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SPECIES OF INSECT AND FUNGAL PATHOGENS CAUSING LEAF DAMAGE ON EUROPEAN BEECH (*FAGUS SYLVATICA* L.)

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***Key words**: beech decline, fungi, insects, mites*

INTRODUCTION

The climatic factors (particularly the draughts of 1999-2004, 2007-2008 and 2011-2012) triggered the phenomenon of beech decay (withering) in some microstations of Romania. This phenomenon generally occurred at the old stands (>100 years old), almost pure and higly productive, positioned in settled stations, with clay soils, or on slopes with sandy soils. Wood and bark fungi and insects were associated with beech stand debilitation (Chira *et al.* 2004).

A relative earliness of beeches with significant treetop defoliation was recorded in 2001-2003, 2010-2013, followed by a slower but steady decaying of their health condition for the next years.

MATERIAL AND METHOD

The material used to conduct our study was harvested from a beech stand located in Bârzava. The stand belongs to the forests of Bârzava Forestry, in Arad Forest Directorate. Description of the tree station and stand in U.P. IV Groşi: ua 121 A: surface = 26.2 ha; altitude 440 – 675 m; southern-oriented; composition 9FA, 1GO; age 110 years old.

To the purpose of analysing the pests within this stand, there were chosen 10 sampling trees, situated at a distance of minimum 25 m.

For each tree, there 4 branches harvested to account for the growths over the past 3 years. The 4 branches were selected to correspond to the three cardinal points in order to observe their influence on the emergence and frequency of pests.

There resulted 40 branches, suitably labelled to facilitate laboratory investigation.

Next, the leaves on each branch growth were submitted to analysis, which resulted in a number of 1610 leaves being analysed.

The presence of all pathogenic agents on stems was reported using the Excel program and statistical methods.

RESULTS AND DISCUSSIONS

The analysis of the species causing damage to the beech stand (tabelul 1) provided a general perspective on the health condition of the leaf apparatus. Among the above mentioned species, the ones causing most damage were: *Mikiola fagi, Fagocyba cruenta* and *Apiognomonia errabunda.* The other species were sporadically encountered on the perimeter of U.P IV Groşi, O.S. Bârzava. However, it is worth mentioning that research was more extensively developed in several areas of our country and the results varied from one area to the another.

The investigations on all identified species were conducted according to the pattern of freqeuncy on tree, stem and orientation.

A general perspective on the condition of the trees from which stems were harvested for analysis indicated that there are no statistically significant differences, the situation varying after cases, with no preference of pathogenic factors for a particular area or tree.

Figure 1 points to tree 5 presenting the highest percentage of healthy leaves, whereas tree 10 presented the largest number of leaves with various lesions. The biotic factors identified on the 10 sampling trees are reported in Table 1.

The graph in Figure 2 presents the variation of leaf number on the 5 growths. As observable, there are no significant variations concerning the amount of healthy leaves analysed at the level of stems. A slight difference appears in the case of stems 3 and 4, but the differences are insignificant and statistically unsupported.

Figure 3 presents the variation of healthy leaves according to the 4 cardinal points. There are no significant differences in the number of healthy leaves according to stem and orientation variables. We can thus conclude that there is a barely distinguishable preference of pathogenic fators for north and east-facing branches to the detriment of the west and south, but statistical evidence in this respect is negligeble.

Table 1. Harmful biotic factors identified on the beech leaves

SPECIES	PHYLUM	CLASS	ORDER	FAMILY
Orchestes (Rynchaenus) fagi L.	Arthropoda	Insecta	Coleoptera	Curculionidae
Phyllaphis fagi L.			Hemiptera	Aphididae
Fagocyba cruenta Herrich-Schäffer				Cicadellidae
Phyllonorycter maestingella Muller			Lepidoptera	Gracillariidae
Phyllocnistis unipunctella Steph.				
Diurnea fagella Denis & Schiffermüller				Chimabachidae
Mikiola fagi Htg.			Diptera	Cecidomyiidae
Hartigiola annulipes Htg.				
Aceria nervisequa faginea Nal.		Arachnida	Acari	Eriophyidae
Aceria nervisequa nervisequa Nal.				
Aceria stenaspis stenaspis Nal.				
Aceria stenaspis plicans Nal.				
Apiognomonia errabunda (Rob.) Höhn *f.c. Gloeosporium fagi* (Desm. Et Rob.) Westend	Eumycota	Pyrenomycetes	Sphaeriales	Diaporthaceae

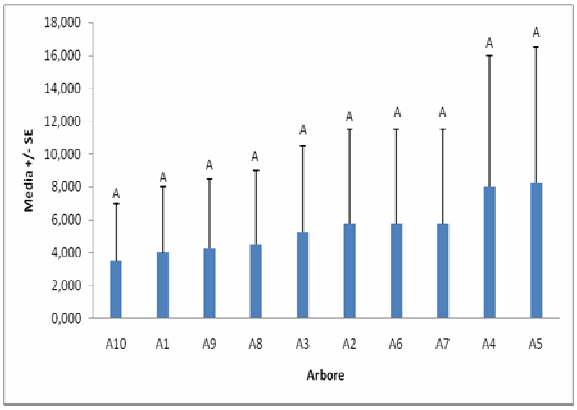

Fig. 1. Frequency of healthy leaves recorded by number of trees

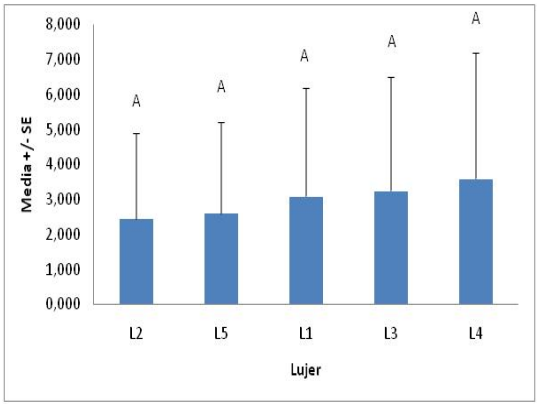

Fig. 2. Frequency of healthy leaves depending on stem

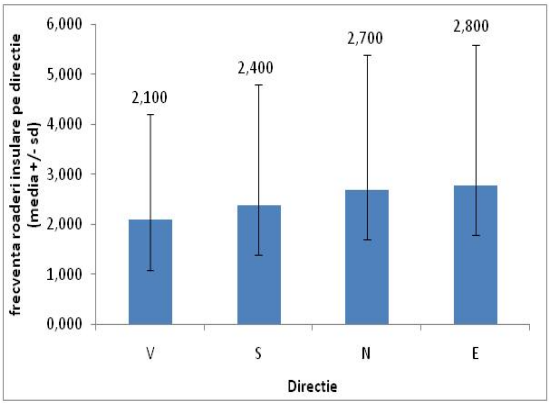

Fig. 3. Frequency of healthy leaves after orientation

The analysis of a number of 1610 beech leaves indicated that:

- 17.88% were healthy leaves;
- 39.81% of leaves were diseased and presented insular cankering;
- 55.71% of leaves presented marginal cankering;
- 6.21% of leaves showed *Mikiola fagi* attacks, with a more significant incidence on trees 10, 8 and 6 and a slight predisposition on stem 5 (resulting from the five-year growth) as well as the west and north orientations;
- 5.59% of leaves showed *Fagocyba cruenta* attacks, especially on trees 1, 2 and 5 and stems 4 and 5 with a slight preference for the north orientation;
- 4.16% of leaves presented *Apiognomonia errabunda,* with spots along the nervure, especially on trees 1, 9 and 10, with a higher frequency on stems 3 and 5, from north facing and south-facing branches;
- 9.25% of the leaves were attacked by *Apiognomonia errabunda,* with almost circular spots on trees 10, 8 and 9, with suceptibility on stems 2 and 4 and preferred orientation to the north.

ABSTRACT

In Romania still are natural beech forest with high productive potential and resistance to biotic factors action. However climatic factors (severe drought of 1999 - 2004, 2007 – 2008 and 2011 - 2012 especially in central and eastern regions) have released the recent European beech decline in Romania. This phenomenon has generally occurred in old (>100 years), (almost) pure, and high productive stands, situated especially on plain sites with excessive clayey soils or on slopes with shallow or sandy soils.

At the same time, in many stands, silvicultural operations (release cutting, cleaning, thinning), were not applied in time, therefore have been installed many different harmful species on beech. At the beech leaves, attacks were reported from the following species:

Insects: *Mikiola fagi* Htg., *Fagocyba cruenta* Herrich-Schaeffer., *Phyllonorycter maestingella* Zll., *Phyllocnistis unipunctella* Steph. end *Diurnea fagella* Denis et Schiff.

Mites: *Aceria nervisequa faginea* Nal. end *Aceria nervisequa nervisequa* Nal.

Fungi: *Apiognomonia fagi* West.

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