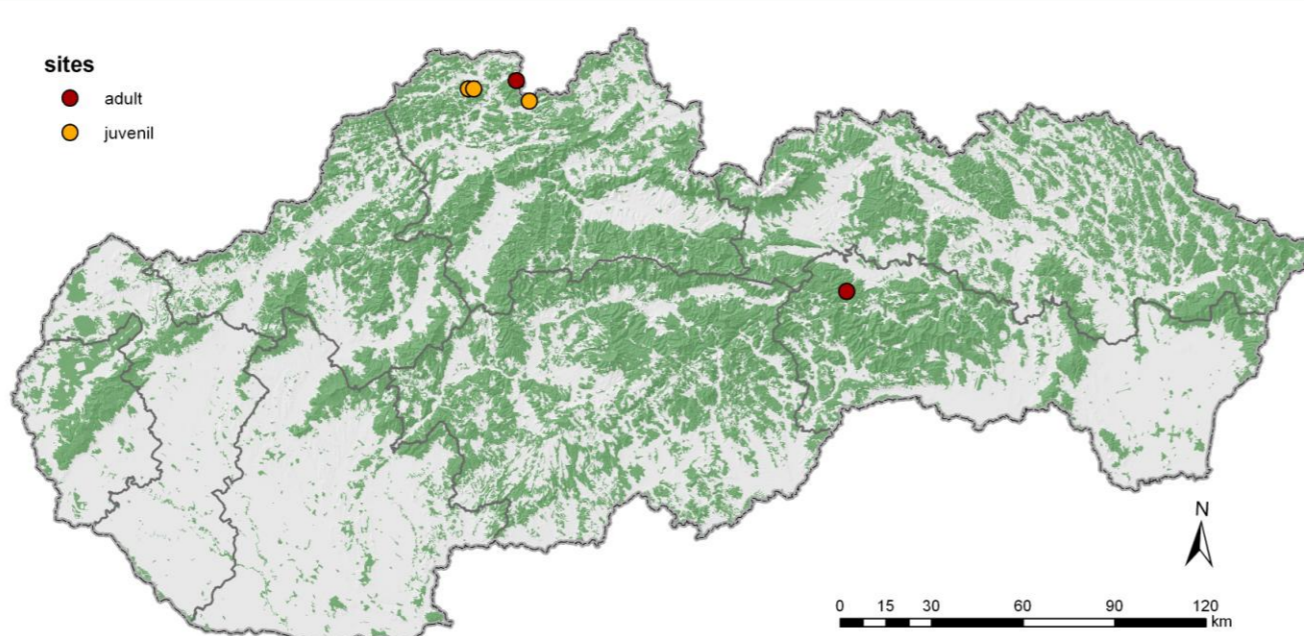


Fig.2 Research plots

## Results

- At all study adult and juvenile spruce sites, the frequency of infection by *Armillaria* was considerably higher in the subsets of declining trees.(Fig. 3,5) Regarding the intensity of damage caused by different *Armillaria* species (i.e. their broad-sense pathogenicity), comparisons of the vital and declining trees did not prove significant differences between *A. ostoyae* and *A. cepistipes* (Fig. 4,6). We found that facultative parasites, such as *A. cepistipes* and *A. gallica* can qualify themselves get into the category of primary pathogens on sites where their hosts are under a multiple stress evolved by climate extremes and air pollutions

### Juvenil trees

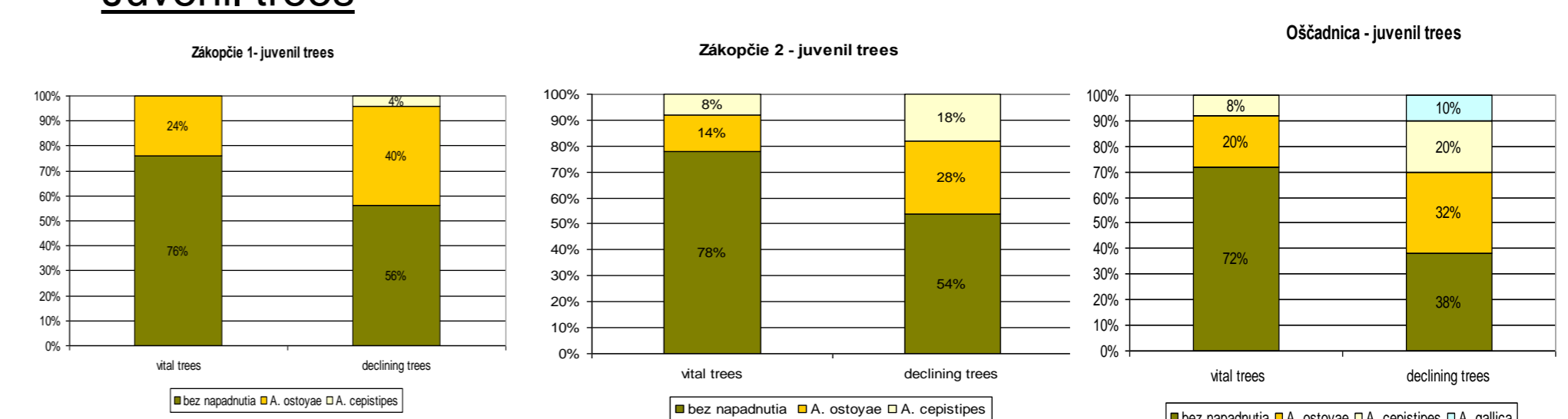


Fig. 3. Proportions of individual *Armillaria* species on the vital and declining juvenil spruce trees

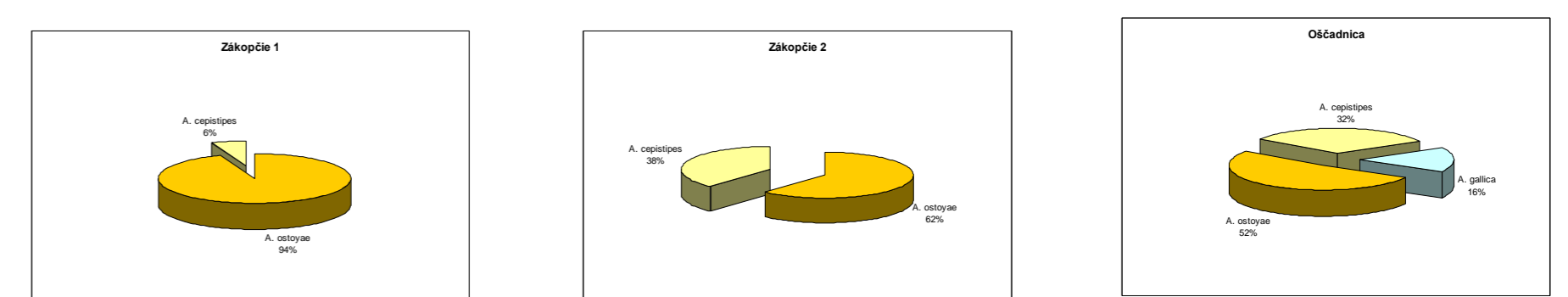


Fig.4. The proportion of *Armillaria* species in all infected individuals

### Adult trees

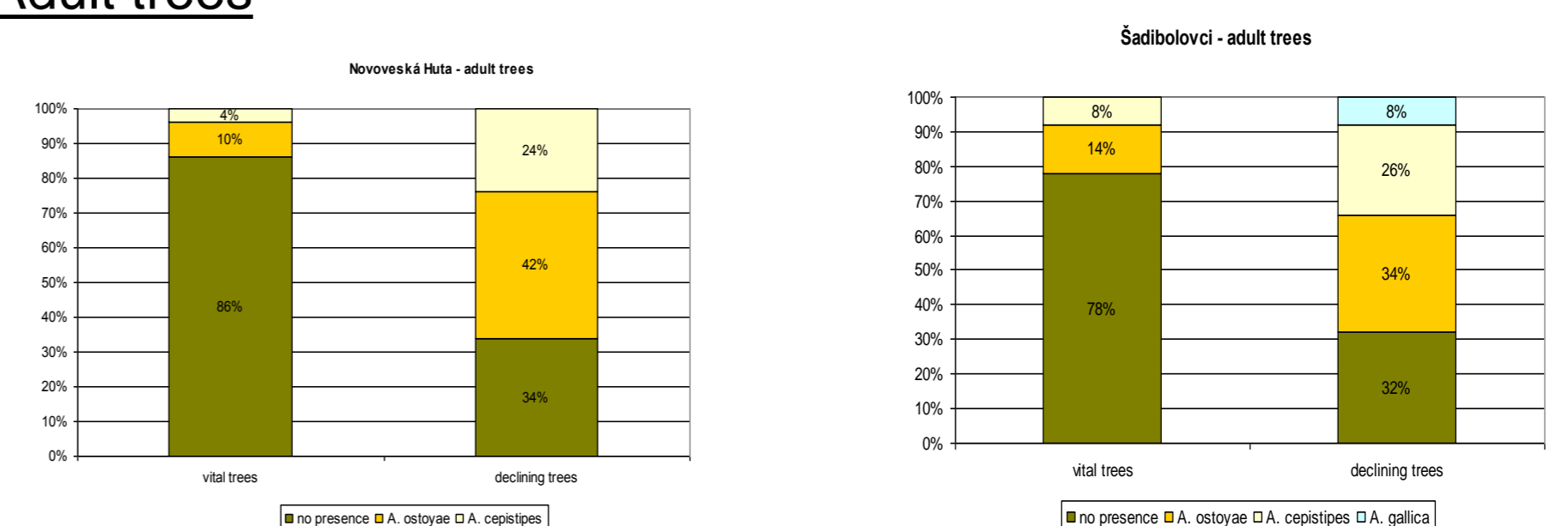


Fig. 5. Proportions of individual *Armillaria* species on the vital and declining adult spruce trees,



Fig.6. The proportion of *Armillaria* species in all infected individuals

## Conclusions

- The numbers of individuals infected by *Armillaria* spp. between the subsets of vital and declining trees differed significantly. This indicates that infection by *Armillaria* spp. is an important predisposing as well as contributing factor for spruce decline. In view of the presence and frequency of several *Armillaria* species, it is worthy of note that subsets of declining spruces were frequently attacked also by the presumably less-aggressive species *A. cepistipes* and *A. gallica*.

## Acknowledgements

- This work was supported by the Agency for Research and Development under contract no. APVV-0045-10.

